Environments, people and mining in the Far Southwest of China since 1500: Cross-disciplinary explorations



Potato fields in Zhaotong, Northeastern Yunnan, at 1800-2000 m (© Nanny Kim)

What this project is about

The mountain zone in the Far Southwest of China is known for its biodiversity and its rich cultural traditions. The lower crunch zone of the Himalayas with mountain ranges between 4000 and 2000 m includes Yunnan province and adjoining areas of Sichuan and Guizhou province as well as of Burma (Myanmar), Vietnam and Laos. Through most of the historical period, the region used to be sparsely populated by many different peoples who mostly remained relatively independent from the major states, with only small pockets of relatively level land controlled by the Chinese empire and settled by Han Chinese and sinicized peoples. Today, it has become a focus of tourist development. Romantic visions picture lush forests, lofty mountains and village life in harmony with nature. In fact, many landscapes look worse than the potato fields in the photo above.

The region is also geologically active and rich in metal deposits. Mining goes back to the prehistoric period, but seemingly played no role in the Chinese expansion into the Southwest. For reasons that are discussed here, mining decreased in historical visibility through the late imperial period, while exploitation by Chinese and for the Chinese market expanded. The first goal was silver, followed by copper, tin, and zinc. Iron mining developed similarly but went virtually unrecorded. In the High Qing, copper and zinc became important for the imperial mints that cast cash coins in great quantities. For this reason, we have records on copper mines from the early 18th century onwards. We have a window on copper and zinc, but many blank spots remain.

There are major open questions:

- Mining and smelting are known to have massive environmental impacts. Has historic mining left the denuded landscapes that we see today?
- How could large mines “appear” in the borderlands when imperial subjects were prohibited from entering them?
- Why would local lords tolerate the dirt and mess of mines in their territories that were not protected by the Chinese empire?

- How could mining towns with populations above 10,000 persons wax and wane without anyone noticing and without causing conflict?
- Intensive mining was a Chinese enterprise. But the late imperial increase of Han and Muslim Chinese populations has been presented as in-migration of military colonists or peasant settlers. Were miners recruited from the landless poor or from runaway soldiers? Why would people become landless and impoverished when land was available and why would soldiers prefer becoming miners?

Possibilities of pursuing these questions by traditional historical methods are limited because written materials are scarce. However, many issues involve questions of locality. A combination of spatial analysis with traditional and less traditional history therefore could be a useful approach:

- If we know the actual site of a mine, chart remains and slag heaps, we can gain an idea of its scale even in the absence of records.
- If we reconstruct networks of settlements, communications and land uses, we can chart influences on local societies and environments.
- Networks of roads and trade give access to investigating economic and cultural integration as a locally specific process.
- Vegetation models that reconstruct processes of change on the basis of fuel consumption, access and time offer the possibility of mapping historical landscape change directly caused by mining.

All these exercises have the methodological attraction of being specific and falsifiable.

Yang Yuda has collected historic and modern information on silver mines over many years, identifying and assessing the large mines, several of which were unknown before. (Read more: Silver mines, Fieldwork reports)

Nanny Kim has reconstructed transport systems and used spatial analysis to demonstrate that miners were no paupers but recruited workers and specialists attracted by high incomes in the borderlands (paper in publication).

Yang Yuda and Nanny Kim have undertaken fieldwork to identify sites and reconstruct technologies in 2011, 2014 and 2015. (Read more...)

This project focuses on historic vegetation models to spatially assess the landscape changes caused by mining.

Summary

At their southeastern end, the Himalayas form a much folded mountain zone that separates China from Indochina, descending from the top of the world to tropical jungles. The Far Southwest of China is the highland part of this zone and roughly congruent with modern Yunnan province. The area, which is about the size of France, contains plateaus that have been centres of human cultures since prehistoric times and rugged hinterlands that into the twentieth century were little influenced by human activities. For its cultural richness as well as its biodiversity, the region is predestined for research on interactions of human societies with their environments. Factors creating different dynamics and transformations include natural and cultural barriers, a variety of land use systems,

compartmentalized diversification, far-flung commercial networks, and migration and economic penetration that was often driven by the exploitation of mineral resources.

The core of the proposed project is the analysis of the environmental history of three mining areas through the last five centuries. Contributions to research on the history of technology and the environment consist in advancing knowledge on an under-researched regional history that is of comparative interest as a non-European case of preindustrial mining on a large scale. A methodological contribution will be realized in the development of applied methods for researching environmental history under conditions of data scarcity that are expected to permit calibrated comparative analyses of developments in different periods and world regions.

The project applies an inter-disciplinary approach that combines historical and geographic methods. The applicant has developed and tested the approach in collaborative projects with Hans-Joachim Rosner (geography, Tübingen University) and Yang Yuda (historical geography, Fudan University, Shanghai) during the DFG research group Monies, Markets and Finance in China and East Asia, which Hans Ulrich Vogel directed from 2005 to 2011. It overcomes limitations due to the scarcity and one-sidedness of predominantly Chinese materials and widens the basis of sources beyond traditional written sources to data from dendrochronology and stratigraphy, as well as from fieldwork and oral histories. By localizing data sets, it employs a new tool of data cross-checking, correcting, confirming and falsifying. In this process, specific questions can be addressed by targeted search for decisive evidence and interpretations tested in models of landscape change.

The project aims at attaining specific and falsifiable results in environmental history and ultimately at identifying factors that tip the balance between sustainable, unsustainable yet relatively stable, and degrading systems. It thus expects to achieve a reassessment of cultural preferences, system trends and technological options historical environmental change and hopes to contribute to ongoing environmental issues.

明清时期中国西南和边疆地区的矿业\地方社会与环境变迁：历史与地理跨学科的探讨

概要

喜马拉雅高原东南角逐渐从雪山下落到热带森林，是地壳折叠的地区、山脉重叠陡险。交通不便的山区自古以来形成分割中国和东南亚的边疆地区。云南省是这个地区中海拔还比较高的部分，文化地理由仅仅占地区面积的3%的坝子和山区形成，坝子从史前时期以来发展文化中心，偏僻山区直到20世纪认为改造影响不大。云南文化多样化和生态多样化和地理关系密切，高山和低谷、坝子和山坡、适合人住与不适合人去都形成独特的条件和动机，包括隔绝与交往、小区域与长途贸易网、长期稳定与突然转变。其中在移民迁入和社会经济改造起到核心动机的作用经常是地下资源：矿产

本项目的核心是对云南三个矿区近五百年的环境史进行系统分析。中国西南地区明清时期的矿业迄今研究有限，和欧洲以及日本中世纪以来的矿业史差别明显。资料和了解虽然有限，明清时期的大矿是工业化之前金属矿大规模开采的重要案例，对中国技术史和经济史的理解有重大意义，同事从比较历史学的角度对人类的社会、资源利用与环境关系的研究十分重要。

为了克服资料稀少的困难，本项目应用一套跨越历史学和地理学的研究方法，包括史料批判性分析、数据的标量化、分段分析，分段可否定、确定或调节。项目组织人2005年到2011年参加图宾根大学傅

汉斯教授组织《中国和东亚钱币、市场和财务，1600年到1900年》科研小组，利用和图宾根大学地理系罗汉斯教授和复旦大学历史地理研究院样煜达副教授跨学科的合作机会发展科学方法。资料方面除了传统史料以外一面用其他史料，如口述历史、遗迹和田野考察等，一面用科学数据，如树木年代学、沉积柱分析等。一切数据用地理信息系统进行确定空间位置之后加以分析。经过分段分析可以提出研究问题，根据初步结果和新提出的问题针对性差资料。最后结果要发展环境变迁模型，对历史上的环境变迁的理解进行确定或否定

本项目的目标是达到环境史上相对具体可靠的结果，以此提高人与环境关系的理解，进一步了解可持续状态、不可持续状态、不可持续但暂且还比较稳定状态的微妙平衡和失去平衡的因素。本项目期待通过环境变迁中文化选择、技术条件等因素起到的作用更深入的了解对目前的人类的选择和局限提供参考资料。

The team

杨煜达 Yang Yuda (复旦大学中国历史地理研究院 Institute of the Historical Geography of China, Fudan University)

Yang Yuda has pursued silver and copper mining in the Southwest of China and in the borderlands beyond for many years.

Cooperation on borderland silver mines since 2009, with intensive exchange on related issues of social, cultural, economic and environmental history.

Hans-Joachim Rosner and Andy Braun (Institute of Geography, Tübingen University)

Hans-Joachim Rosner and Andy Braun use GIS to analyse landscape change through time.

Cooperation with Hans-Joachim Rosner on copper mines in northeastern Yunnan during the Qing period, 2006-2011 and continuing exchange with Hans-Joachim and Andy on everything concerning landscapes and GIS.

Partners (alphabetically)

Name	Affiliation	Expertise	Area of cooperation
Bello, David	Washington and Lee University	Environmental history of China	Environments, cultural and political representations
Bermann, Lex	Harvard University	Historical geography, GIS, databases	WebGIS, technical issues and hosting
Chen, Hailian (陈海连)	Tübingen University	History of mining and metallurgy in Qing China	Zinc and copper mines
Giersch, Pat	Wellesley College	Commerce in Western Yunnan, Bai minority	Trade networks, mobility and Bai culture
Giraldez, Arturo	University of the Pacific	Global silver flows	Global silver flows, silver mines in Latin America

Name	Affiliation	Expertise	Area of cooperation
Janku, Andrea	SOAS, London	Attitudes towards the environment, disasters and hazards	Environments, disasters, and cultures
Kaske, Elisabeth	Carnegie Mellon University	Economic history, financial systems	economic and cultural trends, history of the Qing period
Lan, Yong (蓝勇)	Southwestern University, Chongqing	Historical geography of Southwestern China	Environmental transformations, trade networks
Li, Xiaocen (李晓岑)	Technological University Beijing	Metallurgy and archaeology	Smelting technologies, joint fieldwork
Ma, Jianxiong (马健雄)	Hong Kong University of Science and Technology	Ethnology	Caravan transport in Western Yunnan, oral history
Popplow, Marcus	Technological University Berlin	History of technology	Technological and environmental transformations, esp. in agriculture
Vogel, Hans Ulrich	Tübingen University	Social history, history of mining	Mining in China
Zhou, Qiong (周琼)	Yunnan University, Kunming	Environmental history	Historical environments in Yunnan

Visited sites of historic silver mines

Mine:	Location:	Date:	PDF/ Link:
The Bainiu Mines 白牛厂	Ninglang District 宁蒗县	31.03.2011	01_bainiu_201806.pdf
The Fulong Mines 富隆厂	Lanping District 兰坪县, Yunnan	31.03.2011	02_Fulong.pdf
The Shiyang Mines 石羊厂	Shuangbai District 双柏县, Yunnan	07.04.2011	03_shiyang.pdf
The Lema Mines 乐马厂	Ludian District 鲁甸县, Yunnan	09.04.2011	04_Lema_2018.pdf
The mines in Gengma District	Gengma District 耿马县, Yunnan	15.04.2011, 16.04.2011	Fieldwork
The Maolong mines 茂隆厂	Cangyuan District 沧源 县 and Burma, Yunnan	17.04.2011, 18.04.2011	Fieldwork
The Munai Mines 慕乃厂	Lancang District 澜沧县, Yunnan	20.04.2011	Fieldwork
The Kuangshan Mines 矿山厂	Huize District 会泽县, Yunnan	22.08.2014, 23.08.2014	Fieldwork
The Gejiu Mines 个旧厂	Gejiu City 个旧市, Yunnan	06.11.2015, 07.11.2015	Fieldwork
The Bainiu Mines 白牛厂	Mengzi District 蒙自县, Yunnan	09.11.2015	Fieldwork
The Dulong Mines 都竜厂	Maguan District 马关县, Yunnan	11.11.2015	Fieldwork
The Jinniu Mines	Huize 会泽县金牛厂, Yunnan	12.11.2015, 13.11.2015	Fieldwork
The Mianhuadi Mines	Huidong, Sichuan	19.11.2015	Fieldwork
The New Shiyang Mines 新石羊厂	Shuangbai, Yunnan	24.11.2015, 25.11.2015	Fieldwork

Mine:	Location:	Date:	PDF/ Link:
The Jinsha Mines 金沙厂	Yongshan District 永善县, Yunnan	10.10.2016	22_jinsha.pdf
The Bán Thi mines	Chợ Đồn County, Bác Kạn province, Vietnam	06.11.2016, 07.11.2017	24_ban-thi.pdf
The Old Silver Mines 老银厂	Duogu (Duohu) 朵姑村, Midu District 弥渡县朵姑村老银厂	06.11.2016	29_duogu.pdf
The Yongjin Mines 湧金廠	Fengqing 凤庆县三岔河乡涌金村	06.11.2016	33_yongjin.pdf
The Dayinchang Mines (Great Silver Mines) 会东大银厂, (probably Mileshan in Huichuan 會川密勒山)	Huidong District会东县, Sichuan	18.11.2016	23_dayinchang.pdf
The Malong Mines 马龙厂	Shuangbai District 双柏县, Yunnan	26.11.2016	Fieldwork
The Yeniu Mines 野牛厂	Shuangbai District 双柏县, Yunnan	27.11.2016	16_yeniu.pdf
The Baiyang Mines 白羊厂	Yunlong District 云龙县, Yunnan	30.11.2016, 31.11.2016, 01.12.2016	-
The Mingguang Mines 明光厂	Tengchong District 腾冲县, Yunnan	03.12.2016	-
The silver and zinc mines in the Luozehe valley The historic Old Yiliang Zinc Mines 老彝良鉛廠?	Yiliang (Southern) 彝良, Yunnan	06.10.2017, 06.10.2017	20_huangmukuai.pdf
The silver and zinc mines near Longjie the historic Tongchangpo silver mines 銅廠坡廠	Yiliang Tongchang probably , Yunnan	08.10.2017	21_longjie.pdf
Ngân Sơn 銀山	Bác Kạn province, Vietnam	08.11.2017, 9-11.11.2017	25_ngan-son.pdf

Mine:	Location:	Date:	PDF/ Link:
The Thông Thinh Mines	Tính Túc, Cao Bằng province, Vietnam	10.11.2017	26_tong_tinh.pdf
Qianchang 铅厂	Nanhua District 南华县雨露乡铅厂村	27.01.2018	28_qiangchang.pdf
The Huangkuang Mines 黄鑛廠	Midu District 弥渡县	31.01.2018	30_huangkuangchang.pdf
The Baima Mines 白馬廠	Heqing 鹤庆县黄坪镇白马厂	02.02.2018	31_baima.pdf
The Taihe Mines太和廠	Xinping 新平县老厂乡太和厂	07.02.2018	34_taihe.pdf
The Baidamo Mines 白达莫厂, (The Mingzhi Mines 明直廠?)	Xinping 新平县老厂乡白达莫	08.02.2018	35_baidamo.pdf

Silver mines in the Far Southwest of the Ming and Qing empires



Silver cupellation kilns at the Shiyang Mines

Silver, global trade, and mines in China

Research on global trade flows has shown that China acted as the "global sink of silver" (Andre Gunder Frank) from the late 16th to the early 19th century. Through three transformative centuries of early modern globalization, China attracted the lion's share of Japanese and Latin American silver. Research into silver in China has achieved fascinating insights into economic structures and a dual monetary system consisting of minted copper cash and unminted silver (Richard von Glahn, Lin Man-houng, Akinobu Kuroda).

Silver mining, however, has remained an intractable conundrum. On the one hand, Ming and Qing tax records reflect only very moderate 弄本 outputs of domestic silver mining (Quan Hansheng/Chuan Han-sheng). On the other, silver outputs reached massive scales during the Song period and mines in the Southwest were productive during the Yuan. it seems extremely hard to believe that mining was reduced to a small-scale village industry at a time when the metal was highly valued. Government restrictions on mining certainly existed, but the late imperial state is not known for long-term stringent execution of its policies. The exhaustion of accessible deposits as well as economic and technical restrictions may have limited the industry.

Scattered mentionings point to a different direction. Early Qing records on troules in the Far Southwest of the empire occasionally indicate the existence of long-standing mines that go back to

the Ming period and lead to the formation of towns with several thousand to several ten-thousand inhabitants. A few 18th century records mention mines in the borderlands outside the direct administration of the Qing. A few mentionings draw a relation between domestic and imported silver.

Thus, Tan Cui檀萃(1725-1801), who served as a local official in Yunnan and had a keen interest in practical matters, wrote in the late 18th century:

> 论者以银币之济中国者，首则滇之各厂，次则粤海花银。滇昔盛时，外有募隆，内有乐马，岁出银不赀。
>
> It is said that for the silver that supplies the silver currency of China,the Yunnan mines are most important, while the silver coins that reach Guangdong from overseas come second. When the Yunnan mines were flourishing, there were Mulong in the exterior and Lema in the interior, annually turning out enormous amounts of silver."

He suggests that the output of the Yunnan mines used to be as important as the imported silver and further suggests that two mines, Mulong in the borderlands and Lema in the interior of Yunnan province used to be enormously productive, overshadowing all other mines of the area.

Mining in Yunnan and adjoining regions of the Far Southwest may have been far more important than official records suggest. Research by Yang Yuda based on these indications has found evidence that the scope of mining by Chinese and for the Chinese market in fact has to be reassessed.

If silver mines were more than a village industry, we would like to know **Why we know so little?**

In a nutshell, the Neo-Confucian attitude towards the economy can be summarized as "commercialize, but keep silent about it." We know that economic life in China was thoroughly commercialized in the Song period. The Mongol conquest ended Song affluence and the population collapse during the wars and the vagaries of policies and weather during the Yuan period encouraged a more rural outpook by the Ming founders, but the commercial economy recovered and continued to expand. Tmothy brook has shown for the High Ming, that the ideal of the peaceful old farmer who had never seen the world beyond his native village had become an ideal that rarely applied to real lives. Ming novels tell us about the hustle and bustle of urban life, while monetarization tied seemingly remote village into far-reaching trade networks. Nevertheless, the ideal was alive and well, while political morality cherished classical ideals of peasants as the foundation of society (农本). The ambivalence towards all non-fundamental economic activities involved a certain unease or even disdain. In the public image, especially in the writings that would be handed on to posterity, farming and scholarship were the preferred topics in characterizing both individuals and regions. Hence, we know little about most non-farming economic activities.

Silver mining was a particularly tricky issue. Because the product was money and extraction involved large numbers of workers and environmental damage, it involved actual and moral pollution. Mines and smelters took over areas and made then unusable for agriculture, they polluted water and affected soils. When conflict between mines and fields were brought to the attention of administrators, they had to defend agricultural uses for reasons of political morality. Effects on local society was perhaps more worrying than environmental issues. The lure of silver could induce people to "leave their villages and turn their backs on their wells" (离乡背井), the very opposite of desired behaviour. In the moral order as well as not infrequently in actual event, mining communities were unruly, temporary communities of large numbers of single men, potential hotbeds of unrest.

At the same time, for the same reason of producing money, silver mines were attractive to the administrators. Labouring under conditions of structural underfunding that was institutionalized in the Ming and Qing state, additional incomes were particularly welcome, both to local governments and to line private pockets. Ming emperors attempted to eliminate covetous hands in the administration by dispatching palace eunuchs to supervise the mines. They succeeded in creating a hated and no less corrupt additional structure. The Qing administration promulgated strict restrictions, which were relaxed for metals needed for mining cash coins. On the ground, the contradictory interests in tax incomes and mining restrictions led to a reluctance of formal licenses and systematic underreporting of tax incomes.

As a result, traditional writtne sources contain little beyond official tax quotas and the names of the licensed mines and next to nothing about the unlicensed mines.

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[1]1800-3 (JQ 5-8) magistrate of Yongshan

[2]永善人，贡生

Zhenxiong zhouzhi [光绪]镇雄州志 (Gazetteer of Zhenxiong department), commissioned Wu Guanghan 吴光汉, compiled by Song Chengji 宋成基[3]. Printed 1887. In *Zhaotong jiuzhi huibian* 4 昭通旧志汇编 (四), pp. 1091-1292.

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[3]*吴光汉，江苏阳湖人，1886 镇雄知州。宋成基，镇雄人，贡生*, (fangzhi zongmu 23-28)

Preliminary vegetation models

A model of deforestation caused directly by mining in the area of Dongchuan prefecture, 1700-1800

Northeastern Yunnan was the area with the highest density of mines in the Southwest during the Qing period. Exploitation expanded rapidly after the Dongchuan and Wumeng, areas formally part of Sichuan and ruled by Yi (Lolo) lords since the Yuan period, were conquered and their territories added to Yunnan province in 1726.

The map below shows the area of the two prefectures of Zhaotong and Dongchuan, which were formally founded in 1726 and fully brought under direct Qing control by 1730. In addition to political borders and the large rivers, the map shows the relatively level plateaus (bazi) that were used for irrigated agriculture (light yellow) and as pastures (light green) as well as the larger mines.



Copper, zinc and silver mines were most concentrated in Southern Dongchuan, but important sites are also found in adjacent Huili in Sichuan provinc, in Ludian in Zhaotong prefecture, and in Weining in Guizhou province.

We know very little on historic landscapes and land uses. The only relatively good set of data is the output of the copper mines in Southern Dongchuan. Data on the output of the other mines is not available; we have to make do with an overall ranking in importance.

The model works on the following premises:

1) At the outset of the investigated period, the entire area was forested with the exception of relatively level land suitable for grazing and agriculture, of low-lying valleys and altitudes above the treeline. these areas are assumed to have been static because the transformation of pastures to farmland have no effect on the deforestation process.

2) Deforestation caused by other human activities is intentionally left out.

3) The exploitation of forests for burning charcoal was similar for mature and young forests due to the preference of diameters within 5 cm.

4) For simplicity, clearcutting is assumed.

5) Forest exploitation follows terrain, rivers suitable for rafting, and roads.

6) As charcoal demand for smelting dwarfed all other uses of wood (timbering, machinery, housing, firewood), only smelting is considered.

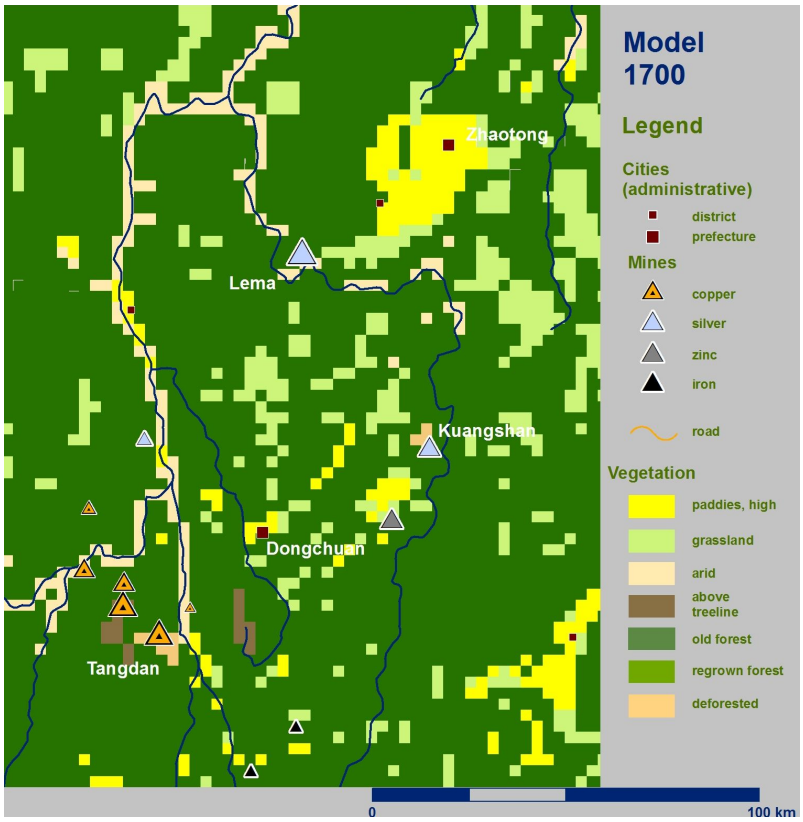
7) Smelting copper consumed an equal amount of ore and charcoal.

8) The reconstruction of acreage of forest consumed for smelting proceeds in the following steps: The metal content in the dressed ore was 30%, outputs are converted to dressed ore accordingly. The ratio of fresh wood:charcoal was 3:1. 400 m^3 of wood were harvested per ha.

9) The model proceeds in 10-year steps for copper mining. For other mines, patches are indicated on the basis of an overall importance only.

10) Forest regrowth is assumes after 20 years, renewed harvesting after 40 years.

Based on these premises, the model was run from 1700 to 1820. The following maps show 1700 (before the expansion of mining), 1750 (after two decades of intensive mining with outputs between 3000 and 6000 t/a), 1780 (after five decades of intensive mining), 1800 (two to three decades after mining outputs levelled out at bout 2000 t/a.


Model
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Legend
Cities
(administrative)
district
prefecture
Mines
copper
silver
zinc
iron
road
Vegetation
paddies, high
grassland
arid
above
treeline
old forest
regrown forest
deforested
Zhaotong
Lema
Kuangshan
Dongchuan
Tangdan
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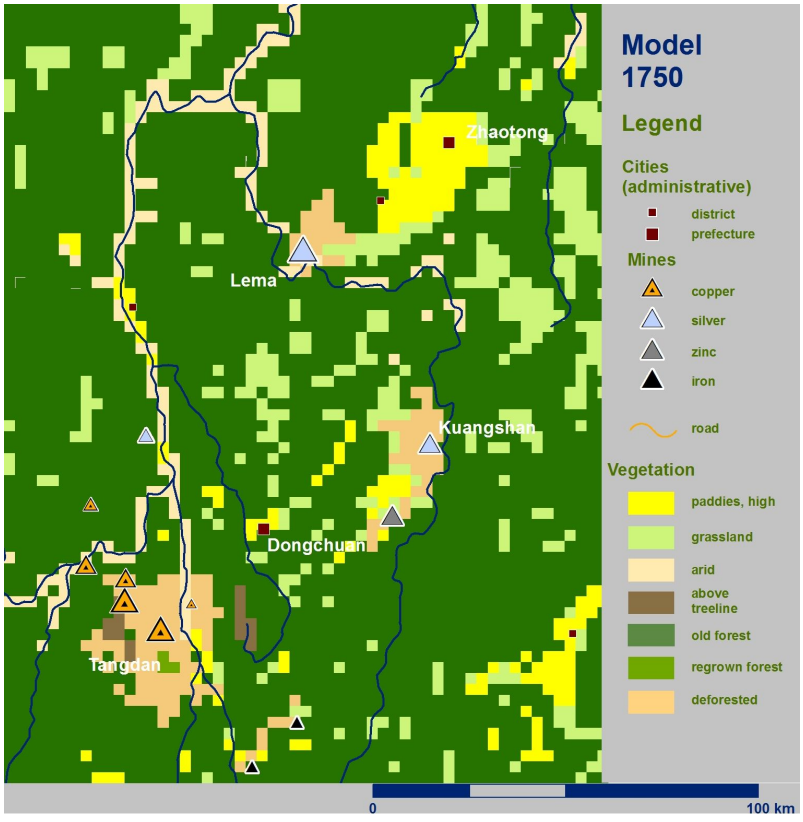
Model
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Vegetation
paddies, high
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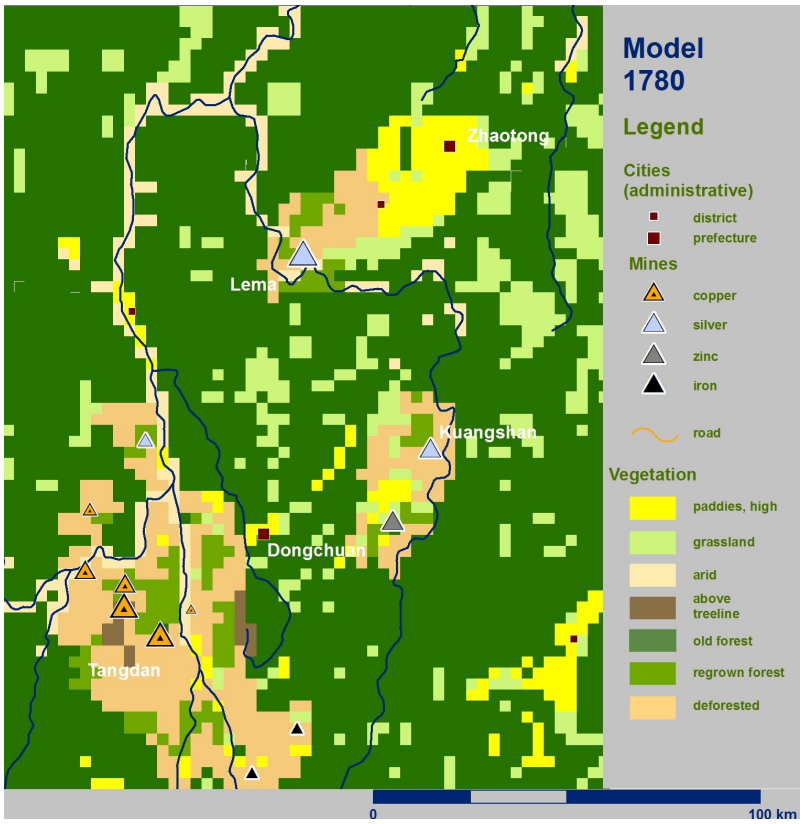
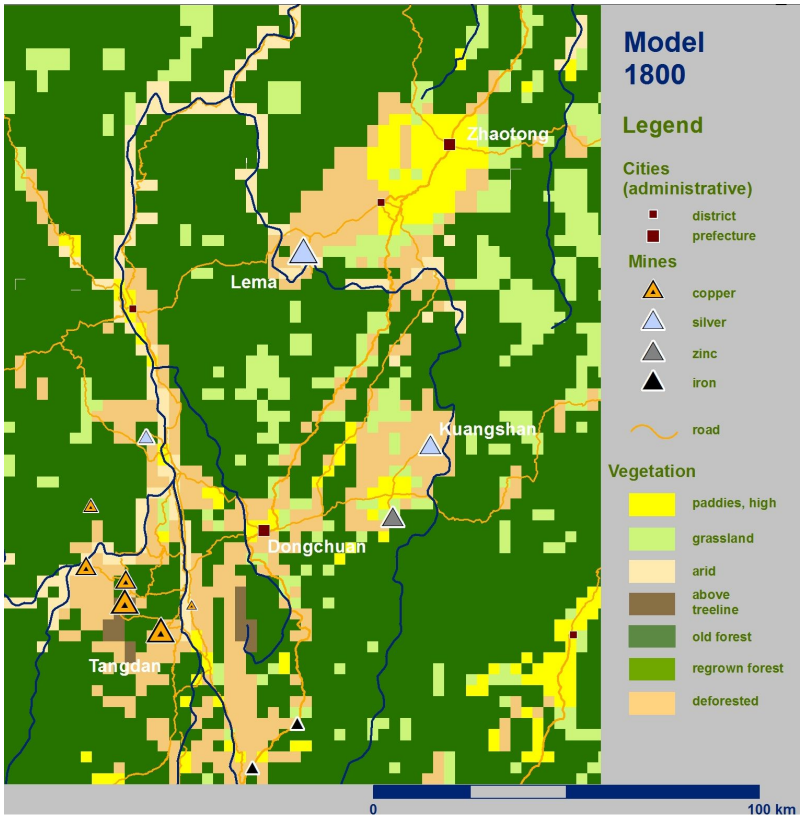
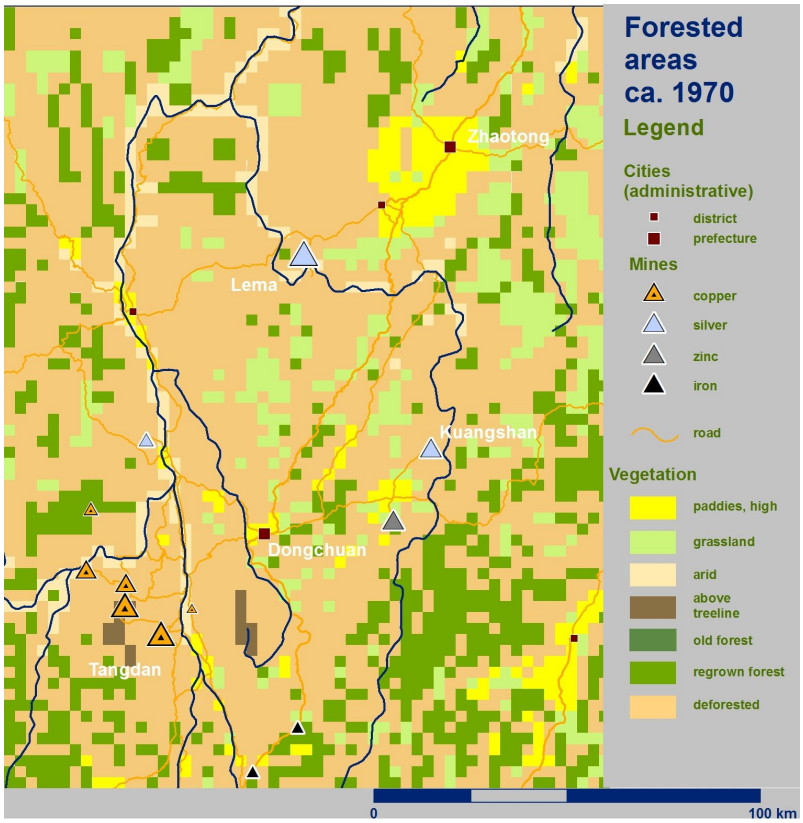




The model shows a rapid expansion of deforested areas with the early expansion. The process stagnates with forest regrowth and the stagnation of outputs on a relatively high level.

Preliminary result: Deforestation was limited by terrain and transport conditions. As a result, charcoal supply was in fact the crucial bottleneck to the expanding the exploitation of ores and to maintaining large mines, as historical records suggest.

The distribution of deforestation can be compared to a map of about 1970 that shows the remaining forested areas in the period of peak deforestation of the 20th century:



The comparison of maximum deforestation around 1970 with the modeled maximum deforestation caused by mining around 1780 indicates that historic mining may have indeed denuded large perimetres around the copper mines of southern Dongchuan, and the silver mines of Kuangshan and Lema. At the same time, it shows the southwestern flanks of the Hongwangshan Massif south of the Tangdan Mines among the more forested areas by 1970, suggesting regrowth after the end of intensive mining. At the same time, the advanced denudation of Northern Dongchuan, especially around Qiaojia on the Jinshajiang cannot have been caused by historic mining.

The Bainiu Mines 白牛厂 in Ninglang District 宁蒗县

Nanny Kim, draft June 2018

Records and questions

No mine of this name appears in the records up to the mid-19th century. *Diannan kuangchan tulue* records the Dongsheng Mines 東昇廠 as branch mines of the Debaoping copper mines (子廠), opened in 1831.[1]

Archibald Colquhoun recorded an encounter on his journey of 1881, with a delegation of what he understood to be the Yongbei silversmiths who came to meet him in Dali to ask for technical advice with suffocating gases.[2] The mention of the distance as seven day-stages north of Dali is suggestive of the Dongsheng Mines.

The gazetteer of 1904 also records the Dongsheng mines, apparently as productive in the 1830s and as a problem to social stability in the late 1840s.[3]

He Zongzhang 贺宗章 (dates unknown), who wrote down his recollections of titbits from the past at some point in the final years of the Qing period, mentions a highly productive mine in Yongbei, vaguely dated to the 1840s.

The identification of the productive silver mine in Yongbei that appears as the Yongsheng Mines with the site now known as Bainiuchang is based on the massive slag heaps here, together with the fact that no other site is known in the jurisdiction of the former sub-prefecture. Geological explorations of the late 1980s and 1990s document deposits of copper, lead, zinc and some other metals, with silver and some lead present in the area of Bainiuchang.[4] The modern findings reveal an unusual low presence of lead in a site of historic silver exploitation.

The historic records suggest a site that was probably not exploited on a larger scale before 1830 and may have been productive either for a short period in the 1830s or worked relatively continuously to the end of the 19th century.

Fieldwork by Yang Yuda 杨煜达 and Nanny Kim, 28-29 March 2011

Supported by: Mr. Yang Jianhua 杨建华, headmaster of the middle school at Jinmian

Main informants: Mr. Sha 厦 of Bainiuchang village, Mr. Xiao Changhuan 肖昌桓 and Mr. Pu Zhonghui 浦仲慧

2011. 3. 28.

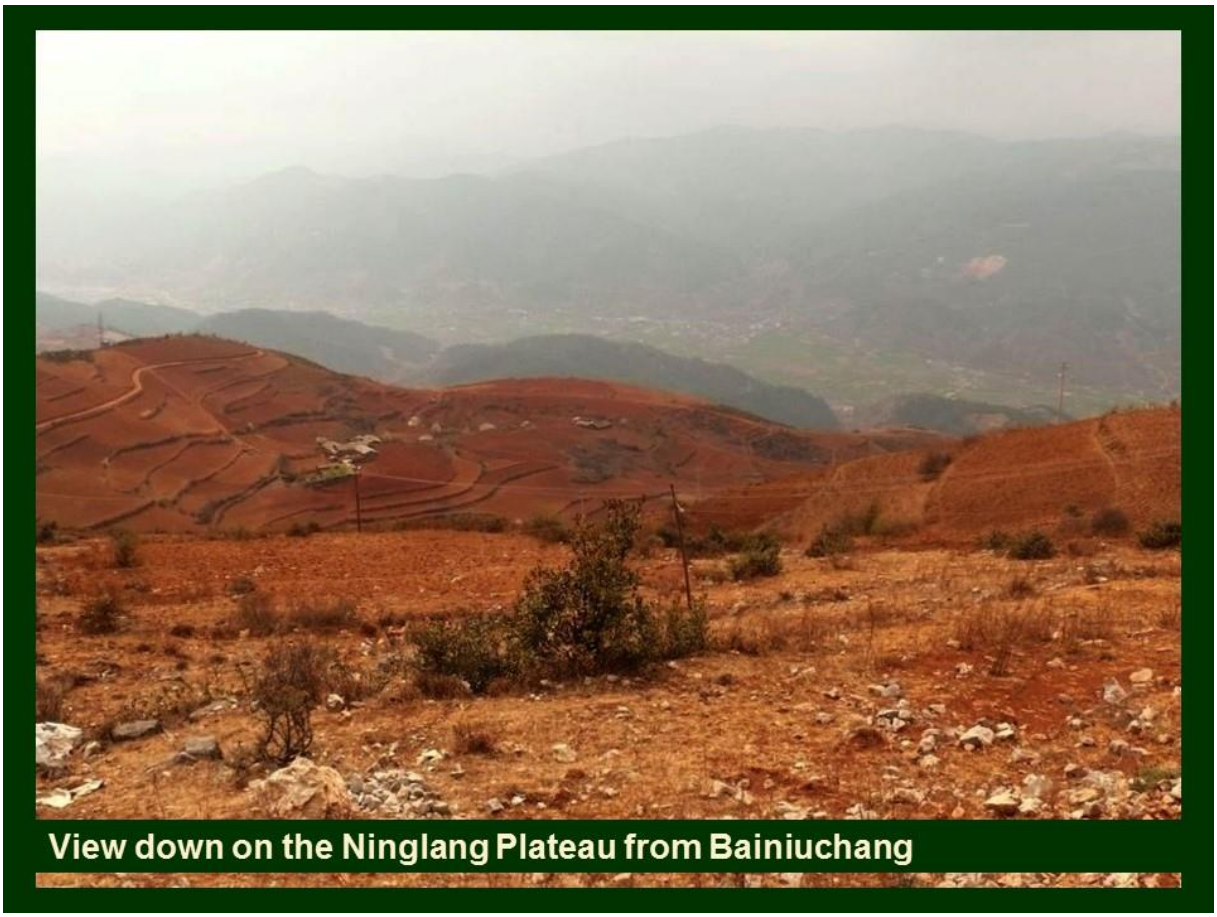
Despite forecast rain, the weather stayed dry. Headmaster Yang Jianhua (34 years old) had contacted Mr Sha (48 years old) of Bainiuchang village as well as the headmaster of the middle school at Hongqi, the administrative village north of Ninglang. In the morning, we drove up from the wide Ninglang valley (at about 2200 m) to Bainiuchang, which is at about 2600 m in a wide basin under the main eastern ridge.

[1] Wu Qijun 1844, 104-5.

[2] Colquhoun 1883, 259-60.

[3] *Xuxiu Yongbei zhiliting zhi*, *juan* 2 and *juan* 3. The gazetteer survived in two imprints of 1901 and 1904.

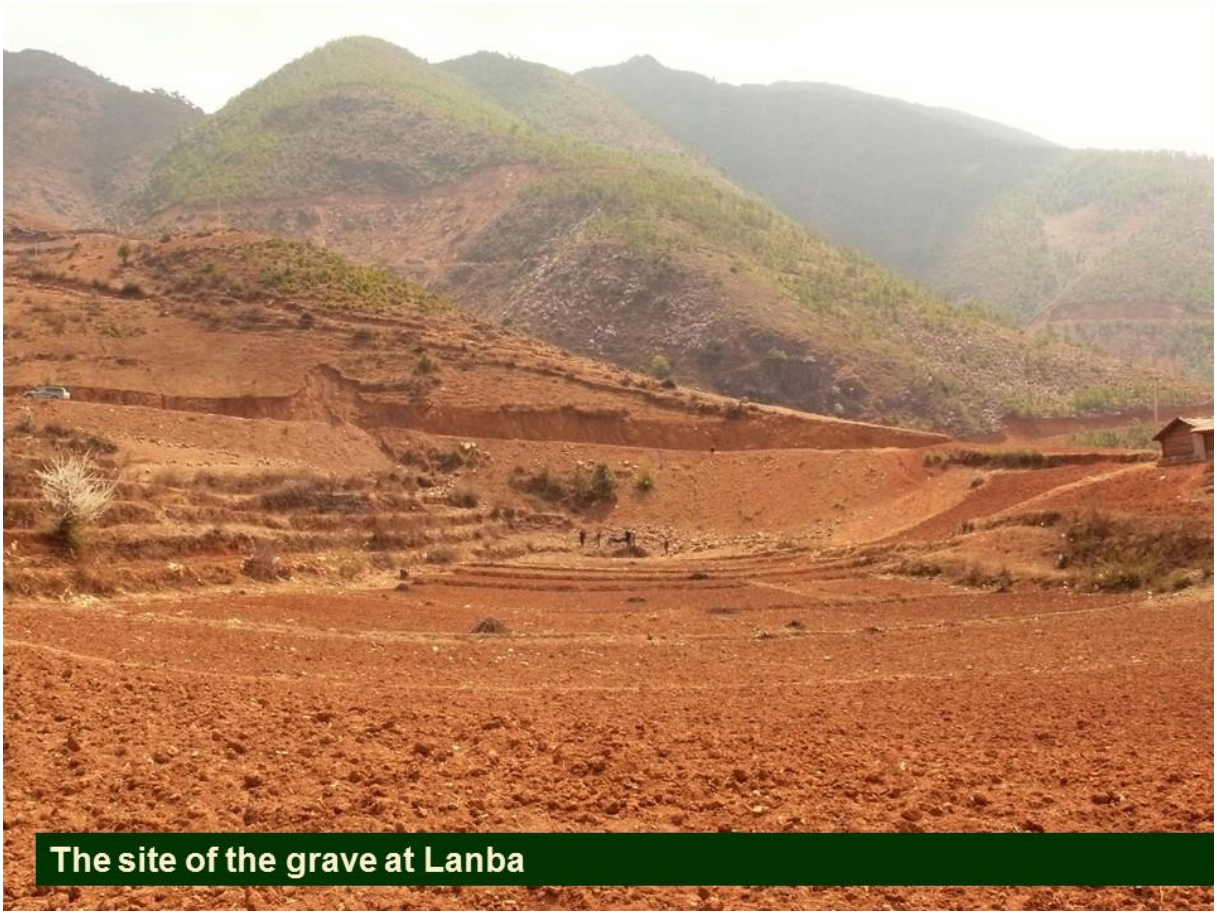
[4] Hu Shouquan et al. 1988 ; Huang Shouquan et al. 1996.


View down on the Ninglang Plateau from Bainiuchang

The mines

Along the dirt road the range is mostly soft sandstone and debris, further up the surface rock is limestone. Only the top of the ridge is wooded.

On the ascent, Mr. Sha pointed out a grave that he remembered to have an inscription. The site was just below the track, but covered by the stones that the peasants working the fields had picked out of their fields. The spot is called Panba 盘坝. At first we were inclined to leave it at that, but the stele appeared carefully executed, so eventually we removed the stones and recorded the inscription. The grave dated to 1886 and belonged to Zhu Wenzhong 朱文仲 who was born in Taoshuping Dongchuan 東川府桃樹坪, a village in the copper mining area on Hongwangshan, between the Maolu and the Dashuigou Mines (now Yinmin). He came to the "Dongsheng Mines 东昇厂" as an adult during the (1863-1875), achieved some wealth, and was commemorated by his sons and grandsons. His first wife died at a place referred to a Baoping in Yongbei 永北厅属宝平. With high probability, this was a shorthand of Debaoping (probably modern Baoping). Since Taoshuping was in the Dongchuan mining area and Debaoping a major copper mine, Mr. Zhu was almost certainly involved in copper mining in some way.



The site of the grave at Lanba



Digging out the grave at Lanba

We reached Bainiu village at 2 pm and visited the slope above the village and the descent into the valley to the north, where several sites were under exploitation.

Bainiu still has some 500 families, the majority are Yi. The slope above the village, which consists mainly of recently harvested potato fields up to the low cliffs of the ridge, is dotted with slag dumps. Many are bare from vegetation, some partly covered under the dry fields.



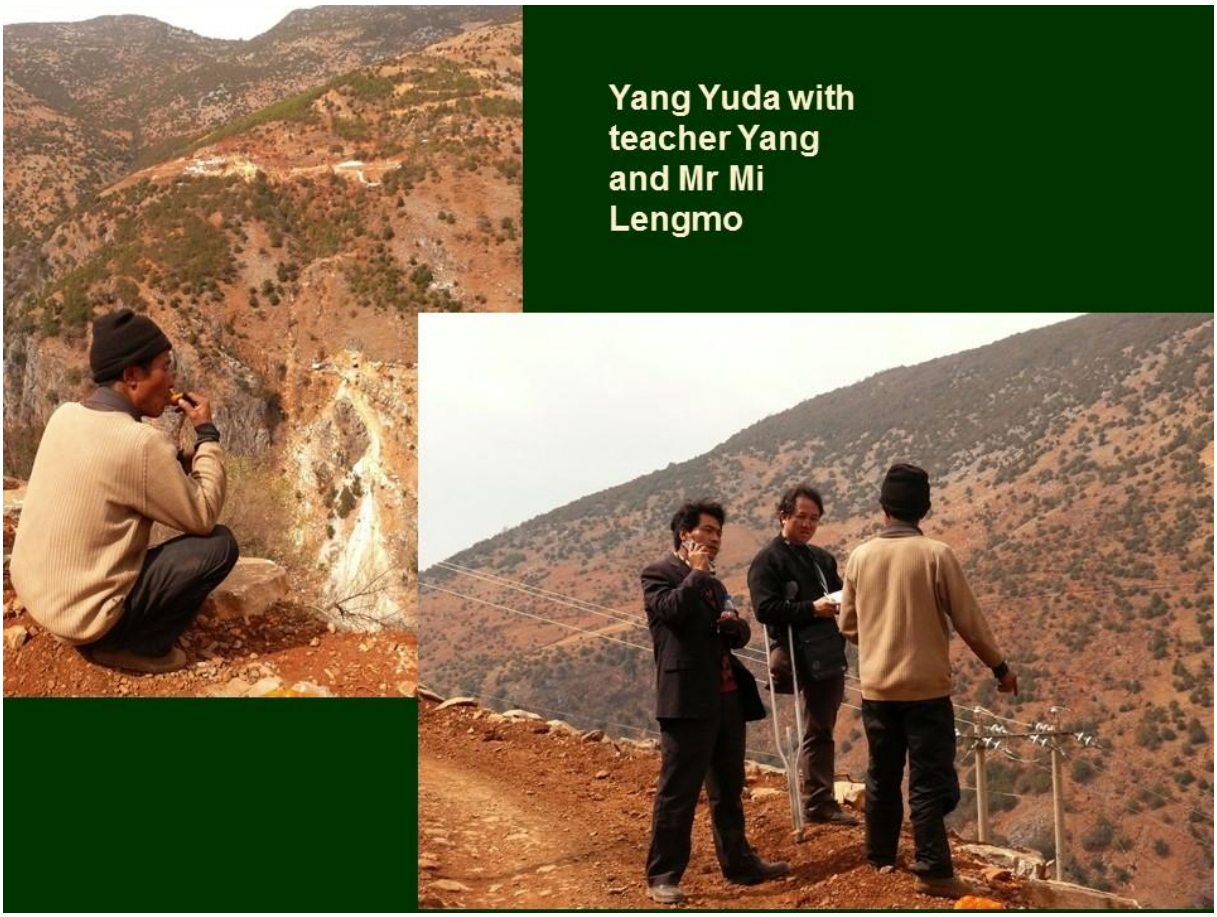
Bainiuchang village on the broad mountain shoulder, with slag dumps behind in the fields



Several small mines are operated close to old galleries, apparently mainly worked for gold.

Near the track that ascends the northern shoulder above the village, we were shown a vertical shaft that might have served as a ventilation shaft. Near a few houses, we met Mr. Mi Lengmo 米冷莫 (50 years old). He told us that his ancestors were black-boned Yi from the Liangshan area in Sichuan and former landlords of Yujia village. His great-grandfather would have moved here, and at the time the Dongsheng Mines were jointly administrated with Sichuan province. The mining bosses were eight brothers, the living member being Zhou Yunkang 周元康. Mr. Mi mentioned a mine or cave with a statue, where people from the valley used to come to pray. We clambered down an instable slope to find a small natural cave a little way down into a side valley that clearly was unrelated to mining and beyond the old mining area. The name of the cave was Miaozi dong 庙子洞. There had in fact been at temple, and according to local legend a beautiful woman's voice had been heard in the cave, which therefore became a place of worship. Further along the valley a couple of mines are operated.

Several old or traditional mining galleries were visible in exposed rock near dumps and in mountain side above the village. Due to the cave expedition, we had no time to investigate the southern part of the slope above the village.



The interviews:

In the late afternoon, headmaster Zhang of the middle school had arranged for us to meet two informants, Xiao Changhuan 肖昌桓 (83 years old) and Pu Zhonghui 浦仲慧 (76 years old) told us what they remembered of the mines in former times. The party secretary of Hongqi and the headmaster of the school also knew of former conditions. Mr Pu had a recently restored genealogy, according to which the family originated from Nanjing and came to Xuanwei in the late Ming. In TZ 4 (during the Muslim wars), the family, which by this time lived in Dongchuan, left for Sichuan, and eventually ended up in Ninglang around 1905.[5]

Mr. Xiao:

The Bainiu Mines go back some 100 or 200 years; they were operating at the time when the Yuanmingyuan was burnt [during the Second Opium War in 1869], and given up before the Xinhai Revolution [1911]. Back then, the Li family were the tax masters, and they had a large residence, which is no more. The family is still living in the area, though no longer important. A prefect Liu of Yongsheng 永胜 used to administrate the mines, but there were riots during the Taiping Rebellion and the mines gradually deteriorated. Descendants of prefect Liu can still be found in the area.

There are a lot of graves around the mines, all these are miners who died and were buried there. Along the stream quite a lot could still be found.

The Bainiu Mines actually used to be the Dongsheng Mines. Miners came from Yunnan, Guizhou, Sichuan and other places. The grain all came from the valley, also maize and potatoes.

The mountains around here all used to be wooded, but the trees were cut to burn charcoal. There used to be charcoal kilns everywhere.

Most Han Chinese in the valley moved in in the late Qing.

Mr. Pu:

My ancestors came from Yintian prefecture in Nanjing 南京应天府 in the 14th year of the Hongwu period

[5] Pu Zhongjin 浦仲今 , "Pushi jiapu liuchuan" 浦氏家谱流传, handwritten manuscript, dated 2003.

[1381]. They first settled in Xuanwei 宣威. This would have been 19 generations ago. 6 generations ago they left Xuanwei. They fled from a famine, all the way here, my grandfather reached here in the Xuantong years (1909-1911), towards the end of mining.

From Xuanwei they moved to Xiaomijiao in Huize, then to Huili, Xichang, Yanyuan, Yousuo, Miyihe, Chenjiawan (会泽小米脚——会东——会理——西昌——盐源——右所——米依河——陈家湾; the last three locations are in Ninglang district). We have a genealogy [which we later were allowed to copy].

Mr. Xiao added here: My family came from Dechang in Sichuan 四川德昌; they were eight brothers who arrived when the mines prospered. My ancestor four generations ago was the third brother. At that time, there were great trees on the mountains, and they had great pillars in Hongqi. When my family came to this plateau, they sometimes went up to work in the mines, and sometimes they burnt charcoal.

Headmaster Zhang put in: My family came 5 generations ago from Sichuan, according to our genealogy from Nanmuhe village in Huaping 华坪楠木河里; they came over to burn charcoal.

Mr. Xiao continued: There used to be a legend: In the third month someone came to sell peaches, and lots of miners came out to buy and eat them, and then the mine suddenly collapsed, and all those who had not come out were buried inside. That is why only one foot of the white ox could be dug out, the rest is still in the mountain.

There is also a story about how the Zhangs found rich ores: They dug and dug for a long time without success. Then somebody got the runs, and he went to a spot out of sight out to relieve himself and right there found rich ores.

At the time, because of all the charcoal kilns and the smelters, black smoke was everywhere and ducks could not fly across the mines.

The mines were worked from people from outside the area. There is a saying that at the time of empress dowager Cixi, the British worked them and paid taxes to the government. Furnaces used windboxes, so large that a man could just reach around with his two arms; they were round and worked by teams of 6 or teams of 12. (一抱粗，一米二周长，圆形，长六尺，六人或者十二人拉。)

How the ores were extracted? Basically by underground mining, the yellow mud cakes [lead oxide cakes?] left from smelting gold [sic!] were all carried out from old mines on the backs of men.

The ore was pounded up by mallets. The silver smelting furnaces were about the same size as brick kilns now.

I have still seen tax master Li when I was young, he looked like an old official, with a white beard. His father, who was tax master before him, I have not seen. They had a lot of silver, and the tax master's son smoked opium, and that is how the family was brought down. At the time, a large tract of land along the river belonged to them, and it was pawned out to the Eighth Elder Zhang 张八老爷. At the time of the grandsons the family went further downhill, but they still had their house. The beams in the house were locked so that it could not be taken apart – otherwise they would have sold it. The earth walls were a metre thick, with bamboo poles inside for strengthening.

All silver produced by the mine smelters had to be handed over to the tax master. The guest master was in charge of all guests of the mine.

Caiyuanzi 菜园子, Lazidong 辣子洞 and Luobudian 萝卜甸 were three villages that exclusively produced vegetables for the mines. The area on the plateau all sold vegetables.

Even some people in Yongning 永宁 and Yanyuan 盐源 burnt charcoal to sell. There is a saying that they gambled in the mines and used dung sieves to sieve the silver, they used torches to light the mining galleries and sold things inside. Inside they used oil lamps, with a wicket of cotton thread.

Mr. Pu further explained:

The people on the plateau originally all were Pumi 普米 and Lisu 傈僳, Han Chinese lived along the foot of the mountains, only in the Republican period did the move down into the plateau.

When we were children, we used to wear hemp clothes and sheepskins. We planted and wove the hemp ourselves. At the time, cotton came from Lijiang and Yongsheng. It took 6 days to get to Lijiang and four to Yongbei, 3 to Yongning, 4 to Yanyuan. Each and every village raised horses, the landlord families had several, the ordinary families just one, and only the poor had none.

Teacher Cha 查, who had heard what we had come for, told us that an ancestor of his used to be an accountant at the Bainiu Mines and that his grave was there. The family had come from Nanjing and would have arrived with the British.

2011. 3. 29.

Before heading back, we paid some more visits to informants, partly on the basis of the information of the evening before.

Mr. Zhou was of poor health and could not be interviewed.

Mr. Zhang 张 (78 years old):

My family came to Ninglang 4 generations ago, and first settled at Beiqu 北渠. My ancestors are from Ji'an prefecture in Jiangxi 江西吉安府, and had moved to Lingshui in Sichuan 四川陵水. My father's grandfather was Zhang Wenzhen 张文贞, he had killed a man in Sichuan, and therefore fled to Ninglang. By grandfather was Zhang Zaifeng 张在凤.

Zhang Wenzhen came from Lingshui to the Bainiu Mines and became a simple worker. Later he became a tax master. At the time, there were many prosperous mines. When Zhang Wenzhen had become rich, he used eight mules to carry silver ingots back home. At Beiqu he had a house with three courtyards build and a room in the back was full of silver ingots. After the Xinhai Revolution (1911) the Long-haired rebels struck [the Taiping], 70 of them came over from Sichuan, passing through Ba'erqiao 八二桥. They came over for the landlords, and when they heard about the rich Zhang family at Beiqu, the came over and robbed them. The house was left empty, and the family never recovered.

At the time, there were over 1000 adits worked (jian 尖) in the mines, and the tax master collected money by the adit. Zhang Wenzhen was tax master for the entire mine, every day he brought eight mule loads down. The silver was collected at the smelters. The adits were worked from people who came from other provinces, ore carriers were mostly locals. They worked as simple labourers. Charcoal burning and transporting was also largely done by locals. At the time, Erpingchang 二平厂 and Yaoshan 药山 were full of charcoal kilns. Smelteres mostly came from other provinces.

The man who worked an adit was the boss 老板, his workers were called "hammer hands" 锤手. Workers at the smelters were called "old guests" 老客 and did as told by their bosses. Ore was called *hong* 硐, *huang* 荒 is gangue rock and soil. They entered the adits and carried out the ore, then it was selected, the good ore was picked out, poor ores were left. The ore had to be pounded to the size of walnuts to be loaded in the furnaces. The windboxes of the furnaces were very large and worked by eight men.

The Bainiu Mines were formerly called Dongsheng Mines, it used to be the only name.

There used to be several ten-thousand in the mines, up on the mountain all was covered in houses.

Slags covered everything, they took some to build roads.

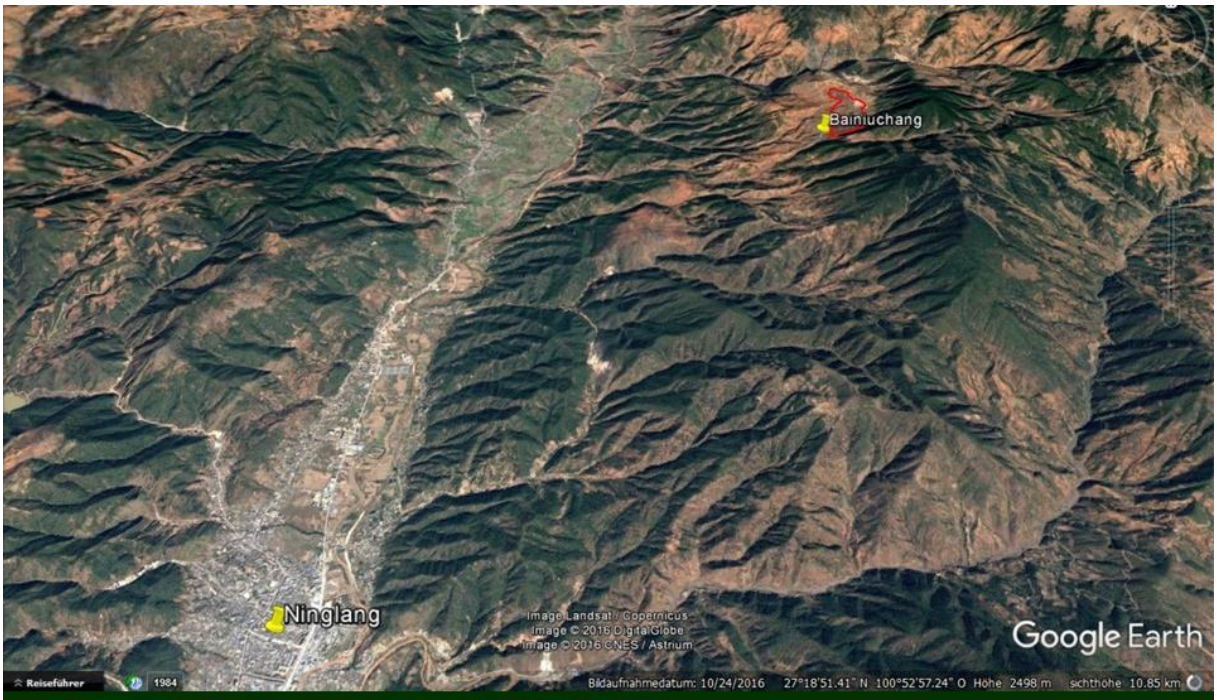
The long-haired rebels burnt the house. When my grandfather died, my father was nine years old. My father died in his 71st year, he was born in the year of the tiger [1914], some 20 years ago [the chronology does not quite work out, as Mr Zhang stated his own age a 78.] The long-haired rebels had the slogan "the upper classes owe us money, the middle classes have nothing to spare, the lower classes come with us, we pay you 8 yuan every day" (上等人差我钱，中等人莫找闲，下等人跟我走，一天给你八块钱。)

The father of Zhou Yuankang 周元康 was village head in the Republican period (乡长).

The family name of my great-grandmother was Feng 冯, and she was also from Sichuan. They lived in Beiqu and had a lot of money. There were five brothers and they were called the "five immortal kings" (五仙王). They were the landlords of Beiqu, all the land across the district was theirs, they even owned land in Yanyuan. One of them was killed in Yanyuan, and their family fortunes went down.

My grandmother's name was Wang, and my grandfather had three brothers. He was the youngest. There still are descendants of the second brother.

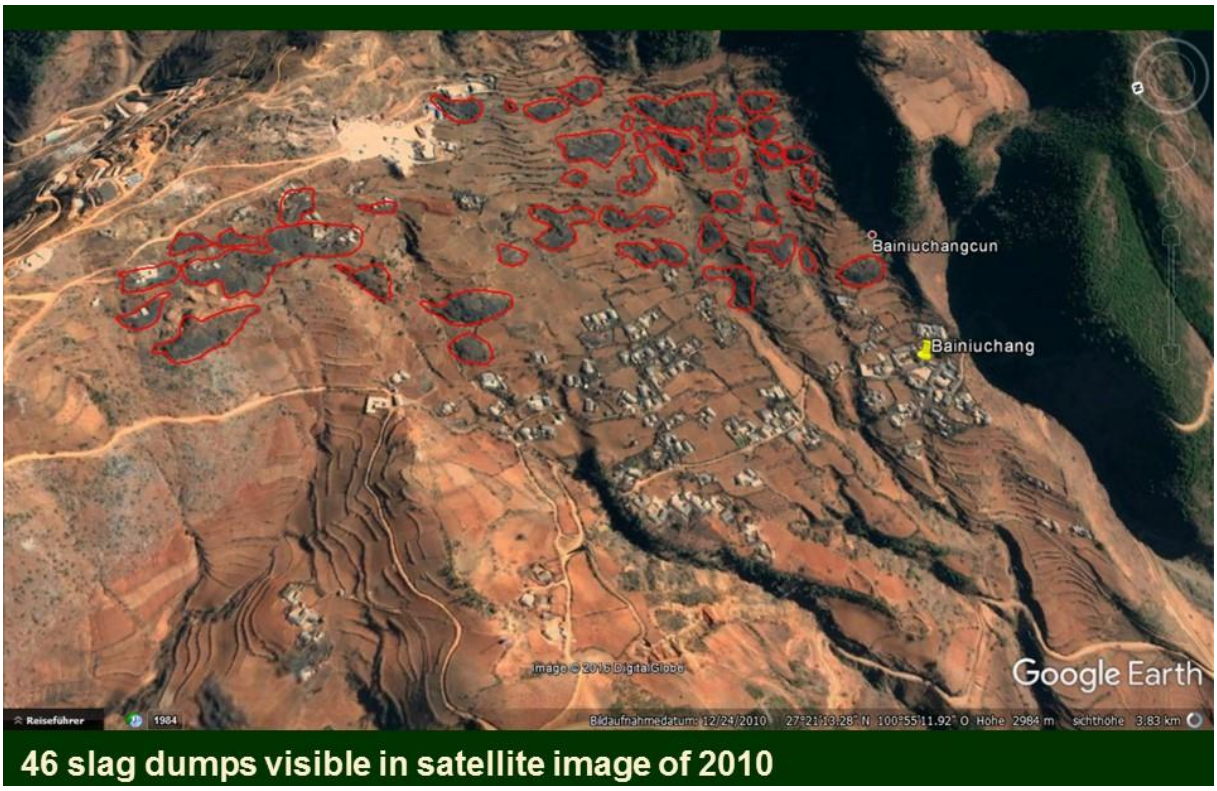
After the Bainiu Mines were abandoned, the Erping Mines 二坪厂 flourished. There used to be a market at Erpingchang, an everybody went there.



The Bainiu Mines in Ninglang District



Bainiuchang village and the slag dumps (red area)



Results:

The still mostly undisturbed slag dumps number by the dozens. The count based on the google satellite image of 2010 (?) is 46. The lead content in these slags is very low, for this reason re-smelting has not been economically viable so far. The amount testifies to smelting on a very major scale. The grave inscription confirms that the mines were still operating and profitable in the period after the mid-19th century civil wars. The oral histories and family traditions confirm that the mines were important in the 19th century, probably most productive in the first half, that an official representative used to reside near the mines, that the tax masters were the most prominent and wealthy representatives of the mining community. The information on the charcoal burning indirectly reflects the intensity of mining, as well as the possibly imaginary stories of gambling dens and markets lighted by torches inside the mines. The findings confirm the records by He Zongzhang and Colquhoun. The slag dumps suggest an overall output considerably above our expectations based on the records.

The Fulong Mines 富隆厂 in Lanping District 兰坪县

Nanny Kim, draft June 2018

Records and questions

No mine of this name or approximately in this location appears in the records.

However, the local gazetteer of Lanping of 2003 records three recently found stele with inscriptions relating to the mines. The longest of these dates to 1804 and records contributions to the construction of the Temple of the God of Wealth. It is of particular interest because it records groups and individual contributions. The total sum raised for building or extending the temple was 4582.63 *liang*. The main contributors were the smelters, followed by the productive mines, the shop owners of the mining town, and the transporters. Lesser contributions were provided by officials, charcoal burners, silversmiths and patrolmen. The smelters collected 0.1 *liang* per smelting process between JQ17/2/22 and JQ 18/12/20 and raised 1395.49 *liang*.[1] The contribution reflects 13,955 smeltings in a period of 22 months!

The stele reflects an extraordinary productivity for the years 1803 and 1804.

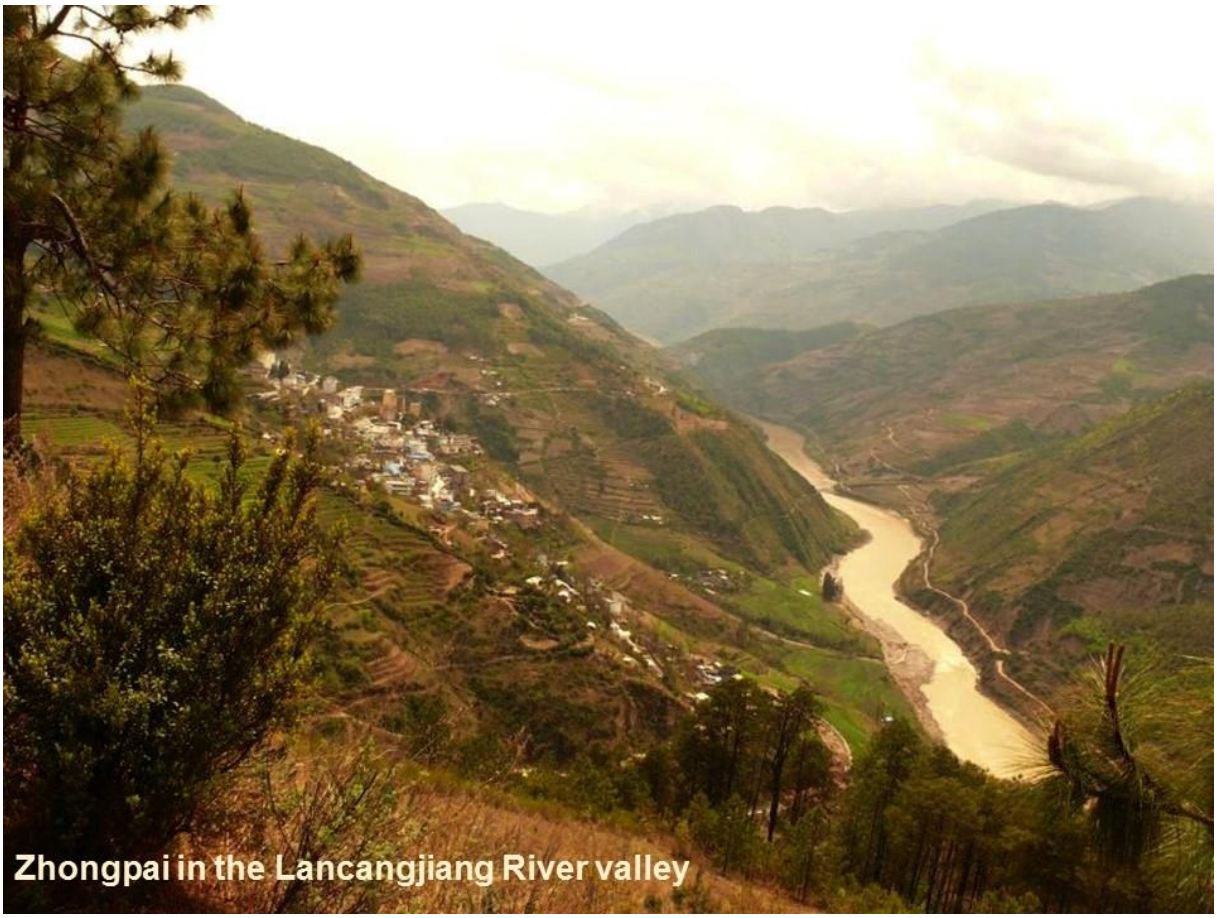
Fieldwork by Yang Yuda and Nanny Kim, 30 to 31 March 2011

Supported by: Mr. He Xiaoli 和小丽 and Mr. He Junzhong 和俊仲

Main informants: Mr. He Junzhong 和俊仲 (born 1946) and Mr. He Xiaoli 和小丽 (born 1976) of Fulongchang village

2011.3.30. Drive from Lanping 兰坪 to Zhongpai 中排, via Hexi 河西

Zhongpai is a new town, formally a *xiang* or administrative village (county), of some 2500 inhabitants. A drinking water tank had recently been installed by public subscription in the centre of town with an inscription that recorded the precise number of households and inhabitants (which I do not recall).



[1] *Lanping Baizu Pumizu zizhixian zhi*, 2003, 230-2. For a discussion of the stele of 1804, see Yang Yuda 2013.

We arrived in Zhongpai in mid-afternoon and following some asking around met He Xiaoli 和小丽 (34 years old) by pure chance. Because Nanny had an allergic reaction, Yang Yuda carried out and recorded the first interview.

Mr. He related that although he now lives in Zhongpai, he is originally from Fulongchang 富隆厂, the former silver mine, and had been in mining for 10 years himself. His grandfather was a horse driver who settled in the "Upper Market" (*shangjie* 上街) of the village, where the upper class families used to live. His father He Junzhong 和俊仲 had revived lead smelting from old slags in the 1980s, and He Xiaoli had revived mining when the exploitation of slags ended in 1996.

Summary of the interview with He Xiaoli:

> I was born in 1976 in Fulongchang village. I studied informatics at Yunnan Normal University and graduated in 1995. I worked in the assigned job for a year but then quit and operated mines on my own. There were up to 14 or 15 mines as a point.
>
> Our family came to the village five generations ago and all have been involved with the mines in some way.
>
> There were only a few mines above the village; at first we started from fairly high up, but only some 800 m into the mountain the ore became fairly rich, with an average lead content of 24.5%, mostly galena, containing about 900 gr silver.
>
> In the past, smelting silver by leaching 堆浸法 has been tried, using sodium cyanide 氰化钠. It worked to some extent.
>
> From 2004 to 2007 over 10,000 tons of ore were extracted from the local mines. In 2007, the mines were registered by the Western Mining Corporation. We stopped mining, but leased out the mines.
>
> My father smelted ores that contained 41.2 [lead] and reached a silver content of 2000 gr [per ton].
>
> The people of old used iron mallets to break up the ore, then sorted it by hand, then used hard rocks to pound it up finely. Coarse sieves were used for washing, then fine sieves that were laid out with gauze. I know that because we found gauze in old gangue heaps. We also found fine sieves with gauze still inside, and we used this method afterwards.
>
> Ore dressing by hand used the same techniques. You have to build a pond, and you move the fine sieves evenly in the water, so that the light refuse matter floats off.
>
> I myself operated mines from 1998 to 2007, for almost 10 years. During that time, from 2001 I became a village cadre. I had altogether 7 mines, each worked in 3 shifts, employing 16 to 17 men.
>
> In the old times, over 20 men worked a mine, and in good times would extract 7 to 8 tons in a day, which were brought out of the mountain by pushcart. The galleries were about 1.2 m wide and 1.4 m high. Our mines were about 1.8 m wide and 1.8 m high, and we worked ore with a [lead] content from 7 to 8%. In the old days, ore with a content upwards 15 to 16% was extracted.
>
> The people of old dressed the ore to a lead content of around 40% before it entered the smelters. Because we found ore of this grade around old smelters I conclude that it was done this way.
>
> Ore with a grade of 30 to 40% could be directly smelted, without pounding.
>
> When we smelted our own ore, we also concentrated it to 30 to 40%.
>
> As for zinc ores, when the ore dressing factory at Liziping 栗子坪 opened, we learnt what zinc ores were.
>
> When I opened my own mines, we hit old workings many times. There were zinc ores inside, up to a grade of 40%, which the people of old had abandoned underground. When we found these ores, we could directly sell them. There were also zinc ores in the old gangue heaps.
>
> In my father's time silver was no longer smelted, only crude lead was smelted.
>
> The slags generally have been smelted four times. The first was when the people of old smelted them for silver. The second was by the Lanping lead smelters, the third was by the joint smelting of eight counties (八个乡镇), the fourth was by my father as the contractor. My father says that the first smelting was by charcoal with bellows at a relatively low temperature, the second with coke, which

was brought in one muleback.

We sold altogether some 24,000 tons of slags, at between 20 and 200 Yuan, some even higher. The average lead content was 15%.

The traditional lead furnaces had chambers about 1.2 x 1.4 m and some 2 m high. These were my father's "small furnaces" and they used 12 PS diesel bellows. Old people said that they used pedal-driven bellows. According to my father, the people of old smelted lead and then used "hoods" to smelt silver, with the silver being driven out by 6 sand bars. The lead was discarded afterwards, and the silver was driven into the ashes.

Old people told me that there used to be 3600 hoods and birds that flew across would drop dead from the skies.

I found the mine was called Sanxing Mine 三星洞. There is a 70 m high cavity inside, from which some 2100 tons were extracted. This mine would have been the richest.

The Sanxing mine enters the mountain at a mild angle, there are vertical shafts inside as well as level galleries and inclined galleries. There are several ten bifurcations in the mine, some galleries I followed for over 200 m without reaching the end. Ores of above 10% [lead] were discarded and there were some 200 tons of zinc ore with a content of 30 to 40% that were piled inside the mine. I would think that some 100,000 tons of ore were extracted from the Sanxing Mine. Silver content was high, about 1500 g/t.

The largest old excavation area was about 6 m wide and so high that I could not see the ceiling in our lamplight.

The worked zone has a height of about 200 m and a length of 800 to 900 m. It is around 2950 m. We drilled level galleries some 60 to 60 height metres apart and went straight in for about 300 m.

We also found old wooden pipes, made from hollowed out trees. They consisted of a lower and an upper half and were held together by bamboo strips, still watertight. The outer diameter was about 10 cm, the inner diameter 4 cm. We found these in the Sanxing Mines. When we dragged them out we found them to be over 40 m long.

For ventilation, the people of old placed hollow trunks or bamboo pipes in the descending gallery. We found things of the people of old inside the mines: Mallets larger than modern ones and of different shape, with one round and one pointy end for digging. Never saw any such hammers of mallets for any other purpose. We also found ceramic bowls, straw mats and the like.

Gangue was often used to fill abandoned galleries rather than carried out.

The people of old used only Chinese yew 红豆杉 for timbering. There was timbering in places of loose rock, using wooden boards.

I suspect that the people of old did use gunpowder, because there was a smell of it and in some places the rock was burnt black.

Old adits were about 1 m wide and up to 1.5 m high.

There were lots of different ways of timbering, in the shape of the character san 三字模, straight ceilings, or pillars: A pillar had a groove in the top end, into wich another hardwood log about 50 to 60 cm is fitted. We saw these in old adits, and the technology is still known and used. The "pig-pen" timbering 猪圈模 basically is a rectangular frame; I have heard about it, but not seen it in old workings, but it is used in recent mines. "Slope-ceiling" timbering 斜顶模 is used where the rock is loose to one side, while the other is firm. The people of old used boards, now we use round timber, which is more resistant. These are the frequently used types of timbering.

The people of old used baskets to carry the ore from the mines, somewhat harder than ordinary carrying baskets. A full basket would weigh about 35 kg.

In the Sanxing Mines, the adits farthest from the entrance would be some 600 to 700 m into the mountain, 200 m by direct line. It would take over 2 hours to get there. Therefore, ore with grades of 7 to 8% was taken out from the top layers, but in the bottom layers even ore of 11 to 12% was left, and under 2800 m they only touched the richest ores.

The gangue heap of Sanxingdong is the size of a hill.

I have also found the entrances of the Sanyuan Mine 三元硐 and the Zhuanlong Mine 转龙硐. I found them based on old place names. Others are Laomanying 老蛮淫, Upper Market 上街 and Lower Market 下街.

Muslim and Han graves are in different places. There is a "10,000 bodies pit" from the time when the Muslims and the Han fought each other, the Han killed the Hui and buried them there. At the time there was a ditty "When the yellow blossoms open on the Huangge Tree, the Muslim will get up and kill the Han families. Never mind if the snowy mountain is 10,000 zhang high, the sun will come out and bring out the flowers." 黄果树上开黄花，回子起心杀汉家。不管雪山高万丈，太阳一出照成花. The well in the village was managed by Muslim Chinese, who kept it locked up and the Han who wanted to drink from it had to pay for the water.

Fulongchang is a mixed surname village, there are families by the name of He 和, Ren 仁, Xiong 熊, Cui 翟, Li 李, and Duan 段; mostly all are Han.

My family came over from Dali, and they would have been Bai. But we are now registered as Han.

There are only 118 individuals living in Fulongchang now, all others moved away, mostly to Zhongpai and to Beidian 北甸, where 2/3 are originally from Fulongchang. There are some 600 to 700 persons in Bedian, 3/2 moved over from Fulongchang.

According to the old people, Fulongchang has been in existence for 6 to 7 generations. In the mid-1980s, when I was a child, there were some 2000 locals and workers in the village.

The Zhongpai lead smelting plant was run by the county and operated three furnaces. There was a granary store that sold rice, meat and liqueur, and a cinema large enough for over 200 spectators. By then, lead smelting used coke, and the furnace had become wider, longer and taller, with bellows of type 18 and a diesel machine of 24 PS. The temperature was higher and the smelting period longer. In 8 days some 15 to 16 tonse of lead cakes could be produced, with a purity of 96 to 98%. Copper would be extracted as "ice copper" and sold separately, with a grade of 27 to 28% of more.

2011.3.31. Zhongpai 中排 to Fulongchang 富隆厂, return to Lanping 兰坪

The ascent from Zhongpai to Fulongchang is a 30 km drive on a dirt track, built in 2004. Before the driving track was built, it used to take 6 hours to Hexi and 4 to Zhongpai on foot or by mule. It took us 1.5 hours by car with partly muddy conditions due to the rain of the last few days. The highest stretch around the shoulder from the valley of Zhongpai to that of Fulong approaches 3000 m along steep and densely forested slopes. The forest consists of broadleaf and some fir, hung with lichen, with an understory of rhododendron, brushwood and ferns.



Old forest on the ascent to Fulongchang

Fulongchang village is located near the rim of a bowl-shape upper valley. Because of the possibility of rain, we had to leave by 2 pm., which left only some 4 hours at Fulongchang. The house of the He family is at the upper end of the village, in fact built on the foundations of a former temple. According to He Junzhong, is used to be the temple of the God of Ores (Hongwang shen 硔王神)



The upper village of Fulongchang. The bare gully next to the village is the site of modern lead re-smelting. The slags left from re-smelting have now been almost entirely taken to smelting plants for another cycle of recycling.





The rebuilt temple on the site of the former main hall, with two remains of carvings.

He Xiaoli took us to the site of the former temple of the God of Wealth (财神庙), now the highest fields at the edge of the forest. The temple was taken down in the 1950s, and the only remains now are bits of tiles and bricks in the fields. The outlines of the courtyards are visible from the layout of the fields, with a raised platform where the opera stage used to be. He Junzhong found a stele dating to JQ 11 (1806) in the 1980s

here, which is now kept at Lanping [in fact the stele of 1804 referred to above]. Local tradition has preserved knowledge of the temple and worship has been revived, even though nothing but a small piece of ore rock remains for an altar.

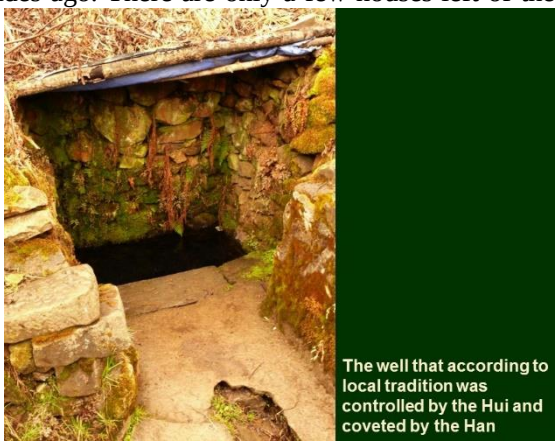






The village today is much smaller than it was a few decades ago. There are only a few houses left of the upper village, the middle has been returned to fields and the lower part is slightly larger, spread along the track to Zhongpai.

The village well is between the upper and the lower village. The water is somewhat warm, and local tradition has it that fighting between Han and Hui broke out over the fact that the Hui owned the well and restricted access for the Han. The Han villagers, fearful of an organized attack, eventually struck first and killed all Hui inhabitants of Fulongchang. The site of the slaughter is still known.

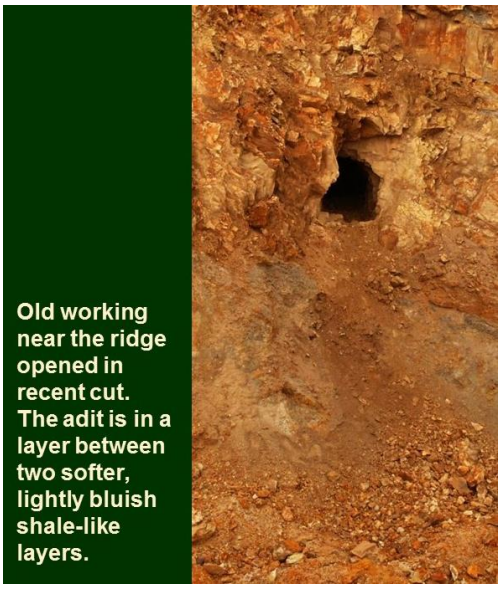


We divided tasks, Yang Yuda interviewed He Junzhong, while He Xiaoli took me to the mining, washing and smelting sites. All historic mining is in a valley to the east, beyond a saddle above the village. A tiny Shanshui temple 山水庙 sits on the saddle. Some 300-500 m into the next valley the spoil heaps begin. They extend a long way down the valley, with tongues stretching over at least 50, possibly over 100 m in height.


Mr. He Xiaoli 和小丽 on the slope covered in a thick layer of gangue


Cut at the driving track near the bottom end of the gangue slope, showing a thickness of at least several metres


Smooth large rock on the gangue slope, which according to He Xiaoli would have been used for grinding or pounding ores. Length 79-80 cm.



Old working near the ridge opened in recent cut. The adit is in a layer between two softer, lightly bluish shale-like layers.

Near the top of the gangue slope, workers digging up gangue for recycling for its lead content hit on two old galleries. According to He, the galleries slope downwards, following an ore seam. The zone of exploitation is between layer of softer and darker rock under a limestone-like layer.

While descending the slope, He Xiaoli pointed out the shift from sorting to crushing and washing (245, 248). The gradient is less here, and the surface consists of small bits of rock. He Xiaoli explained that there was no ore among the larger bits of rock (1-4 cm), showing that the ore had been washed. There were also basins 1.5 to 2 m in length and width, probably originally roughly rectangular. A little way further down a more level grassy spot with a harder rock that had a polished surface. According to He Xiaoli, this would be a broken-off part of a rock upon which the crushing had taken place. Again a little way down was a larger pond, probably as a water reservoir, roughly rectangular, ca 10x8 m across. He Xiaoli based his reconstruction of ore dressing on his observations on this site and findings from old galleries. He and his men used bamboo sieves made after remains found underground, some laid out with silk, and built a pond for washing.



Dry pond in the gangue slope. According to He Xiaoli, this pond was one of a series and built for ore washing.

Two historic mine entrances that according to He Xiaoli were the Sanxingdong 三星洞 and the Sanyuandong 三元洞, knew about were at the lower end of the slopes covered in debris. Mines in operation now, are also in this lower level. The digging up of historic slags has changed the surface and probably erased the mining entrances. Local tradition has it that the boss who started the Sanxing Mine hired men to start excavations who gradually became fed up because they never saw meat but only doufu. Eventually, the boss was unable to pay his men, and ran away to Hexi. His men hit a seam on that very day. When they found their boss gone, they broke into his house to have a look at his pots, expecting to find better food. All they found, however, were dregs of Doufu. Realizing that he had not been exploiting them, they went after him and caught him in Hexi. Unable to convince him that they not only had not come to kill him but had really struck a rich seam, they tied him up and brought him back. Subsequently the boss reputedly became a rich man. From written records we know a similar story that is attributed to a Gejiu mining boss.

We had a look at the mine that He Xiaoli operated until 1996. He told us that the hit old workings after driving their gallery 800 m straight into the mountain. From these, they extracted gangue and discarded zinc ores, while also mining along the old adits. They never reached the end of the network or found the old entrance. The new entrance was closed in 2008. He Xiaoli reckons that the historic miners had good geological knowledge, driving in the workings in the inclination of the ore seams, while keeping them safe by leaving sufficient space between galleries and adjusting the diameter for ventilation. He saw ventilation shafts and timbering. The height of the old galleries did not exceed 1.50 m (if I understood correctly) and

rarely expanded. They found leftovers of bellows for ventilation and pumping tubes of bamboo and wood.

The historic smelting site was about 1 km along the valley, at roughly the same level as the lower end of the dressing site. Near the smelting site is a small knob with several visible galleries. He Xiaoli told me that this knob is a hollow shell, having been exploited thoroughly. The name of this mine is not known. It can be identified by many bright red spots otherwise yellowish ground, left from furnaces in which high temperatures changed the colour of the local clay. Small glazed parts, presumably from furnace linings are also present.



Looking north along the slope covered in gangues



Small basin that used to be filled with slags



Smelting site.
According to He Xiaoli, the yellow soil tunrs red when exposed to high temperatures. He therefore identifies the remains as the backs of furnaces.

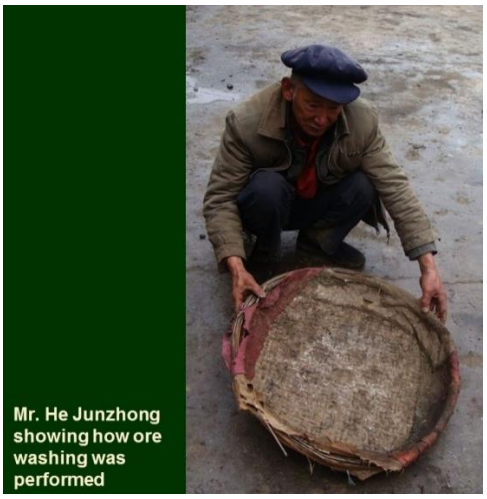
The site and the slope and gully below used to be covered in slags, which have almost entirely been dug up for recycling. A couple of women were washing slags from a small stream. He Xiaoli picked up a few small pieces (under 1 cm) and differentiated them as slags of the first and third smelting. He mentioned that the choice of the smelting site was behind the ridge and at some distance so as to prevent toxic fumes from affecting the village.

When returning to the village, we took a small detour to the site of recent lead smelting. The main site occupies the southern end of the bowl in which Fulongchang is situated, but the smelting also extended into the lower end of the village. Re-smelting was performed in three waves. Initially, probably since the 1950s, slags (later also waste ores) were re-smelted for their lead content using more or less traditional methods but coke instead of charcoal. The remains of the oldest furnace indicate a square structure about 2-2.5 m outside length at the base, probably about 80 cm – 1 m inside, and a height of perhaps 2.5 m. The slags of this process still contained about 14% of lead and were later re-smelted in more efficient, larger furnaces, fitted with motor-driven bellows. In the final wave, slags transported to industrial smelting plants.

In the meantime, He Junzhong had explained the smelting processes that he had known or heard about when he was young, and showed remains. These included a section from an enormous bellows that the family uses for collecting empty glass bottles, slags and bits from the lining of furnaces as well as glazed sections of clay sticks that were used to form a grate in the cupellation hearths to separate the metal melt below from the charcoal above.



Mr. He Junzhong 和俊仲 in his courtyard



Mr. He Junzhong showing how ore washing was performed



Sand bars shown to Yang Yuda by He Junzhong



A section of a bellow used as a container in Mr. He‘s home

Results: The amounts of historic slags that were reprocessed at Fulongchang village and shipped to Hexi cannot be reconstructed. The now empty bowl near the village and the still visibly dug-up dumps on the original site suggest a considerable scale.

The village was resettled relatively recently, possibly only during the Republican period. Its waxing and waning over the recent decades exemplifies the swiftness and seemingly traceless change, with much of the village reconverted to fields by now.

Summary of the interview with He Junzhong:

I started working in mining when I was about 28, about 1973 or 1974.

The Fulong Mines were started in the Qianlong period (1736-1795). People from three provinces worked them, and they worked different claims. The main mining sites were the Zhuanlong Mines 转龙洞, The Yanzi Mines 烟子侗, the Sanxing Mines 三星洞, the Caoping Mines 草坪侗, The Sanyang Mines 三阳洞, Sankeshu 三棵树, the Tianxing old mines 天星老厂, and the Dafengxiang 大风箱. There is another deposit above Dashitou 大石头, which is good, but has not been worked. At one point, there were 3600 hoods and 360 furnaces all working at the same time.

The hoods (罩子) had an inner diameter of about 200 cm, and walls 40-45 cm thick made from clay and stone [Mr. He used the term 沙石, a general term for soil, sand and stone] mixed with furnace ash and salt. Some 10 jin of salt had to be added to every 100 jin of soil and stone. You needed 100 jin of salt to build a furnace.

The furnace bottom was shaped like a wok, about 30 cm deep, and there was an hollow structure of the shape of the character 十 underneath, about 5 cun deep. When we dug out the structures under old furnaces, they were often full of lead. I reckon that they were for temperature regulation. When I built my own hoods, I did not use this structure.

In the furnace bottom, some 1000 kg of [rich] lead were placed, the ore was ground to powder and placed on top. From the top of the load, the "dragon bone" (龙骨), a structure made from clay (沙石) and arranged in rows. The coal was placed on top of this structure. The height of the furnace above the dragon bone was about 70 cm, and the temperature reached up to 1200 degrees.

The ash of sawtooth oak (麻栎树) was sprinkled in to absorb impurities, so that silver separation could begin. In the end, the lead was tapped and the silver remained.

The furnaces had two openings in their front, the upper for adding charcoal, the lower for adding ore.

I have operated such hoods in the past, not for smelting silver but mainly for smelting lead, to separate copper in the lead. I have heard about silver separation from the elders, and I think that I could do it.

The lead smelting furnaces were built from clay and stone (沙石), 1.2 *zhang* high and with an outer diameter of 8 *chi*. The chamber was 8 *chi* high and funnel-shaped. There were three rocks that supported the ore and charcoal, and the air inlet from the bellows was below these. Further down, there was an opening for tapping the slags, and another for tapping the liquid lead, with a small pond to capture the lead. We used wooden sticks to rake the slags out.

For a smelting, 200 *jin* of charcoal were first placed in the furnace, and when the temperature had reached 100 to 120° a basket of ore was added. A basketful would have been 50 to 60 *jin* of ore. 8 hours later, another two baskets were added, and 14 hours later another three. 8 hours later 40 to 50 *jin* of charcoal were added. The adding of ore and charcoal was in turns. As the ore melted, the liquified lead flowed out. A smelting generally lasted 3 to 8 days, at most 13 days, the crucial point was how long the three stones that supported the load lasted. On the first day, a smelting could produce some 500-600 *jin* of lead, and then about 1 ton per day. A smelting of 8 days would produce 7 to 8 tons of lead.

The bellows were made of purple cypress (紫柏香树). There were two types, large and small. The small bellows had an inner diameter of 50 cm and were about 3 m long. These were worked by two men. The large ones had an inner diameter of 100 to 120 cm and were about 4 m long, worked by 4 men. They were held together by nails and cow hides, with two air outlets leading into one ventilation pipe. The pipes were made from iron sheets and led into the furnace. They were about 1 m long.

[Mr. He had two sections of an old bellow in his courtyard. This specimen had a diameter of about 75 cm and appears to have been about 2 m long before being cut in half.]

From 1958, mechanized bellows were used initially pedal-driven ones. From 1987, we used 18 PS motor bellows, and later 24 PS diesel machines. With these, we could process 4-5 tons per day. We

smelted old slags, later on also mined ores. I have smelted over 1000 tons altogether.

After the lead smelting, a ton of lead was placed into a hood, and "driven off" (赶出去) with sawtooth oak ashes. When the silver appeared, it had a purity of 70-80%. An iron spade was used to ladle cold water on and to lift the silver out.

The smelted lead was used at "bottom mother" (座母), to obtain silver, mined silver ore had to be added. And sawtooth oak was necessary.

The ores in the limestone are relatively rich, up to 3960 g/t. In the red sandstone, galena at 1800 g/t and plattnerite [黑铅矿, presumably 块黑铅矿] at 2400-2500 g/t is found.

I do not know how much silver could be obtained from a load of 1 ton of lead, because I have not done any silver separation.

In the county and in our village and by myself, we have smelted 16,000 tons of lead from old slags.

In the past, the furnaces looked like stars at night.

There were people from Yunnan, Han and Hui in the mines, but the Hui controlled the well and hence the entire mine. The local temple 本主庙 used to be the upper section of our courtyard.

When the mines flourished, each province had their temple, and the thirteen provinces together maintained the great Temple of the God of Wealth (财神大庙). After the temple had become a ruin, I still saw the back walls when I was young. There used to be an opera stage where everyone came together to watch performances.

There is a story that there was a dispute on control over the mines, with the Hui composing a poem and the Han answering. After the fight, the Hui were killed, and the mines went into decay. Later, a man from Jianchuan and an official from Heqing came to smelt lead, but on a small scale only. They sold to a Xia from Dali. That would have been in the Republican period.

In the past, lead was not the target, but silver. The mine was under the administration of Yunnan. After the fighting between Hui and Han, the mines were ruined.

I made money with smelting lead but I los a lot in mining. All good ore had already been taken by the miners of the past.

From the old slags at Fulongchang, I reckon that the miners of the past extracted 25,000 tons of lead from about 80,000 t of ore. If the silver content was 3200-3300 g/t on average, the total output would have been 24,000 kg. I reckon they obtained about 250 tons of silver.

By using sodium cyanide, some 50 kg of silver were extracted in the past.

In the past, everything was carried in on horseback. The rice came from Yongchang, the bacon from Xuanwei, the wine from Heqing.

My grandfather came as a horse driver from Weixi, and later sold lead from smelting. There used to be no fields in the village, and the houses were bamboo- and mat-sheds. People who stayed on were descendants of miners.

When the village flourished, it had two market streets, the Upper market and the lower market (上街子、下街子).

Mrs. Hu 胡 (aged 63), He Junzhong's wife, briefly related her family history:

My family is originally from Lijiang, and the name was Mo 莫. Three brothers four generations back fled from war, loading their belongings on over 90 pack mules. My grandfather arrived at Fulongchang, and he had money. It is said that he was the boss who ran the mine and that he had a large money store.

Further information provided by Mr. He Junzhong:

A ton of lead was first placed in the separation hood, then 300 *jin* of charcoal. When the temperature had come up, the ore was added. At first one or two baskets, they would have been "fried" (炸) in 11 to 12 minutes. A hood was operated a day and a night, 24 hours, frying 30 to 40 *jin* per hour, hence 700-800 *jin* in 24 hours. The upper and lower opening were rectangular, about 6 *cun*, the upper for adding charcoal, the lower for adding ore.

The sawtooth oak ash was added from the lower opening with an iron spade, sprinkled over the surface of the lead bath. The silver would not stick to the ash and gather. After 24 hours, there would be between 3 *jin* and 6-7 *liang* and 4 *jin* of silver, never over 5 *jin*.

For lead smelting you needed about 3 *jin* of charcoal on 1 *jin* of lead.

For separation in a hood, about 1000 *jin* of charcoal were needed in 24 hours.

For copper oxide, less charcoal was needed, a bit over 2 *jin* per *jin* of lead.

The lead content in copper oxide ores was between 40-50%, even 60-70%.

In the past, small carrying baskets were used to carry the ore out from the mines. The galleries were quite small, and there were also shafts, very steep. In these the men had to tie a rope around their waists and get pulled up, with baskets of 40-50 *jin*. In level galleries, they carried about 100 *jin*.

I have seen shafts that were over 200 m deep.

Sesame oil lamps were used for lighting, in small earthen bowls, with cotton wicks.

We left Fulongchang village towards in mid-afternoon and returned to Lanping the same day.



The Fulong Mines in Lanping District



Fulongchang village
Red area: slags
Orange area: temple

Results

Due to the stele inscription and mainly thanks to the rich information collected, practiced and generously shared by He Junzhong and He Xiaoli, the Fulong Mines have become one of the best documented sites. The period of intensive exploitation is relatively well-defined, reaching back no further than about 1780 and ending in the 1850s, with the temple construction of 1804 probably marking the bonanza years.

He Junzhong's estimate of 25,000 tons of lead recycled from historic slags since 1949 omits the minor bus existing recycling activities from the late 19th century to 1949. His estimate of average silver content founded on careful observation and the analysis of samples of historic ores found in old workings appears highly credible. We therefore regard his estimate of a total output of some 240 tons as reliable and probably conservative.

The Shiyang Mines 石羊厂 in Shuangbai District 双柏县

Nanny Kim, draft June 2018

Records and questions

Productive mines in Chuxiong prefecture appear in the records of the Yuan (1279-1368) and Ming (1368-1644) periods. The Shiyang Mines are thought to have been one of these, but firm evidence is not available.

SongYingxing records mines in Chuxiong that exploited ores poor in lead and had to procure lead from outside the area.[1] These mines have also been identified with the Shiyang Mines.

Emile Rocher recorded information that he probably obtained either in Gejiu or possibly in Kunming according to which the Shiyang, the Bainiu and the Malong Mines (石羊厰、白牛、馬龍) exploited "massive seams of a yellowish ore are found, which contain little lead but much silver, and also a notable quantity of gold. After the silver is brought to the required purity, it is treated for extracting the gold."[2] With Bainiu a probably misspelling of Yeniu (野牛), the cluster of mines refers to the major mines of Shuangbai (formerly Nan'an 南安州).

The Shiyang Mines are located on the tips of two ridges that fall into the valley of the eponymous Shiyang river 石羊江, from the northwest and the northeast respectively. The river is an upper arm of the Yuanjiang 元江, which becomes the Songkoi/Red River 红河 as it enters Vietnam. The beginnings of the mines are unknown, but they were important in the late 16th to early 17th century, around 1700 and again in the early 19th century.

The local gazetteer of 1746 records a bonanza for 1695-1696, that led to setting an annual tax quota of 22,393 *liang* (ca. 829 kg) of silver. By the early 18th century, however, the mines only submitted some 1000 *liang* per year, gradually dwindling to a few hundred by mid-century.[3]

By 1829, the reported taxes had fallen to merely 5.5 *liang*.[4]

The gazetteer of 1922 records that the mines of modern Shuangbai were unsurpassed in productivity throughout the province to the Daguang period (1821-1850). The total number of miners in the Malong and the Shiyang mines ist stated to have been 20,000 men, while other mines employed some 7000 to 8000, and the numbers at some point surpassed 10,000 at the Yeniu Mines as well (清道光以前，其产地之多，矿苗之旺，甲于全滇。彼马龙、石羊两厂，各集至二万余人。其外，各厂亦各集有七八千人，野牛厂则时在万人以上。)[5] The record further specifies that the massive fighting started in the Malong and the Shiyang Mines, and that the interruption of work led to the drowning of the deeper workings, hindering efforts at restoring mining in the early 20th century.

The outbreak of massive hostilities that escalated local violence and pogroms into a civil war is thought to have taken place at the Shiyang and the Malong Mines and involved several ten-thousand.[6]

The re-exploitation of slags is recorded as a village industry for the Republican period.[7]

The duration and the scale of exploitation at the Old and New Shiyang Mines is uncertain. The Old Mines may have been worked since the Yuan period and may have been very important at some period during the Ming. Their scale during the Qing is uncertain apart from the bonanza of the 1690s. The New Mines may have been worked for a relatively short period only, with the intensive period probably dating to the first half of the 19th century.

Yang Yuda and Nanny Kim carried out two fieldwork trips to the Old Shiyang Mines (*shiyang laochang* 石羊老厰) in 2011 and the New Shiyang Mines (*shiyang xinchang* 石羊新厰) in 2016.

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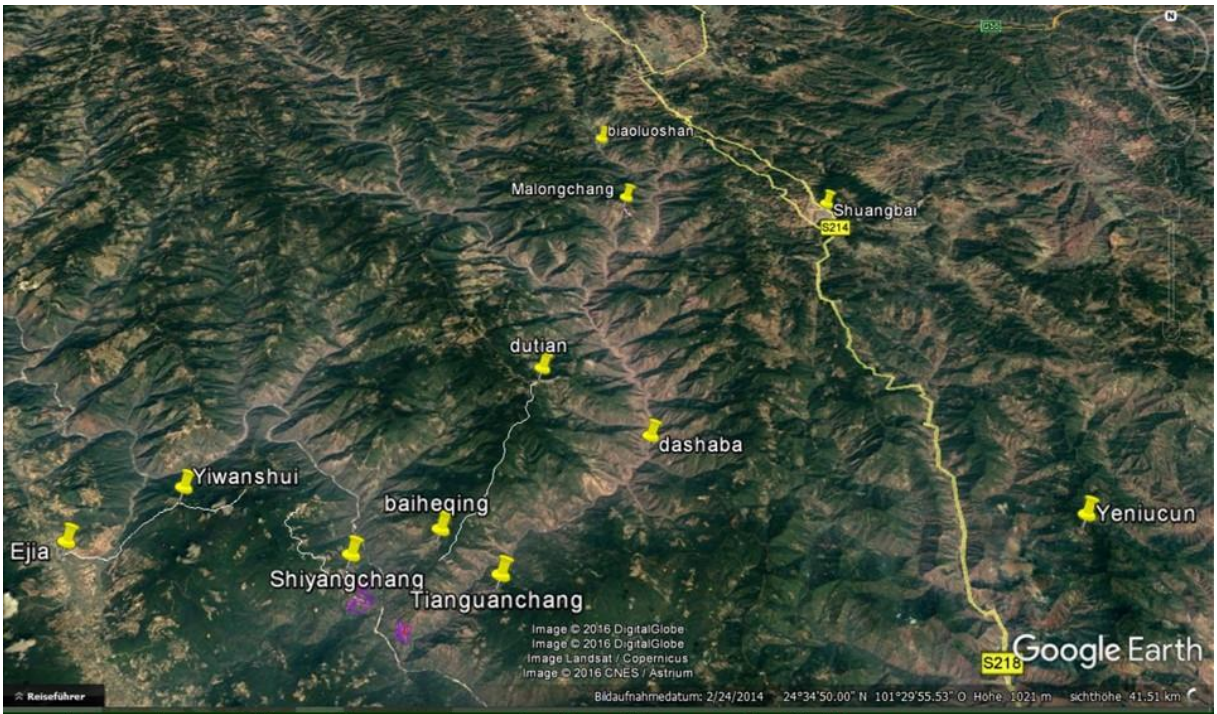
[1] Song Yingxing 1638, *juan* 2, 6a.
[2] Rocher 1879, II, 239.
[3] *Ejiazhi shucao ben* 峨嘉志書草本 1746, 20, 25-30.
[4] *Yunnan tongzhi*, 1835.
[5] *Mochu xiandizhi* 摩芻縣地志 1922, 18.
[6] Atwill 2006, 78.
[7] *Xinzuan Yunnan tongzhi*, juan 64.



Overview of the silver mines in the Shuangbai-Ejia areas

Fieldwork on the Old Shiyang Mines (石羊老厥) by Yang Yuda and Nanny Kim, 7 April 2011

Supported by Mr. Wang of the Ejia town government and Mr. Wang of Shiyangchang village

Main informant: Mr. Wang of Shiyangchang village, Mr. Zhang Fuchang 张富昌 of Liangzitian 梁子田村 near Dashuigou 大水沟

2011.4.6. Shuangbai 双柏 to Ejia [石号] 嘉, arrival at Shiyangchang 石羊厂 village after dark

In the area, all valleys run NNW to SSE. Ejia is located on the northeastern flank of the Ailaoshan range, that descends from 4000 m to the Shiyangjiang 石羊江 (also Lishejiang 礼舍江), and upper arm of the Yuanjiang, at about 500 m. The middle section is occupied by many villages crammed into narrow valleys, with rice terraces where irrigation and terracing can reach.

The Mines are some 40 km west of Ejia town. We drove in some 10-15 km on the country road, then entering dirt tracks across forested country that is not extremely rugged but broken and relatively dry. Rather suddenly, the track reaches the valley of the.

Mr. Wang (58 years old), put us up and showed us around the following day. The dialect was difficult for me. Mr. Wang's house consisted of four rooms and a semi-open kitchen, fridge, a gas stove, a huge rice cooker, and a microwave. another two rooms are a little way down, and a bathroom with shower and washing machine and 2 toilets. Solar power provides hot water, and the toilets are ceramic basins complete with flush. He had stabled goats and pigs, as well as a couple of donkeys. I understood that he had built the house only in 2004 and also owned a car and a motorbike that were parked outside. Two adult children are involved in goat breeding (these are not grazed but stabled in this region). There are also sidelines of collecting pine resin from the forest and eucalypt oil from trees planted for the purpose and harvested every 3-5 years, as well as cultivated mushrooms.

2011.4.7. Shiyangchang, return to Shuangbai

In the morning, we learnt that the village had long been abandoned and was resettled only in 1985, when a smelting company was set up. Smelting turned out unprofitable, however, and the plant was closed in 1988. The Wangs were one of 8 families who had come for jobs at the plant and decided to stay when it closed. The village now has 9 households. It sits on the NE flank of a narrow ridge that extends into a bend of the Shiyangjiang. The slope descends at well over 60° over at least 800 m down to the river, which mostly in invisible. The ranges to the east of the river are equally steep.

Before 8 am, we were on our way on a path along the ridge. About 1 km from the houses on a little side-ridge was the smelting site and a long slope which according to Mr. Wang used to be covered in slags ang gangue. The trail almost certainly was the old road, with built and paved stretches still visible in one section. There were four well-preserved domed hearths just below the path, and mine entrances beginning just above.



Remains of the old road linking the temple saddle with the mining area near the top of Shiyangchang village





Mr. Wang told us that there altogether some 300-400 mine entrances on this slope and on the other side of the narrow ridge. They are visible from the little ledges formed by waste rock where the slope is grassy, but are mostly hidden in thick, young forest. He took me to 4 entrances that were only about 50 m apart from each other. The lowest gallery started off almost level, while the higher ones were inclined at increasingly steep angles.

Enormous amounts of large debris covered much of the mountain flanks, with gangue mostly light rock, often with quartz veins. The path runs for about 3 km level along the ridge and probably continues around the nose and along the western mountain flank into a side valley.



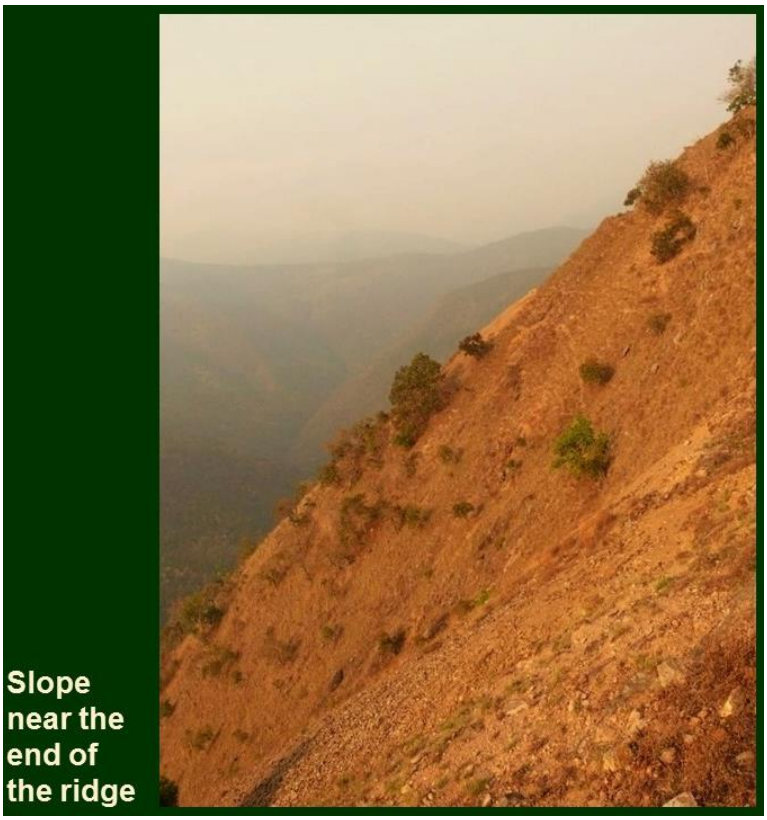


Slope covered in gangue



View down a gangue dump into the Shiyangjiang valley. Remains of foundations near the bottom end of the gangue field.

We passed two small side-ridges. On the first, a caved-in entrance of a mine with remains of walls that may have belonged to two small huts to both sides. Mr. Wang told me that this used to be a deep mine, he had been inside to a depth of about 100 m. The ground in front of the entrance was levelled with waste, and there were further remains of walls and possibly of a pond for water storage on the nose below. On the second nose a wall remains forming a row of small houses were clearly visible. The slope becomes increasingly steep and ends in a denuded nose. As our guide became concerned, we did not round the corner.



Slope near the end of the ridge

Mr. Wang pointed out the location of the New Mines (Xinchang) at roughly the same height across the river. As far as our informants knew, both mines were deserted after the fighting between Han and Hui miners broke out. According to tradition, the majority of miners were Hui and fled when a Han militia attacked them.

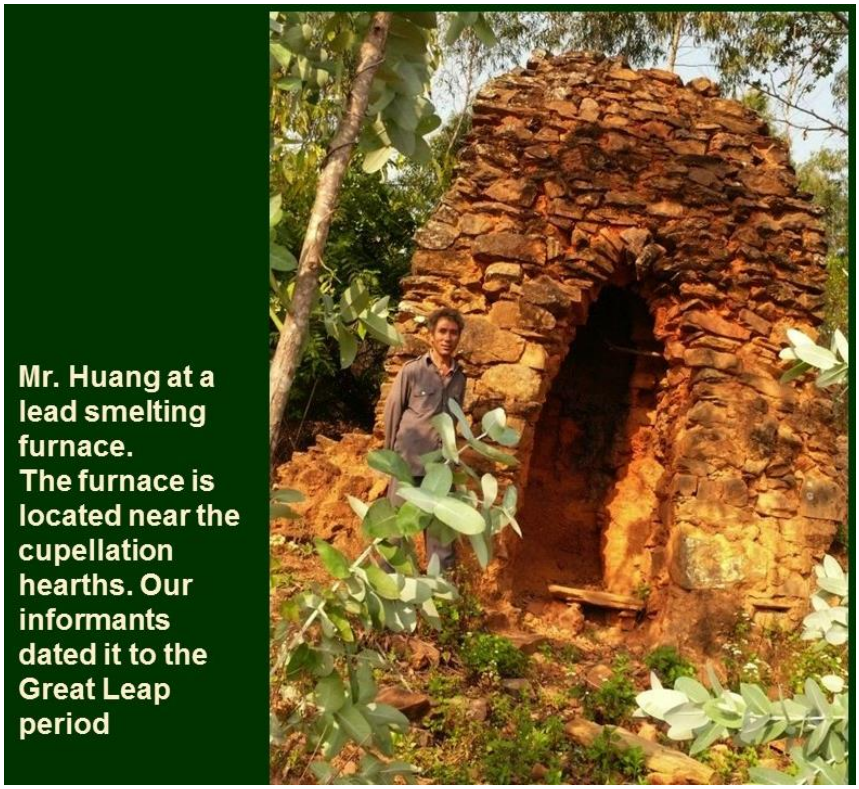


View down a small side ridge with remains of buildings. The river below is the Shiyangjiang.

We returned by the same path that we had come. When nearing the village, Mr. Wang took us some way down into a eucalypt copse. There were several rows of 5 or 6 hearths, and some more in an angle facing NW. Near the site were the remains that he said were from a grain store built during the Great Leap. A little

way further down were furnaces. A well-preserved furnace was 4 m high.

The furnace and the hearths were partly reddish due to heat exposure. The presence of a building dating to the Great Leap (1959-1961) and the height of the lead smelting furnace suggests that the furnaces, as well as most probably the hearths date to this period.



Mr. Huang at a lead smelting furnace. The furnace is located near the cupellation hearths. Our informants dated it to the Great Leap period

Back at the driving track above the village, we continued along the ridge to a narrow saddle in the ridge, the site of a former temple. Mr. Wang told us that the temple was destroyed during the Great Leap. The dimensions of the temple grounds and of some of the buildings were still visible from remains of walls and differences in the vegetation. In a tiny shrine, locals had assembled broken remains of a stele, that they found some 10 to 20 years ago. We could make out the date QL 38 (1773) and that it recorded the donation of fields to the temple.



Temple area on the saddle





In the afternoon, we went to Dashuigou 大水沟, the only larger village nearby that located a few km north and slightly above the Shiyang Mines, also on the descent to the Shiyangjiang.

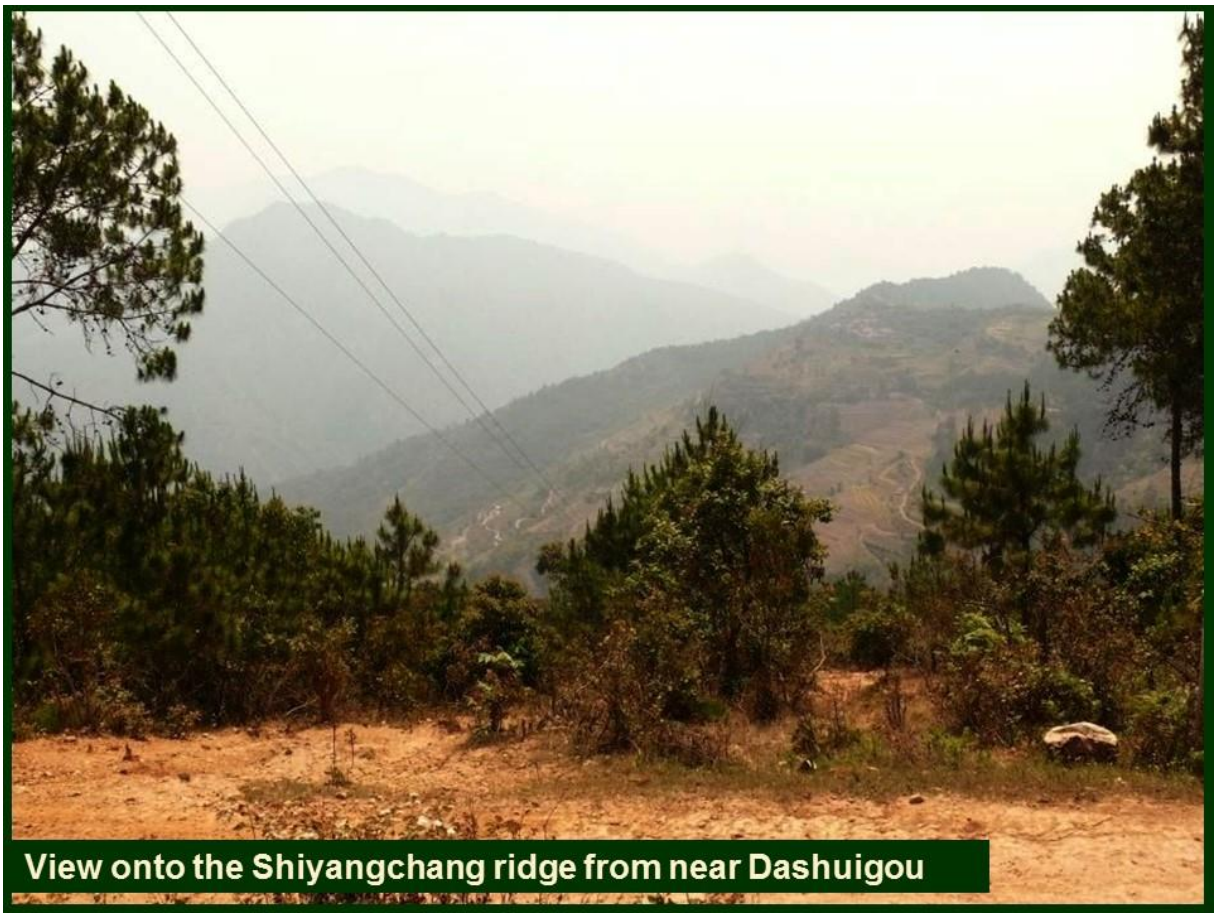
Dashuigou is a compact, clearly old village that now consists of 27 families. The village is built along remains of a canal, some 1.5 m in width. With the oldest grandfather very deaf, we were advised to look for a family who lived a short way below the village.

Mr. Zhang Fuchang 张富昌 and his son (aged 46), sand both knew something of local history. The father mentioned that this stretch of the river, which now is usually called Lishejiang, used to be called Shiyangjiang (which now, according to Google maps, is again the case). The name Dashuigou derived from a canal that had been built to supply water to the mines. Others had mentioned that Dashuigou used to have plenty of water but now was quite dry, implying that this was due to the hydroelectric plants. The last informant specified that the old canal was still visible in places. The origin of the canal is uncertain. As the old path from the top of modern Baiyangchang village also runs at a corresponding height and descends very gradually,

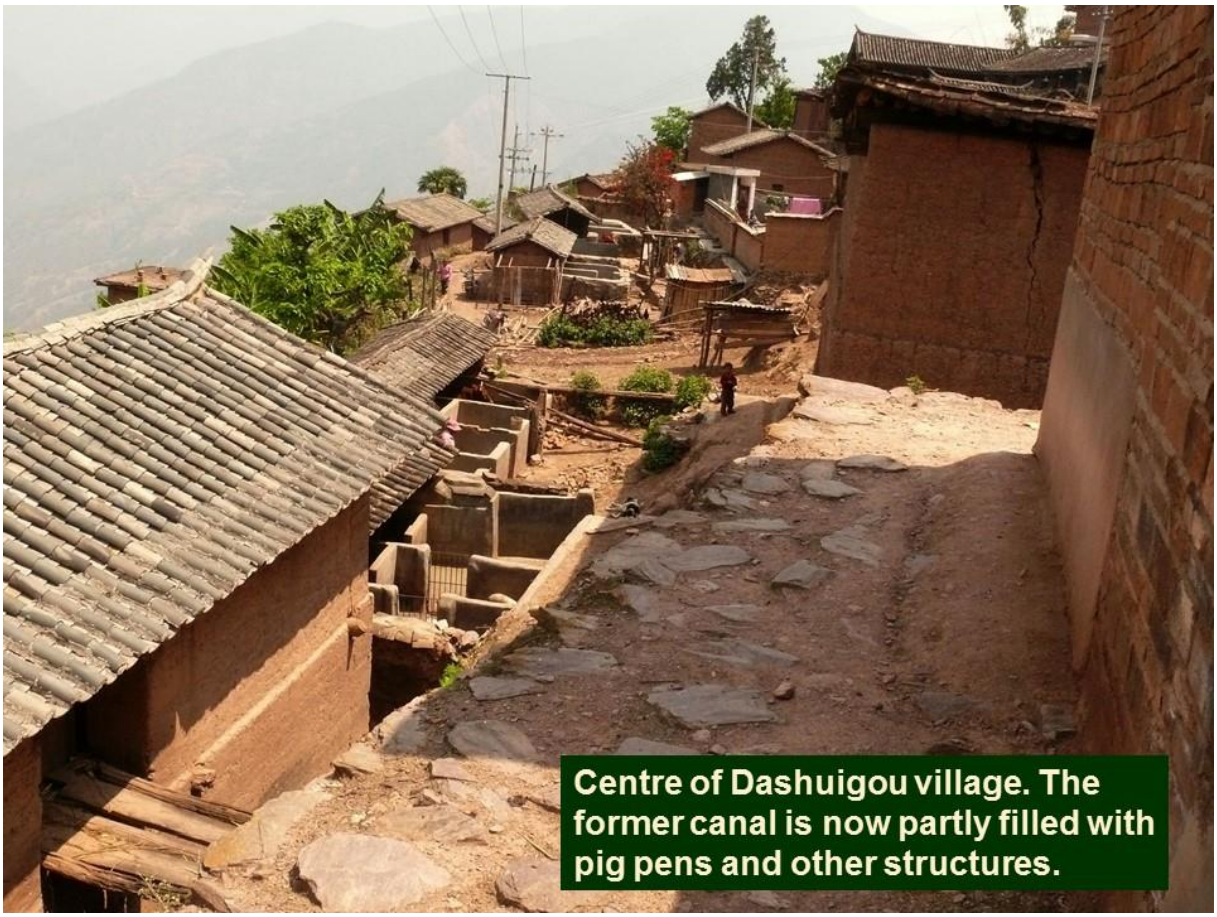
it appears highly probable that both structures indicate a former contour canal that brought water right into the mining area. The younger informant took me to a charcoal kiln in the forest. It has been disused for quite some years, but he used to help his father making charcoal and would know how to set up a kiln.
Due to the problematic track, we had to depart at 2 pm.


View north up the Shiyangjiang, from the temple saddle


View north towards Dashuigou on the saddle of the next ridge



View onto the Shiyangchang ridge from near Dashuigou



Centre of Dashuigou village. The former canal is now partly filled with pig pens and other structures.



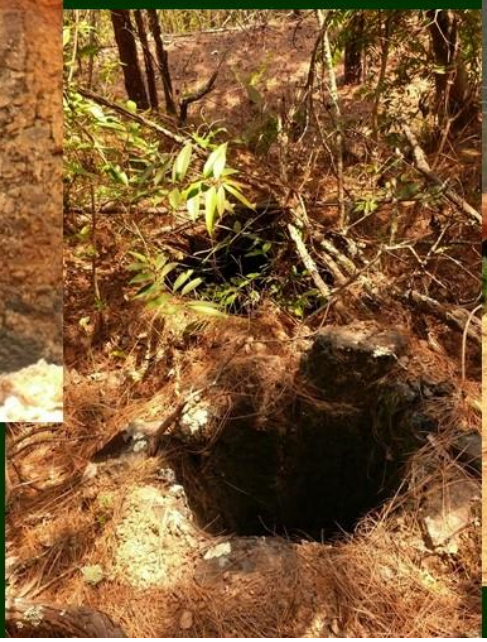
Mr. Zhang Fuchang
张富昌



An old charburning kiln in the forest near Dashuigou



Inside walls
and chimney



Mr. Zhang Jr.



Fieldwork by Yang Yuda and Nanny Kim on the New Shiyang Mines 新石羊厂, 24 – 25 November 2016

Supported by: Luo Xingfu 罗兴福, party secretary of Dutian sub-county 独田乡

Main informants: Luo Xingfu; Li Junun 李俊, head of the cultural bureau of Dutian sub-county; the mayor of Baiheqing village

We reached Shuangbai just after 12. Since 2011, the country road from Chuxiong to Shuangbai has been replaced by an (almost finished) wide motor road. Luo Xingfu 罗兴福, the party secretary of Dutian 独田乡, was waiting for us with other members of the district government. Secretary Luo told us that it would take 2 hours to Dutian and another 2 into the New Shiyang Mines, but that the road to Dutian was under construction and therefore closed until 6 pm.

We therefore went for a walk around the tip of the Chamu lake 查姆湖, which is now a park (was a building site in 2011) and to the local gazetteer office at 2 pm. A recent reprint of three historic gazetteers listed numerous old mines. The local historians stated that in addition to the Shiyang Mines, the Malong Mines 马龙厂, the Yeniu Mines 野牛厂, and the Tianguan Mines 添官厂 used to be important. Tianguan is a site south of the Malong River, in fact quite close to Shiyang, but rather difficult to reach by car. We decided to visit the Malong and the Yeniu Mines.

At 3:30, we visited the Cultural Relics Institute, a brand new building with an ethnic exhibition nearly finished. The specialists of the Cultural Relics Office were away, but Mr. Su of the institute knew something about the New Shiyang Mines, specifically that old furnaces were still on site.

We met with secretary Luo for dinner and followed their car to Dutian in the dark. Dutian is a large village along a single main street, with one private guest house, new and clean, and with wifi.

2016.11.25. Xin Shiyang Mines 新石羊厂

Secretary Luo had arranged for Li Jun 李俊 the head of the local cultural bureau and Mr. Guo of the village administration to accompany us to the mines. The road to Baiheqing 白鹤箐, the last village before the mines followed the valley of the Malong river, then an upper branch heading west and turned south only after entering the Shiyangjiang valley. The area is almost entirely forested and very thinly inhabited. The forest looks to be under 20 years old.

During the long drive, teacher Li told oral traditions of Baiheqing. In 1994, he had participated in a visit by members of the Shuangbai Cultural Institute to Baiheqing. They had interviewed the oldest inhabitant of Baiheqing, then 79 years old, who was the last descendent of local miners.

Mr. Li's account of the foundation story of the mines: There once was a mule driver emperor who sent out a man to follow a water buffalo to find for a suitable grave site for himself. The man was to walk as long as the buffalo kept walking and identify the place blessed by fengshui by the site where the buffalo would lie down. The buffalo came down from Xiaguan 下关 and never stopped until it reached a place called Koumuzhuang 口木庄, where it lay down and would not get up again. All were convinced that they had found the blessed spot and the emperor hired many men to dig a grave. But, every night the earth that had been dug up would grow back again. After digging had led to nothing for several months, the emperor became angry and set even more men to work. The digging still had no effect. One day, an old man sent on corvée to work on the grave realized in the evening that he had lost his pipe during the day, so he went back by himself. As he looked for his pipe on the grave site, he heard a voice that said: "Not afraid of a thousand men digging away, not afraid of ten-thousand digging, only afraid of being nailed down by copper nails and iron nails." (千人万人挖都不怕，就怕铜钉铁钉钉下). He reported this and the man in charge found two newborn children, a boy named Tongding 铜钉 and a girl named Tieding 铁钉. He bought them from their parents, had two pits dug on the grave site, and buried the infants head down. They heard a terrible cry and blood spilled out of the mountain at two places, one named Xuechong 血冲, which is now renamed 德冲 [still a village on the Malonghe] and the other ... [missed this place name]. In between the two sites, a white crane flew out of the mountain, the mountain dove, and it flew off towards Xiaguan. The *fengshui* spell was thus broken. The place where the crane flew out of the mountain was called Baiheqing, the place formerly called Koumuzhuang.

Mr. Li also related the oral history concerning the conflict between Hui and Han. According to this story, all miners were Hui, and the local Han in the area became jealous, so Li Wenxue 李文学 led others to take over

the mines. In the first battle, the Hui lost, and many were killed. A second battle followed, when the Hui returned with reinforcements to take revenge, and killed large numbers of Han. In the mining area, many graves were left by these battles. [Yuda: this is a mixture. Li Wenxue is an Yi hero identified by Liu Yaohan 刘尧汉, who had nothing to do with the mining conflicts. Nanny: There actually are large numbers of graves near the mines. These appear to be from different periods, the dated ones that we saw in fact date after the civil wars.]

Li Xun also told us that reportedly there used to be a huge stone mill at the New Shiyang Mines, the millstone weighing over 10 tons, which was later covered by other material. [Guo and the village mayor stated later that they had not seen such a millstone.]. In the old times, the ore was carried out from the mines, then pounded into small pieces and washed to get rid of soil and light fractions, then ground by a mill that was worked by men. After grounding, the ore was sieved, using five to six different sieves, that were graded more and more finely. Only the finest ore concentrated in this process entered the smelters.

According to local sayings, the Shiyang Mines had exploited only one of the hind legs of ten silver goats.

Li Xun also mentioned that two large old temples used to exist in the mines, the Old and the New Temple. In the New Temple, a copper bell of about 100 *jin* used to exist that was later taken to the primary school. At some point, an iron rod was used to strike the bell and eventually the bell cracked and was sold for waste copper.

Asked about other temples in the area of Dutian, he said that there was a temple at Zhulin'ao, which had been burnt but was now rebuilt and well frequented, and several shrines, one of which used to have 4 copper Buddhist statues, about the height of an adult, which were sold by the village government in the 1980s to raise funds for the first phone.

The area of Dutian is 260 km2, the population 4700. Many villagers now make good incomes by selling mushrooms, timber and by raising cattle and goats. Goats sell alive at 32 Yuan per kg, cheaper in more remote areas.

Li Xun reckons that Baiheqing is at 1000 m, the Shiyanjiang at 650 and the New Shiyang Mines at 890 m. Upon asking, he stated that charcoal burning went on everywhere in the area, and that charburners from near and far used to sell to the mines.

We reached Baiheqing about 10 am. The village mayor (村长) was waiting for us and led the way on his motorbike (He also possesses a small truck and a car.) The track gradually descended along the ridge. Where the ridge became slightly wider, the mayor made s stop at the site of the Old Temple 老大庙. The site was some 20 m above the track in the forest. Remains of a small building with earth walls consisting of 3 rooms were still standing, the main hall according to our informants. The walls were between 2.5 and under 1 m high, and about 0.7 m thick, the building was 5.6 m deep (inside measurements) and 10.2 m wide across. There were no remains of tiles or bricks on the forest floor, and the informants confirmed that the buildings used to have thatched roofs.

Downhill of the temple site are many old graves. Some of the graves were within the temple compound, apparently built after the temple had fallen in disrepair. It turned out that we were at the upper end of the "Grave Mountain" (坟山) which extended down the slope and towards the river for roughly 1 km. According to teacher Li, there were some 2000 graves altogether. Nanny found three graves with small stone tablets, the only readable inscription dating to the Tongzhi period (1863-75).

We got back in the car and followed the track down some way, until teacher Li stopped us at the site of the New temple 新大庙 and the market street. The temple site much resembled that of the old temple. The street consisted of a visible street some 2 to 2.5 m wide, with the bases of small cubicles to both sides, suggesting shops. The informants stated that this street used to be about 350 m long, but was how interrupted by the driving track. The graves extended right down to the street area. A broken up stele inscription had been assembled by teacher Li. Though missing parts, it was partly legible, recording the rebuilding of the Xiyue Temple 西岳宫 (Huguang guildhall) in the year Renshen ([lost] 一年岁次壬申, i.e. probably 1892).

Li Xun was convinced that ox carts used to transport ores from the mines to the smelters and that the street had just the width for carts to pass.

A short distance on, on the SE shoulder of the ridge was a smelting site with several rows of cupellation hearths still recognizable. About 6 rows were clearly identifiable. Yuda and Mr. Guo measured the best preserved hearths:

Dome inside height 105 cm, diameter 125 cm, thickness of the front wall 35 cm, side wall 40 cm, 3 holes in the dome visible from the inside, with diameters between 1.5 and 3.6 cm. Triangular hole in the back wall, 13 cm wide. The other hearths in part showed larger inner diameters and heights. In the ceiling of the domes was a layer of ends of *shatiao*, around 10 cm in length, placed on end and plastered together with clay.

The ground around the furnaces was covered in slags, mixed with numerous *shatiao*, though apparently not in a thick layer. Below the street, the ridge falls off steeply into the Malonghe to the south and the Shiyangjiang in the west. From the lowest row of furnaces to about 40 height metres below the somewhat flattened and in part hollowed out ridge is covered in slags. Apparently formerly in a thick layer, which has been recently dug up and shipped away for re-smelting. The driving track was evidently built for this purpose, as well as installations for loading trucks and some houses. The present surface mainly consists of waste rock from sorting, which covers the red soil to up to 2 m. The layer peters out towards the lower end of the dug up section. [Nanny: due to the gradient, a considerable amount of waste materials may have eroded into the river valleys.]

There were some more remains of cupellation hearths and other structures near the lower western end of the slag field. Among these was a smelting furnace with a large, square base over 2 m in width and length. According to our informants, this furnace dated to 1958. Teacher Li stated that when he first visited the site in 1995, there were some 200 tons of lead cakes piled up next to the furnace, left from the Great Leap. These would have been sold later. He also mentioned that he heard from old people that a wooden ramp was built down to the Shiyangjiang at the time to send the slags down.

A short way further down was a rectangular structure of stone walls, 4.8 m in length, 2.75 cm in width and about 1.9 m high. The height of the walls was still relatively regular, suggesting an open structure. On the eastern wall were two openings framed in bricks, 35 x 60 cm, with a square hole of 10 cm. On the northern wall facing uphill was a domed entrance, 90 cm wide, 100 cm high, about 110 cm deep, the inside opening covered with a millstone. The walls were about 60 cm thick, and there were two raised sections inside, about 80 cm deep and 60 wide, leaving a channel of about 50 cm in the middle, which was filled with earth. The purpose of this structure was unknown. [Yuda: possibly a roasting kiln?]

A nearby grave stele dated to 1857.

A little way down the western slope were 3 more hearths, similar in dimensions to the higher ones.

The informants told us that there were two other slag dumps in the area, but that this was the largest. Concerning the recent selling of slags and gangue, Mr. Guo stated that a company worked the slags for about 3 years, filling one [?] large truck per day. According to the village mayor, they may have sold 5000 tons of slags as well as gangue. The metal content [presumably lead] in the gangue was about 3%, which was concentrated to 30% for selling. The loose rock material near the smelting site was this gangue.

The Tianguan Mines 添官厂 on a small nose above the Malonghe were pointed out to us. All informants confirmed that the Old Shiyang Mines were the largest and had the largest slag dumps, the New Shiyang Mines came second and the Tianguan Mines were somewhat smaller. [Yudan commented: according to the gazetteer, the slag dumps of the Old and New Shiyang Mines were some 4000 to 5000 tons, while there were 8000 tons at the Tianguan Mines.]

The village mayor took Nanny to look at a few mine entrances on the Western slope, clambering along northwards for a short stretch. The mining entrances began from the lower end of the graves almost down to the river, which was still at least 200 m below. According to the mayor, there were 70 to 80 on this slope. The six entrances seen were at the same level and quite close together, leading into the mountain at a slightly downward angle and about 25 m apart from each other, some as close as 5 m. Where the terrain was slightly less steep, massive fields of waste rock covered the slope. Rock of light grey with some quartz, similar to the waste rock at the Old Shiyang Mines. The mayor said that he had been inside the mines; the galleries were mostly narrow, but at times opened to large halls. The largest would be “as high as the trees,” which were around 15 m in this forest.

We returned to Baiheqing about 2 pm and had lunch in the courtyard of the mayor.

On the ascent near the village and in the forested slope, we had a look at a recent charcoal kiln and at the remains of two further structures, which according to Li and Guo dated to the Qing. All three were earth and rock structures about 2 m in diameter, with a flat dome, a door in the front and a chimney in the back. According to the mayor, a kiln produced about 500 kg of charcoal. He had not considered the amount of fresh wood that was required. He detailed that different sizes of wood could be used, as long as they were properly arranged, indicating diameters of perhaps 15 cm to thin sticks. We were also told that some of the old kilns

were twice this size.

We reached Dutian about 6 pm and Shuangbai towards 10 pm.

During the fieldwork at the Yeniu Mines (27 November 2016), Li Zhengchang 李正昌 (born 1966, of Laochang village) told us that he had been involved in the transport and selling of slags both near his home village and at the Old Shiyang Mines and a site called Caiyuanzi, working with his own mules. He was positive that the slag dump of the Old Shiyang Mines was the largest that he had seen.



View across the Shiyangjiang to the ridge of the Old Shiyang Mines



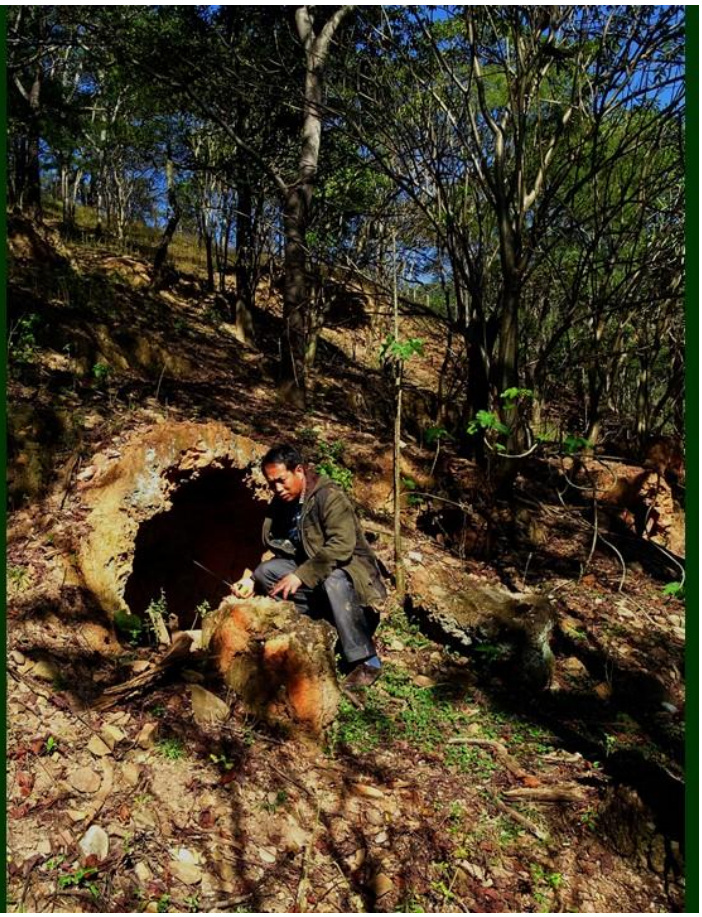
Remains of the lower temple



A grave near the site of the remains of the upper temple

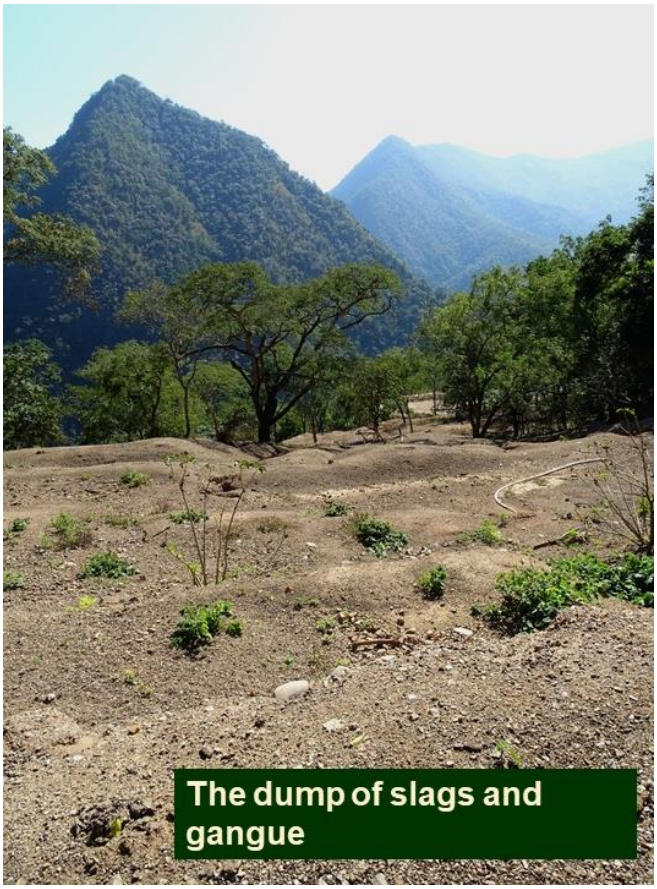


A cupellation hearth, Branch-secretary Chen and Mr. Li Xun

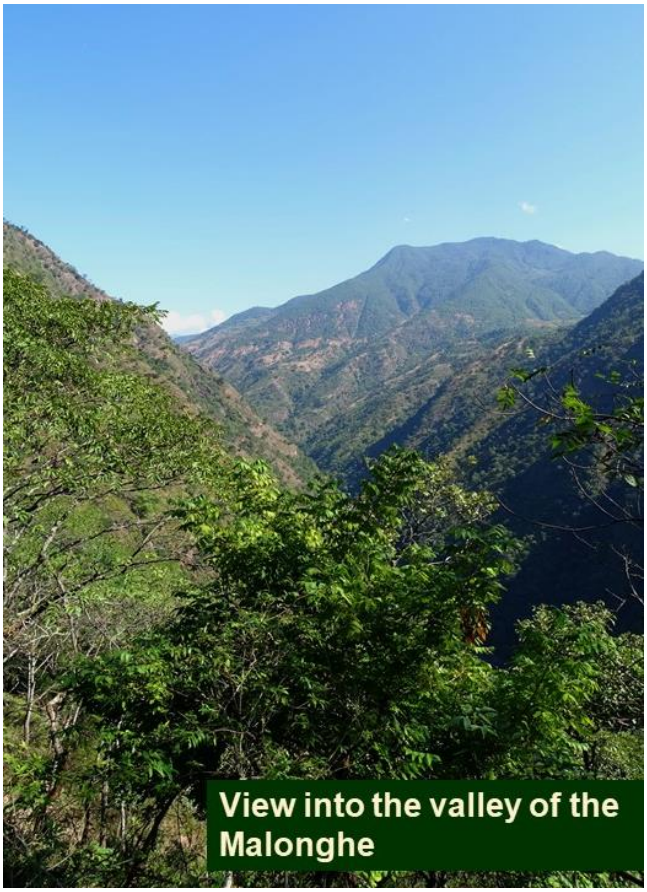




A row of cupellation hearths



The dump of slags and gangue



View into the valley of the Malonghe



Remaining slags



The unidentified square Structure near the bottom end of the slag dump





The unidentified square Structure near the bottom end of the slag dump

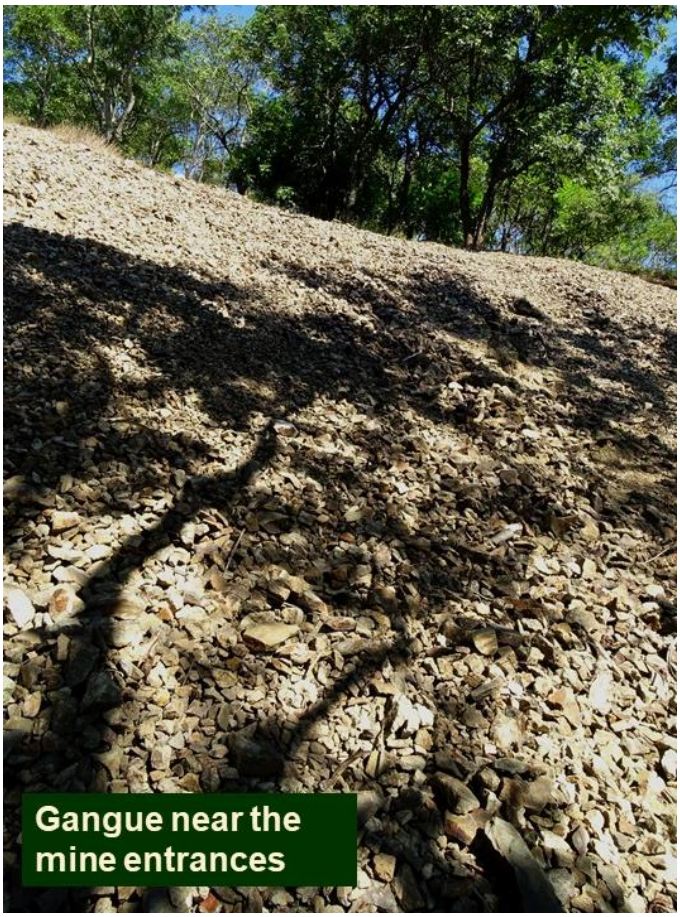




The unidentified square Structure near the bottom end of the slag dump


A well-preserved cupellation hearth And structure of sand bars in the ceiling


Village mayor Zhang at a mine entrance



Gangue near the mine entrances



Remains of a street and stalls or small houses



Tiles on the forest floor and assembled parts of a broken stele



Charburning kiln presently in use at Baiheqing



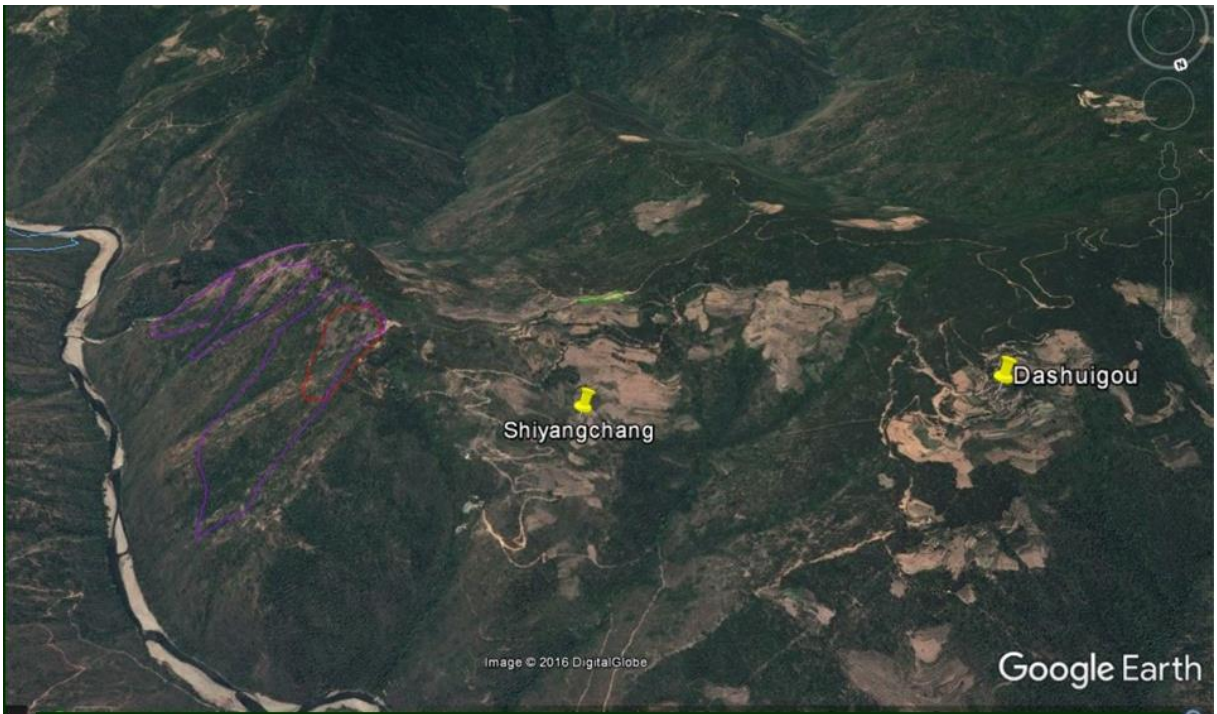
Charburning kiln presently in use at Baiheqing



Historic charburning kiln between the New Shiyang Mines and Baiheqing



The Old Shiyang Mines
Red area: slags
Purple areas: gangue
Green area: temple site



The Old Shiyang Mines
Red area: slags
Purple areas: gangue
Green area: temple site



The ridge of the New Shiyang Mines at the confluence of Shiyanjiang (left to right) and Malonghe (descending). The Old Shiyang Mines are on the ridge in the foreground.



The New Shiyang Mines

Blue area: Mines
Purple areas: Gangue heaps
Red area: slag dump
Green area: Graves

Results:

Findings and the information on re-smelted slags confirm that the Old Mines were considerably larger than the New Mines, while the Tianguan Mines apparently were again smaller.

The evidence is rather contradictory. The number of mine entrances suggest very considerable exploitations, while the amount of slags and gangue, as well as the grave mountain support suggest a more modest scale. The tiny temples appear mismatched.

At the Old Mines, the large number of workings, together with the canal that would have tapped a water source at least 15 km away, suggest exploitation on a considerable scale that lasted for centuries.

The gradients could explain the loss of a large proportion of the discarded materials. The temple remains at the Old Mines suggest an originally extensive structure, while the remains in the forest above the New Mines were surprisingly small. There is the possibility that exploitation at this site lasted only a relatively short time, with the main sites of worship and social organization remaining at the Old Shiyang Mines. More probably, the remains belong to restored buildings that date to the period after the civil wars.

The overall scale of mining is impossible to assess on account of the steep terrain. Much or even most of the gangue and slags may have been washed down into the Shiyangjiang and carried away in summer floods.

The Lema Mines 乐马厂 in Ludian District 鲁甸县

Nanny Kim, draft July 2018

Records and questions

According to the records of the provincial mining administration, the mines were opened in 1742 and produced silver and copper, with the copper obtained from the lead oxide produced in silver cupellation. The location of the mines is described as 80 li south of Ludian 鲁甸, west of the Mt. Longtou 龍頭山and near the Niulanjiang 牛欄江. The tax quota of 1844 was 6363 *liang* (滇南矿产图略，卷下，102). The provincial gazetteer of 1835 reports a maximum tax revenue of 42,532 liang, presumably reported not long after the opening of the mines, and a modest revenue of only 4,674 *liang* for 1829 (*Yunnan tongzhi*).

The mines appear in a few official memorials submitted by provincial governors to the central government, with decreasing tax returns reported from the 1780s (Academica Sinica Digital Archive).

Two well-informed scholar-officials of the late 18th century mention the mines as the most productive silver mines in the interior of the empire. Zhao Yi 赵翼 (1727–1814) served in Zhenyuan, the district just across the border of Vietnam and the Tong Thinh/Songxing Mines, in a special function in Yunnan during the campaign against Burma in 1668-1669, and as treasurer of Guangdong. In notes that probably date ot the 1770s, he wrote on the sources of monetary silver:

> Yet in Yunnan only the Lema Mines produce several 10,000 *liang* [roughly several tonnes] each year, while all other silver is brought in from abroad. The silver coins used in Guangdong and Fujian all arrive on ships from the Southern Ocean through trade with the many barbarians. Then, there are the Dashan Mines in Burma, beyond the borders of Yunnan, and the Songxing Mines in Vietnam outside the borders of Guangxi, where silver mining flourishes。
>
> 然滇南中惟樂馬廠歲出銀數萬而已，他比自恃外番來。粵、閩二省用銀錢，悉海南諸番載來貿易者。滇邊外則有緬屬之大山廠，粵西邊外則有安南之宋星廠，銀礦皆極旺。(Zhao Yi 1982, 515).

Tan Cui 檀萃 (1725–1801), a less famous contemporary of Zhao Yi who served as local magistrate of Luquan, not far south of Ludian, who wrote in a similar vein towards the end of the eighteenth century:

> Those who discuss these matters say that, for supplies of China's silver currency, the Yunnan mines rank first, while the silver coins that reach Guangdong from overseas come second. When the Yunnan mines were flourishing, there was Mulong in the exterior and Lema in the interior, annually turning out silver beyond count。
>
> 論者以銀幣之濟中國者，首則滇之各厰，次則粵海花銀。滇昔盛時，外有募隆，内有樂馬，歲出銀不貲。(Tan Cui 1804, 754).

Wu Daxun 吴大勳 (dates?), an author of the same period as the two quoted above, specifically described the silver produced by these mines:

> The quality of the Lema silver is such that the ingots have dragon lines that rise on the surface; this is the best "dragon line silver."
>
> 乐马厂银质量，质成锭，面有龙纹凸起，是最好的龙纹银。 (滇南闻见录, printed 1782)

Republican sources identify Lema as the site of the mines of the Zhuti district 朱提縣 that appear in records of the Han period (*Zhaotong zhigao* and *Xinzuan Yunnan tongzhi*). According to the Republican provincial gazetteer, the workings were at the Shoupa Cliff 手扒岩 of Mt. Laojun 老君山. The site is said to have been most productive during the Qianlong and Jiaqing periods and abandoned in the Xianfeng and Tongzhi years (新纂雲南通志卷六十四, 5b).

The gazetteer of 1995 records the mines as highly important from 1742 to 1792, detailing:

> Deep [mining galleries] were between several hundred and over 1000 m deep, with many bifurcations and vents for air circulation. In the large mines, such as the Guanyin, the Lotus, or the Lion Mines, there were "offices" inside, as well as "performance halls." When the mines flourished, these were 48 large furnaces that would be operated through the night, and a dense and busy roads network. All along the 40 km from [Ludian] city to the mines there were lanterns along the road, and the noise and bustle of traffic would never stop."
>
> 洞深几百米至上千米，里面多有岔洞和配风巷。在观音洞和莲花狮子洞等大矿洞里，还设有办案的‘官坊’及唱戏的‘闹堂’等。鼎盛时期……冶炼大土炉４８个，炉火通明，道路四通八

达，纵横数十里。从矿区至厅城相距４０公里，一路檐灯高挂，车水马龙，热闹非凡。 (indirect quote from *Ludian xianzhi* 鲁甸县志).

Based on the official records, the mines appears very important in the mid-18th century and declining yet still from the end of the century up to 1850. The highest reported tax reflects an annual output of about 10 tons (at the official tax rate of 15%). Contemporaries as well as in local traditions recorded in modern sources, however, present Lema as the leading source of silver in the 18th century.

Fieldwork Yang Yuda and Nanny Kim, 2011.4.9., supported by the Haolong Corporation 浩龙集团

Supported by: Haolong Mining Corporation, Mr. Yu Chaokun 余朝坤, director of the industry and trade office of Ludian District, Mr. Peng Tao 彭涛, former general manager of the mines at Babaoshan, Mr. Ma 马, assistant county director and Mr. Wang 王, assistant county director

Main informant: Wan Xingkui 万兴奎 (73 years old), of Babaocun, and Mr. Peng Tao 彭涛, general manager of the recently closed Longtoushan branch of the mining corporation

The driver of the car that we took from Zhaotong to Ludian told us that Ludian used to be tiny, consisting of only two long streets. It now has spread over much of the narrow extension of the Zhaotong plateau. The Haolong Corporation 昊龙集团 that exploits the Lema Mines is the leading enterprise. Mining and the re-smelting of old slags used to be the main activities, but the company now has branched out to other activities.

Mr. Yu Chaokun arranged for contacted the local government of Longtou. Mr. Peng Tao accompanied us to the historic mines. Babaoshan 八宝山 village, some 40 km from Ludian towards the Niulanjiang and is squeezed on a narrow ledge in the valley running fairly straight SW towards the Niulanjiang, is the main village in the historic mining area. We reached Babaoshan after lunch and stopped at the primary school in the centre of the village. The school entrance is still flanked by two large stone lions, two other guardian animals and a round stone carving. A flight of steps some 7 m wide leads down from the narrow motor road to a path along the valley, with two more guardian lions at the bottom. According to local tradition, the mine yamen used to be located here. The remains indicate a building of impressive dimensions that probably towered over the path that used to be the main road from the Zhaotong Plateau into the mines.



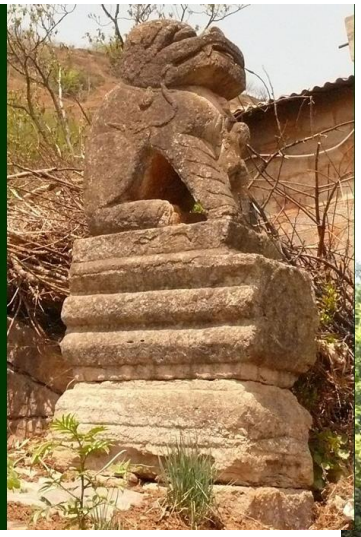
The Lema Mines in Ludian District
The larger river in the bottom corner is the Niulanjiang.

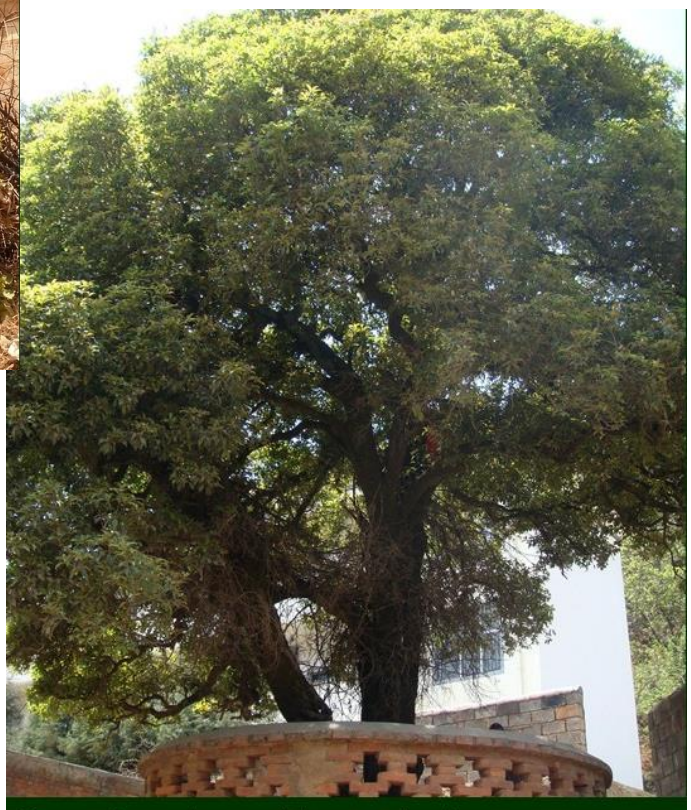


More remains outside the school. The part of a stele that Mr. Yu is washing could be deciphered as QL 52 (1787)

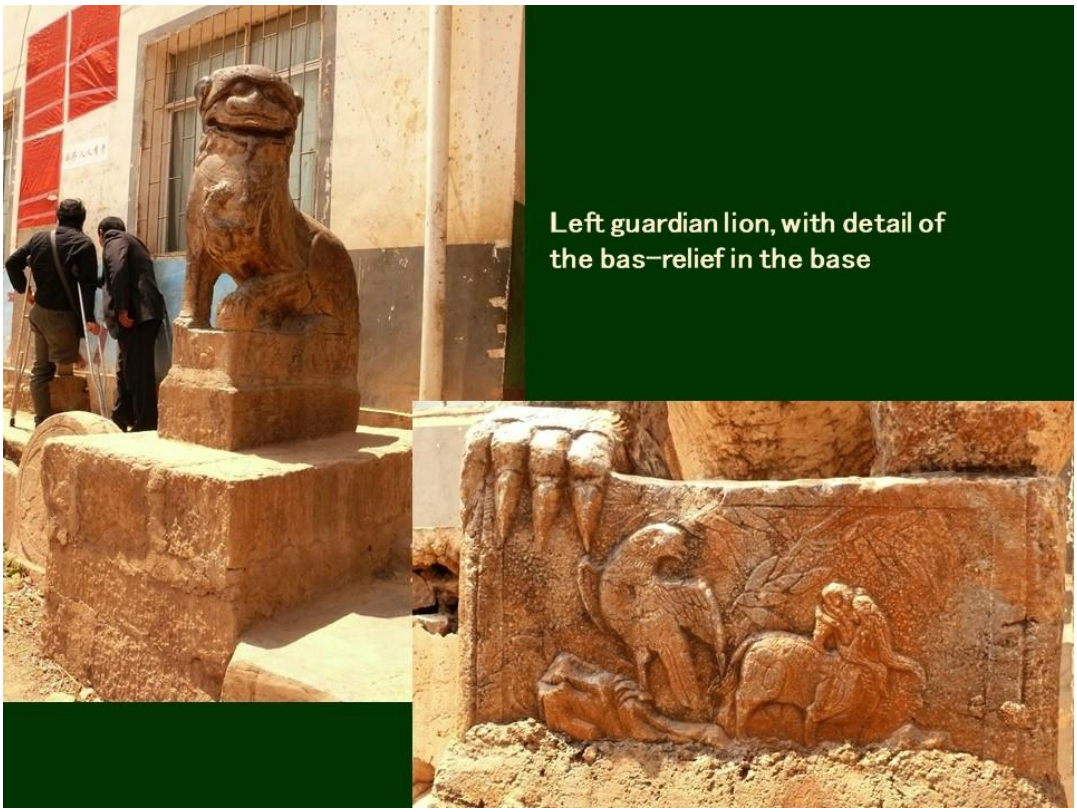
Two guardian figures next to the stairs



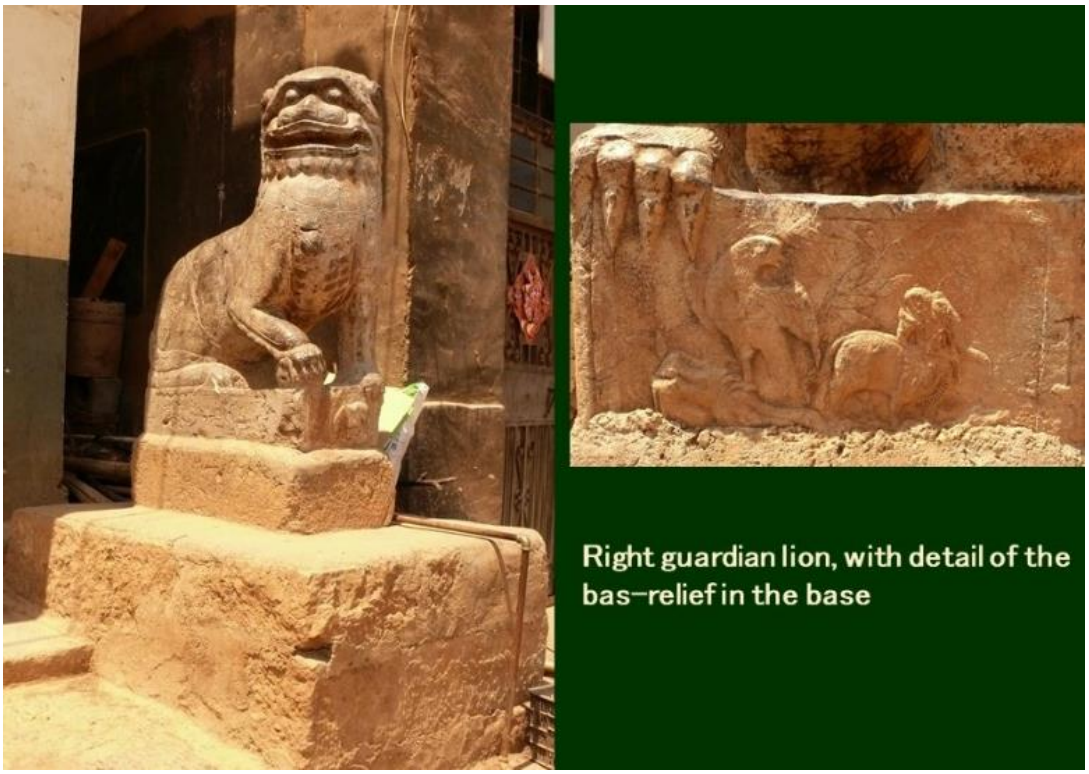




One of two large old trees in the schoolground

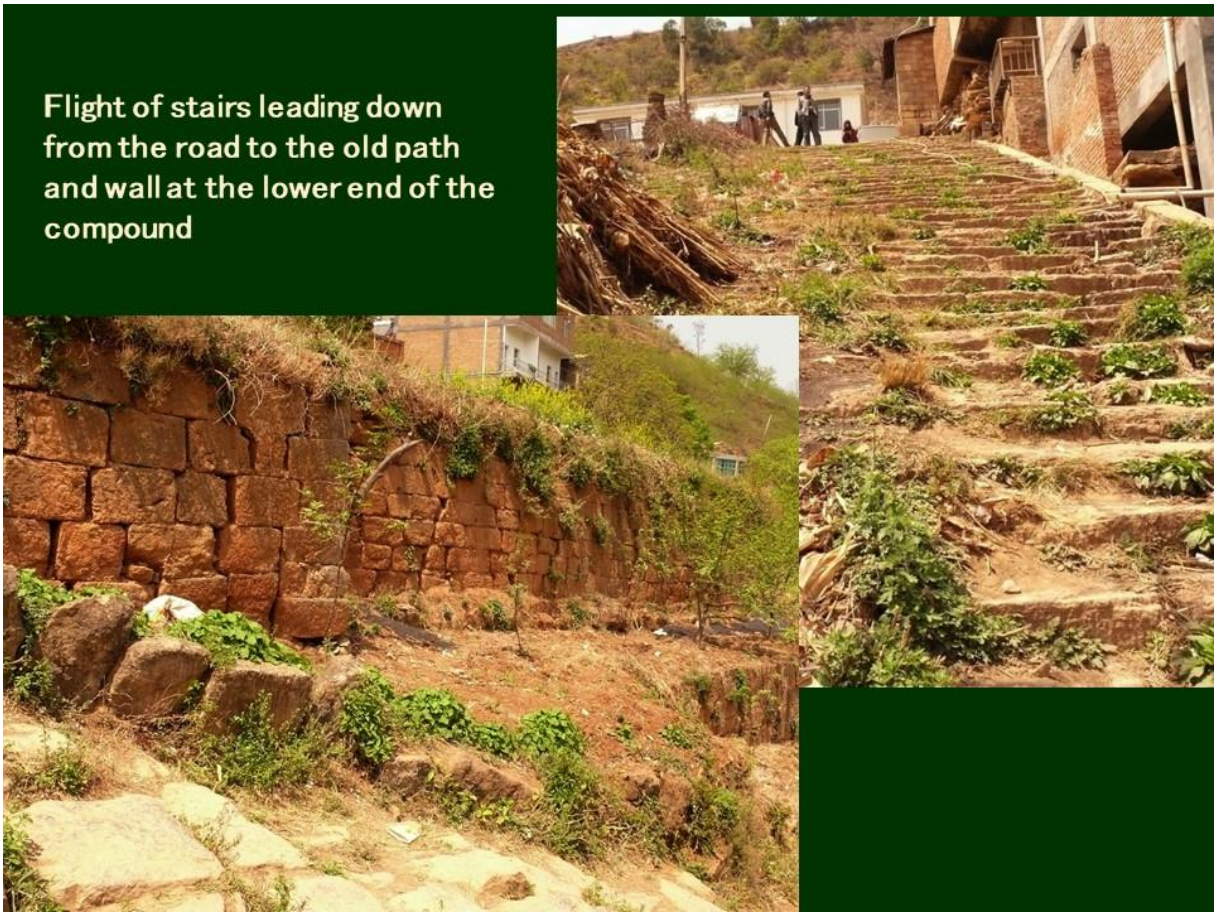


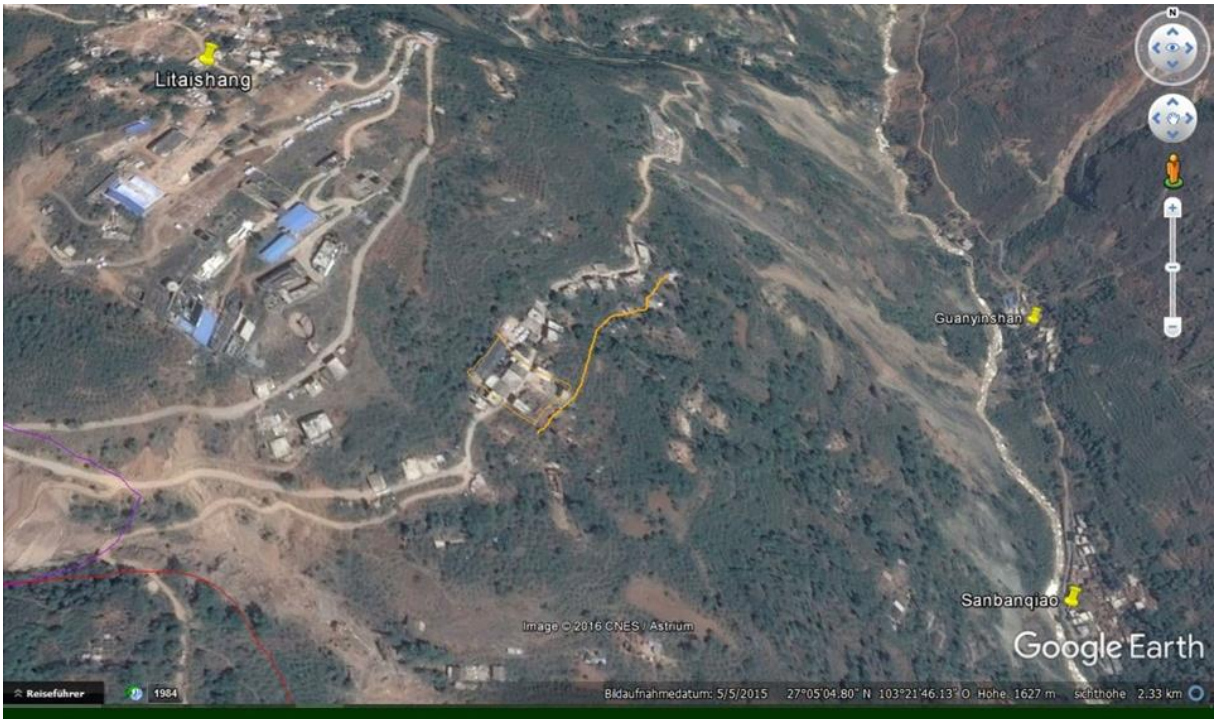
Left guardian lion, with detail of the bas–relief in the base



Right guardian lion, with detail of the bas–relief in the base

Flight of stairs leading down from the road to the old path and wall at the lower end of the compound



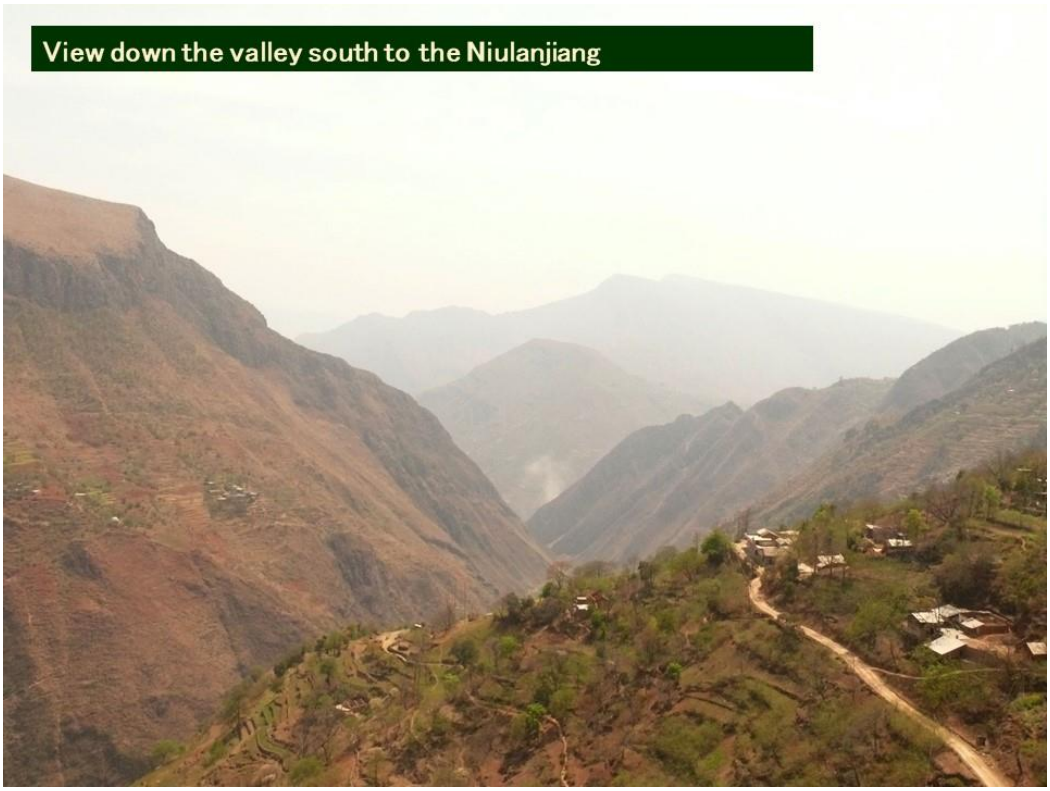


The site of the mine yamen in the village of Litaishang
Orange area: probable yamen site
Orange line: visible section of the old road

The mining area begins 3-5 km further down the valley. The ridge here dips for an opening of a side valley, before the mine mountain forms the final ridge that descends to the Niulanjiang over about 10 km. The bottom the dip has been excavated by industrial means, possibly because the main slag dumps used to be here. It is now an artificial pond that catches mud from ore washing. Several small companies are still working a few mines, while the corporation in no longer involved.

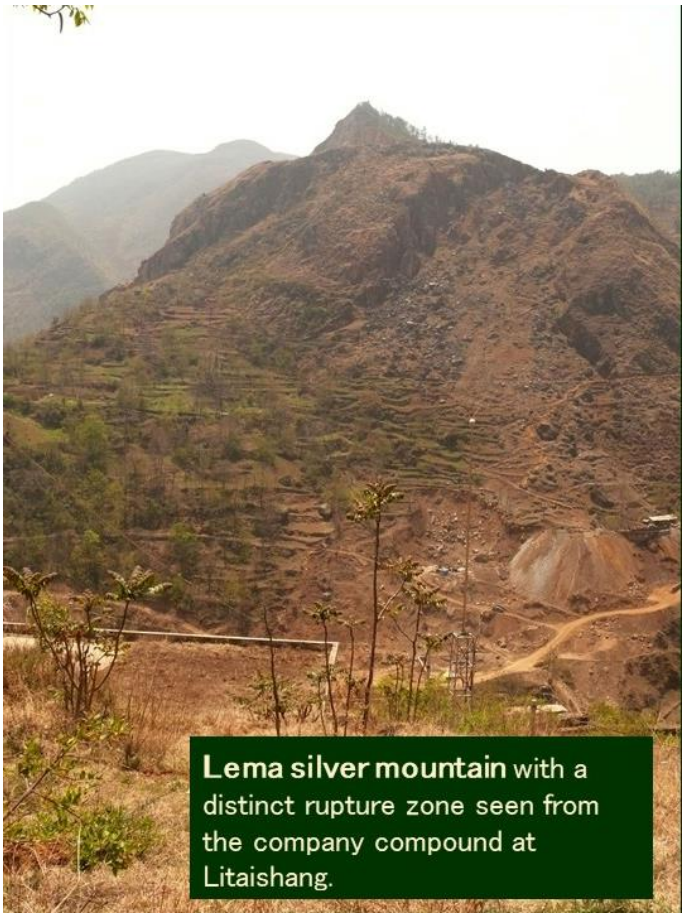


Path (old main road) leading northwards from the bottom of the stairs



View down the valley south to the Niulanjiang

The mine mountain looks unusual. The roughly triangular shape displays a wide ditch that runs up the northern mountain side over a height difference of over 300 m from a dip in the mountain chain to the peak. The ditch is flanked by walls that are reddish and appear like a soft conglomerate in the lower parts to change to limestone in the upper third, while the ditch appears to be superficially filled with debris.

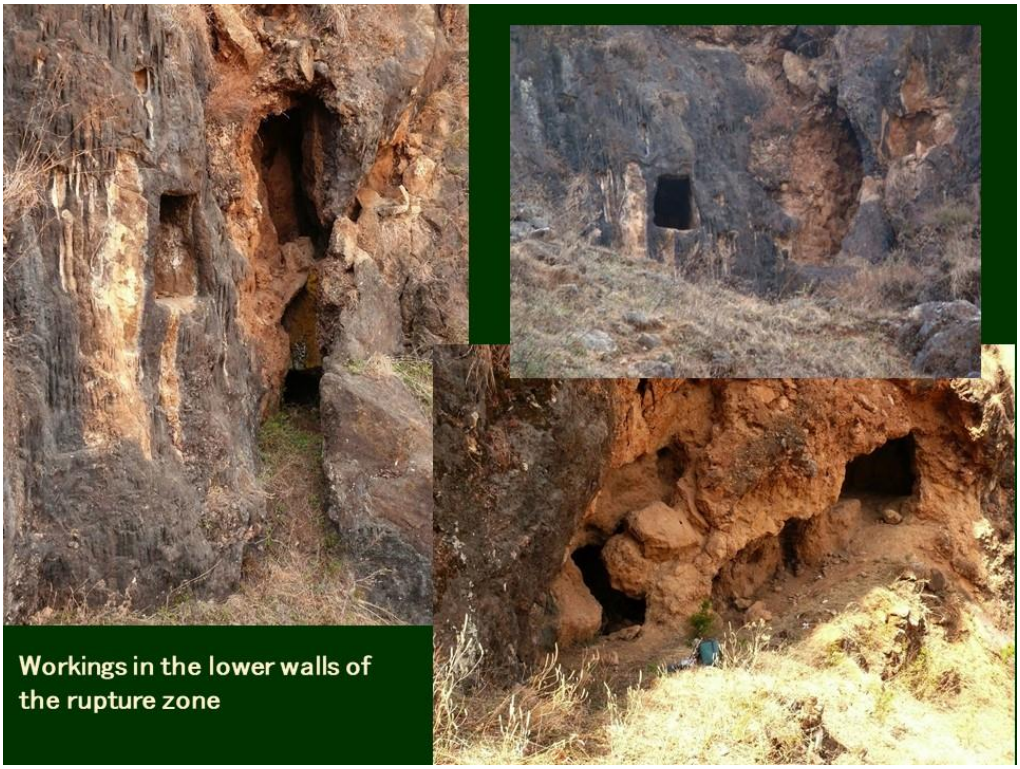


Lema silver mountain with a distinct rupture zone seen from the company compound at Litaishang.

Several small mines are still being worked near the bottom of slope. We met Mr. Wan Xingkui 万兴奎 (aged 73). His family came to the area 11 or 12 generations ago from Nanchang in Jiangxi. He was knowledgeable about the mines and quite agile. While I went to explore the slope, Yuda inteveiwed Mr. Wan, who subsequently took us to the only surviving temple and an old mining gallery.

A hasty exploration of the fault zone showed this ditch to start off about 100 m wide at the bottom and lined by walls to the top of the ridge. There were some mining galleries in the lower parts of the wall, which mostly appeared to be shallow.

At the height of the ridge, the fault ditch narrows and is filled with potato fields, still running between limestone. The triangular top of the mountain has a rocky face to the north, possibly is also appears shaped by the fault.



Workings in the lower walls of the rupture zone



Eastern walls of the rupture zone



Upper part of the rupture zone



Narrowing rupture zone near the top



Half broken off limestone top



Rock with crystallized quartz in the rupture zone

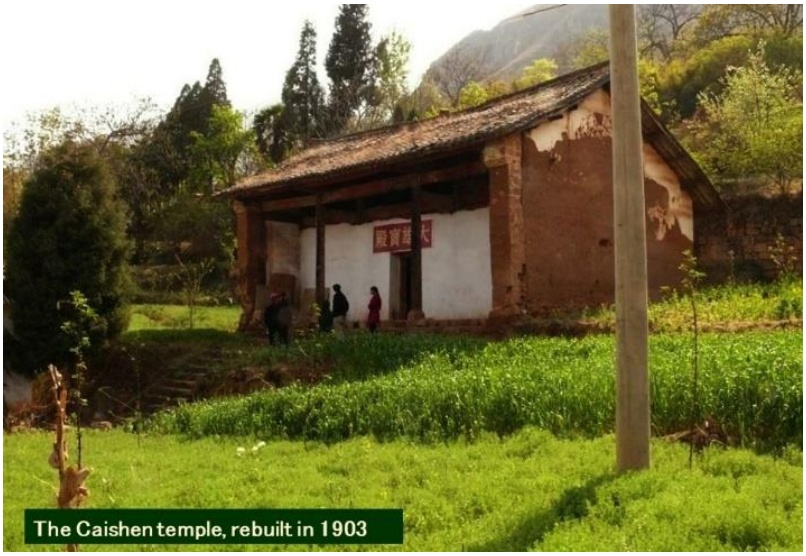


View down the ruptured slope and onto Litaishang

Mr. Wan took us to the temple that is located above a small village on the eastern mountain flank a short way down the valley below the dip. The temple was rebuilt in the GX period after all eight guild temples had been destroyed during the civil wars. Two stele in the temple dated to 1810 and 2001. According to the inscription, the first temple was erected in the Jiajing period of the Ming dynasty (1507-1567).

The mine was near the northern end of the eastern slope and close to the main path, yet would have been hard to find without a guide. According to Mr. Wan, it is several hundreds metres deep, hitting the ore seam 300 m into the mountain. The gallery is 1.7 m high and at least 1.5 m wide.

Layers of gangue and slags were clearly visible in the fields of the village and in cuts, but the layers did not appear thick. Overall amounts appear small. Due to the steep terrain, much debris may have been washed down the valley. Another possibility is that the main processing sites used to be in the side valley that has been changed by industrial exploitation. Due to time constraints, we were unable to descend further along the valley to survey other remains.



The Caishen temple, rebuilt in 1903

Summary of the interview with Mr. Wan Xingkui:

My ancestors came here to work in the mines, in the Qianlong period, 11 or 12 generations ago. They came from Nanchang in Jiangxi. I heard from my grandfather that the mines were worked on a great scale in the Qing, the Lion and Lotus Mines were the richest, even the dust that the miners brought out in their straw sandals was worth money. My grandmother used to wash straw sandals in the entrance of the mine. She sold the ore that she washed out and that was her living.

There is a story that one year on the 7th day of the 10th month there was a great flood, and the the Lion and Lotus Mines were washed down. The market at Chaishiba was also destroyed. The grave on the company basketball ground belongs to the Fan 范 family, they were very mighty, but got sashed down in this flood as well.

There were what they called the eight great temples, by the people who came from the eight provinces to work in the mines. I heard that the mines were originally run by Yizu people, later the Hui and Han fought the Yi, and the Yi were driven out.

I live in a place called Manyingshang 蛮营上, where there are some pottery sherds that are quite fine, left by the Yi.

The graves at Dafenwan 大坟湾 are Yi graves, they burnt their dead and buried them in urns. I found a jade pipe mouthpiece there.

There was the Caishenmiao of Yunnan, the Heishenmiao of Guizhou, the Chuanzhumiao of Sichuan, the Chushenmiao of Hunan, the Wanshougong of Jiangxi, and also temples of Anhui and others.

Hui and Han fought each other, and burnt the eight great temples. In the end the Han fought back and defeated the Hui.

The Hui graves are at Xinfenshan 新坟山, an area of over 20 Mu, the graves were dug up in the 1960s but this was reversed in the 1970s and a stele erected.

The old Hui graves are below the Caishen temple at Laofenshan 老坟山.

I heard that there used to be two market streets inside the mines. There are two mass graves, where peoples without money were buried. Only those with some money could afford graves.

I worked with the geology team for 4 years. After graduating from primary school I started work in 1955. I have been inside many old workings; the Dayou Mine 大有洞, the Caigou Mine 才狗洞, The Tiancheng Mine 天成洞, the Leishen Mine 雷神洞, the Yuanbao Mine 元宝洞 – that was a very large one, the gallery 2 m wide and 2 m high, very straight, the Dayou Mine was also this large – The Dayou Mine descended into the mountain, there was a very steep section where there were holes, over 30, for wooden beams to hold on. I have also been into the Qinjia Mines 秦家洞 and the Drainage gallery 水泄洞.

The deep mines that I have been to were 300 to 400 m, with innumerable workings to both sides. There was an opera stage inside, with room for some 300 seated spectators.

They used chisels (qianzi 钎子) that were some 30 to 40 cm long. I have seen one, and on that I picked up was some 12 to 13 cm long (see photograph).

The geology estimated the amount of extracted ore at 3 million tons. Ore with a silver content of 100 g/t was not worked in the old mining area, but left behind.

The smelting was as the Yuanbao Mine 元宝洞, the Guanyin Mine 观音洞, at Yanzifang 烟子房 and other places. They used large bellows made from camphor trees. There used to be a primary school in the Caishen Temple, and there still used to be a bellow, the children used to play hide and seek in it.

Before and after liberation there still was some smelting. It was called maize-flower silver 包谷花银子.

The slopes and fields on Laojunshan are all covered in gangue and slags.

In the Republican Period, a dam was built on the slope to wash down historic gangue that was then washed for ore.

The ore from the top of Laojushan used to have a content of 5000-6000 g/t, up to 7000 g/t. It was a greenish sand, very flaky, it could be chiselled off easily.

There is a wall of ore in a currently worked mine, some 300 tons, with a content of 400 to 400 g/t.

In the old mines, the workings were only about 1 m high, the men had to work lying down, and the ore was carried out in small baskets that were dragged along. In the generations above mine, miners discarded ore below 400 g/t, if possible underground, if not at the mine mouth.

I have not myself seen old furnaces, there was only a wall left of furnaces of the Republican period, with a bellow that used to be worked by 6 men. The furnace in front of the wall looked like a stove.

In 1952 there was only Old Lei 雷 who still knew how to smelt. After his there was nobody left who knew the technology. They did not know what to use as fluxes.

In the smelting that I saw in 1952 there was a wall, about 40 cm thick, and the bellows were worked behind the wall, by six men. The furnace that looked like a stove was made from refractory bricks, roughly square and 2 chi across, with a chamber that was open, about 2 chi deep and a bit over 1 chi wide. It was loaded with ore and fuel, charcoal at the time.

There was a pond outside the furnace, built from refractory brick, about 1 chi across and bowl-shaped, for the molten lead. The slags were raked off the surface. There was a little channel from this pond, called the silver ditch, that led to several little sand moulds about the size of bricks, to collect rich lead. There were wooden boards clad in iron sheet to close the moulds when full.

Five to six men loaded the furnace, not continuously but intermittingly, using flat baskets to load charcoal and ore, always first a charge of charcoal, then a charge of ore.

The ore was broken up to get rid of rock, to about the size of walnuts. It was sorted at the mine mouth, with piles for contents of 700-800 g/t and over 1000 g/t. In 1952 they used this sorted ore, with no further dressing.

I believe that the amount of gangue and slags is over 800,000 t.

Mr. Peng Tao added some information:

The ore exploited recently had a silver content of only 100 g/t. Gangue and slags count as “surface ore” and are estimated at 800,000 tons, with a total metal content of 120 tons. This resource is under exploitation at present.



Worn down chisel found by Mr. Wan Xingkui 万兴奎

Additional information

Fieldwork at Xiaozhai 小寨 in Ludian by Nanny Kim, Hans-Joachim Rosner, Rüdiger Specht and Stefan Dieball, 22 March 2007

Upon the suggestion of an informant at Zhaotong, we visited a village by the name to Tongchang (copper mine) in a valley about 5 km NNW of Xiaozhai, about 15 km SW of Ludian and the administrative village on the route to Lema. We reached two tiny villages named Xia tongchang 下铜厂('Lower copper mine') and Shang tongchang 上铜厂('Upper copper mine'), but could not find out anything about historic exploitation.

A Xiaozhai we were told of a smelting site, with slags, a wall and some graves still on site. An informant added that the fields south of the still visible site used to be largely covered in slags, but that these had been removed in the 1970s.

Fieldwork at Baogunao 包谷垴 and Tuanlinbao 团林堡I n Qiaojia 巧家县 by Nanny Kim and Liu Peifeng, 12-13 October 2017

Several place names and sites of copper mining known to the Cultural Relics Office at Qiaojia are located relatively closely to the Lema Mines, on the slopes to the south of the Niulanjiang.

Our driver to Bagunao happened to be from Babaocun 八宝村. She told of a relative who found a stone statue in an old mining gallery that was so large that he could not move it. He would have photographs.

We visited Tongchanggou 铜厂沟, 3 to 4 km SE of Baogunao by walking path. The smelting site had been

identified by the Qiaojia Cultural Relics Office. Two informants of Tongchanggou village, Zhu Zhongyun 朱忠运 (aged 64) and Lü Guangfu 吕光甫 (aged 42), stated that their ancestors had arrived sven and six generations ago, when the mines were no longer worked. The slags extended for about 0.5 km along the stream and were packed in thicker layes in the side-valley, partly covered by recently built houses. Workings were visible in the steep slope above, with their number uncertain, as some of the slope is wooded. Local oral tradition records 48 mine mouths, the standard number that expresses a considerable multitude. Mr Lü knew of exploitation in 1958. Recent attempts were not successful.

The visit to Tuanlinbao, probably the site of the former Qilichang 七里厂, was hampered by mist. With the support of the local government of Laodian 老店镇, we visited a small smelting site, probably of copper, and collected some information on the historic mines.

Wang Dachao 王大朝 (aged 63), the owner of a drugstore in Tuanlinbao related that his family came from Ji’an 吉安 in Jiangxi 6 or 7 generations ago, that that Tuanlinbao consists of 23 villages with a population of over 3000, mostly Han Chinese.

Informant confirmed that old workings existed, but were not keen to take us there. Exploitation reportedly was for zinc and lead, with one informant stating that it would have been for silver in the old times. Oral tradition clearly identified as a “branch mine” of the Lema Mines and delivering their output to Lema. Place names that appear to be connected to historic mining, such as Douya ping 豆芽坪, Miaoping 庙坪, Guanfang 官房 and Guolu ping 锅炉坪 (or Gulu ping 古炉坪?).

A site further into the valley is called Niujiaochang, which we could not visit.

Fieldwork on 14 October found two very extensive zinc smelting sites at Qianchang and to the NE of Qianchang. According to local tradition, the ore smelted here came from Sanhe.



The sites in Qiaojia south of Lema visited in 2017



View from the ascent south of the Niulanjiang to the Lema ridge



Liu Peifeng and informants at the stream above Tongchanggou





Results

The local tradition recorded in the recent temple stele and in Mr. Wan's oral history that attributes the beginnings of the mines as "run by the Yi" date the beginnings of the mine before 1726, and specifically to the early to mid-16th century.

The large mines known by name and consisting of main galleries with many workings reflect a high degree of organization and suggest that the period of intensive exploitation was relatively recent. We never heard of underground halls and chambers for official, ritual and supply purposes at other mining sites.

The high estimate of 3 million tons of extracted ore would require a large amount of gangue and slags that the 800,000 tons still estimated on site. The high gradients are an obvious explanation for the loss of loose material. The estimate of extracted ore nevertheless might be high.

None of the informants mentioned copper ores or slags. It appears possible that the extraction of copper from litharge cakes that is mentioned in the records and that led to the classification as a copper mine was performed at another site, or that it was relatively unimportant.

The sites in the vicinity of Lema at Xiaozhai, Baogunao and Tuanlinbao, as well as the zinc smelting sites at Qianchang document the development of further mines from the mining center at Lema. Copper may have been worked in other locations, at least partly, with Lema functioning as the administrative unit.



The mines in Gengma District 耿马县: Laochang 老厂 (historical Shiniuchang 石牛厂?) and Manpingzhang 蛮平掌/Mangpianchang 芒片厂 (historical Xiyichang 悉宜厂?)

Shiniu Mines with a militia of several thousand men is recorded in the context of the Qing-Burmese border wars of 1767-1769. The Xiyi Mines appears in the tax records of 1829. Indirect records suggest a considerable importance of the Xiyi Mines in the early 19th century.

2011.4.15. and 16. Fieldwork by Yang Yuda and Nanny Kim, supported by Xiong Dao 熊道 of the Gengma Tourist Office, Duan Degen 段德根 of Laochang, and Mr. Kong 孔 from Mengsa

2011.4.15. Lincang 临沧 to Gengma 耿马, fieldwork at Laochang 老厂

We only realized that it was Poshuijie 泼水节, the water-sprinkling festival, on the 16th, after reaching Lincang, when it was too late for rescheduling. Reached Gengma in the late morning, with water sprinkling going on along the road and preparations in the town in full swing. Much appreciated that Xiong Dao 熊道 (born 1981) of the local government and from Daxinzhai 大新寨 was game to take us on for two days all the same.

This is a country of sugar cane, planted to well above 1000 m. We crossed several ridges of ca. 1500 m, much land appears to have been opened for cultivation quite recently, and the main crops are maize and sugar cane. It was a hazy because of the burning off of sugar cane stalks. Forest recovery appears fairly quick in these parts, with much evergreen broadleaves, mixed with pines and some tropical firs on the higher ranges. The Mengsa plateau to the east of Gengma is as about 1300 m; the Gengma plateaus at 1100 m. Both are hilly, crossed by many small streams flowing mainly southwards. Gengma has been completely rebuilt after a major earthquake in 1988.

Gengma used to be the seat of a local Shawba or Shan lord. Two mines are recorded under the names of Shiniu 石牛 and Xiyi 悉宜. Out indication for looking for these sites were two streams named Laochanghe 老厂河 and Xinchanghe 新厂河. These are small tributaries of the Nandinghe 南定河 that descend from the ridge that borders the Gengma plateau to the north. The Nandinghe runs at about 600 m at Mengjian 猛简, the ridge reaches over 2000 m. A village called Laochang (Old Mine) is located on the upper reaches of the Laochanghe, while Manpingchang 蛮平掌 village had been identified as the Xiyi Mines on account of information that these were at the Daheishan, which is a peak near this village. The location of the Shiniu mines is not clear, but Laochang appeared a possibility.

That afternoon, we headed for Laochang (“Old Mine”). Leaving Gengma, we took the motor road towards Mengding, which begins ascending ridge almost immediately. It first passes through tea gardens, then mostly cultivated slopes (mainly sugar cane and maize). Quite high up the mountain it passes by Shihuiyao 石灰窑 (chalk kiln) fairly high up the ridge, a place that might have been

associated to the mines for the production of chalk needed as an agent in smelting. Uncultivated steep ground is covered in relatively young mixed forest, much used and thinned out.

Some 5 km after the pass at 2000 m we left the asphalted road at the turnoff to Mengjian. The administrative Laochang village is far down the range at the lower end of a basin where several streams join and tongues of the two higher side-ridges from approach each other. While waiting for a local official, we had a talk with the old lady living next door. She is 74 years old, tiny and agile. She told us that her nationality is registered as Han, while her relatives in the Dali area are Hui. Her family came over 1 or 2 generations ago, after mining had ceased – as far as I understood. Only a handful of families live in this village, which appears to be a recent, administrative settlement.

Duan Degen 段德根 (49 years old), the village cadre of Laochang, took us to see mines that had been worked on and off since the 1980s, remains of temples, and the old village. We first doubled back and almost climbed back almost to the main road, to turn into a track that had been built for mining. The track serpentines along the slope, in and out of numerous gullies, for perhaps 10 km, leading to the office and dorms of a small mining company that has been working here for 17 years. From here, the road descends towards a stream. There is a mine entrance that is being worked. Around the corner along a small stream are an old mine entrance and a mine that according to Duan and the local mine operator was operated for a short time in the 1980s. The modern workings exploit the same seam as the historic gallery.

Remains, such as gangue and slags are difficult to find in the young but dense forest. The historic mine entrances are thought to be along this slope at between 1400 and 1200 m.



Track through the forest to the mine entrance



Shrine next to the mine in operation



Historic mine entrance



Remains of the mine worked in the 1980s

The next stop was the most important site of Laochang: the remains of the temples. It took a long time to reach by car, even though the distance as the crow flies is at most 3 km from the mine. We climbed back to the northern mountain ridge from which the streams forming the Shuangqiaohe or Laochanghe descend, and turned into a narrow track that descended through the forest. At some spot that looked much like any other Duan stopped and took us into the sparse but brambly forest at ca. 1550 m. It was relatively open because this is a slightly milder section of the ridge and used for graves. Duan pointed out the sites of three temples, the Liusheng miao 六省庙, the Wusheng miao 五省庙 and the Sansheng miao 三省庙 (Temple of the Six, Five and Three provinces). There were old bricks and bits of tiles everywhere, some walls and foundation platforms still clearly visible. The Liusheng miao apparently had occupied at least 3 courtyards on the ridge. The other two temples north of this temple, where the bamboo and the brambles were too thick to penetrate. The lower end of the temple area is the upper end of the old village of Laochang, at about 1500 m.



A corner in the site of the Liushengmiao



Bricks and roof tiles in the site of the Liushengmiao (1)



Bricks and roof tiles in the site of the Liushengmiao (2)



The lower end of the temple area.

Along the track that continues north from the top of the village, slags form scree fields. Slags have been dug up in places, while they are invisible under the undergrowth in others. The extent is impossible to overview. Since it was already dusk, explorations were very limited.

When Duan pointed out remains of smelting furnaces or hearths, we found several sites of wall remains and clay that had been turned red by heat, as well as one almost intact cupellation hearth with a young tree growing in it. The dating of these remains is uncertain.



view of Laochang village eastwards toward the next range with Yaodian and Manpianzhang



Remains of the rear wall of a cupellation hearth and the intact hearth (1)



Remains of the rear wall of a cupellation hearth and the intact hearth (2)



Slag dump at the track just east of the top end of the village, and detail of slags (1)



Slag dump at the track just east of the top end of the village, and detail of slags (2)

To return to Gengma, we drove down a steep track that keeps on the small ridge. Duan pointed out that the area now turned into fields below the village of Laochang is called Tanshi (charcoal market), at about 1450 m.



Fields below Laochang still known as “charcoal market”

2011.4.16. Gengma 耿马 to Manpingzhang 蛮平掌

Set out from Gengma at 9 am. Xiong Dao’s native village Daxinzhai 大新寨 is on the ridge behind the Xinchanghe 新厂河. According to him, it was founded in his grandmother’s generation, probably in the 1950s. Some 15 years ago, it was abolished and mover to Mengsa 猛撒, with only two or three families staying behind at the old site. Xiong had contacted Mr. Kong (about 46 years old) of Mengsa, whom we picked up there. Mr. Kong had used his truck for carrying slags to processing plants for years until a bad accident 11 years ago.

Upon inquiry about Yaodianzi 腰店子 (half-day station) on the ridge at roughly halfway between Laochang and Manpingzhang, Mr. Kong told us that the village was abandoned and would mean a 3 hour walk. He knew about remains of temples. Upon his advice, we headed for Manpingzhang, which is on a driving track.

According to Kong, the amount of slags at Yaodianzi was less than near Manpingzhang, whereas he had not seen enough of Laochang to venture a comparison. He explained that they used to build small dams near the top of the ridge and flush out slags along gullies that formed down the slope. He pointed out a now empty pond with a visible dike wall almost on top of the ridge, and Xiong Dao happily concurred that when he was a boy and used to herd cattle they used to have baths in these ponds. We were not quite sure what to make of this, but on the way back in fact saw several of such flushed out gullies that extended several hundred metres down the mountain flank and could not have been natural.



Site near the top of the main ridge where the track cuts into a gangue heap.



Dell with several old mine mouths, and detail of one of them. Further pits on the top are vertical shafts (we saw one of them). (1)



Dell with several old mine mouths, and detail of one of them. Further pits on the top are vertical shafts (we saw one of them). (2)

On the ridge, the track cuts into a thick layer of mining debris (the visible layer is up to 5 m thick). Mr. Kong knew of some mine entrances nearby in a tiny dell almost at the top of the crest. He explained that the galleries near the bottom sloped down, while those a bit higher up went straight down. The dangerous pits had been blocked up by the cattle-herds. Two entranced were easily visible; Mr. Kong remembered dozens some 10 years earlier. Near this site is another pond with remains of a dam just below the road. The amount of gangue is evidence of mining near the top of the range, a rather unusual location.



View from the track about 100 m below the main ridge to the west. Yaodianzi would be the dip on the ridge to the right of the highest tree.

From the main ridge, we followed a track down a side ridge, with a view on the higher ridge that separates the valleys of the Laochanghe and the Xinchanghe. Manpingzhang still is an inhabited village at approximately the same height as old Laochang (between 1400 and 1500 m). Mr. Kong showed us a site in the village with the remains of two lead smelting furnaces. One was not a heap under grass and bushes, the other still had a height of over 3 m. The dimensions appeared slightly smaller than those of the furnace at the Shiyang Mines, that dates to the Great Leap. Slags are found in sprinkled in the soil down the slope bordering the village. According to Mr. Kong, the majority of old mines were along a side ridge right below the village. The ridge is now mostly wooded, with a rocky, steep curve in the the part of the NW side facing us.



Furnace in Manpingzhang village



View from Manpingzhang village eastwards. The newly opened land on the far mountain slope were all planted in Walnuts. The wooded ridge that descends in the midground below according to Mr. Kong if full of mine entrances.

Kong recalled a temple site at the top end of the village. The Li family lives nearby, and Mr. Li, in his late 30s, was happy to help. He took us to the temple area right behind his house and to a grave in the forest adjacent to it. The temple site was just harvested bean fields, with levelled areas of three courtyards still obvious. Just under the surface were pillar bases (inner diameter ca 30 cm, outer just under 50 cm) and the kerb of what probably used to be the edge of the raised platform of a main building.



Mr. Kong, Mr. Li and Xiong Dao at Mr. Li’s house



The site of the former temple



The line of cornerstones along the terrace, a pillar base, and a vase found in the old temple grounds (1)



The line of cornerstones along the terrace, a pillar base, and a vase found in the old temple grounds (2)



The line of cornerstones along the terrace, a pillar base, and a vase found in the old temple grounds (3)



The line of cornerstones along the terrace, a pillar base, and a vase found in the old temple grounds (4)

The grave of a couple with inscriptions for both deceased appeared unusual and rather interesting. It took a while to clear and copy the text.



The Daoguang period grave near the temple grounds

(For the texts of the inscriptions, see Yang Yuda 杨煜达 and Nanny Kim 金兰中. 2012. “Yunnan Gengma Yixi yinchang xin faxian beiwen ji shiliao” 云南耿马悉宜银厂新发现碑文及史料 (Newly discovered grave inscriptions and materials on the Xiyi Mines in Gengma, Yunnan Province). *Xinan guji yanjiu*, issue 2011: 433-441.)

Mr. Li remembered old graves in a forest to the west of the village, and took us to see these. Several mounds still existed, but we found only two graves with inscription, dating to the Jiaqing and to the early Republican period. The earlier grave had recently been disturbed, a stone knob that used to crown the stele had been moved, and the mound was roughly reclosed. The later grave was small and built from older bricks and bits.

Its occupant had been a minor official dispatched from Zhenkang to supervise the mine. It is evidence that mining lasted into the early 20th century, though on a much reduced scale, with even the official buried with second-hand materials picked from nearby temple ruins.



Forest west of the village with two grave mounds. Near the site of the Jiaqing period grave.



Mr. Kong and Mr. Li investigating the Jiaqing period grave inscription and the knob that used to top the grave (1)



Mr. Kong and Mr. Li investigating the Jiaqing period grave inscription and the knob that used to top the grave (2)



The early 20th century grave.

When heading back to Gengma into the evening, we came by the slope covered in flushed out gullies. These were reminiscient to gullies left by logging, but deeper and less regular. They are locally called xiagangou 狭干沟 (Narrow dry valleys) while Mr. Kong also knew the term mingcao 明槽 (open ditch, a technical term in mining).



Gully in the mountain-side left from flushing down slags.

Results: The old village of Laochang definitely was a historic mining site, but the name of Shiniu was not known locally. The extent of the exploitation remains unclear, but definitely was significant. The site of mines and gangue heaps on the top of the ridge remains mysterious and might continue along the ridge to Yaodianzi. It is above Manpianzhang. On the basis of the temple sites, the grave inscriptions and Mr. Kong's information on mine entrances, this site may have been the largest of the three.

The Maolong mines 茂隆厂 in Cangyuan District 沧源 县 and Burma

The mines appear in the record of the 1750s in the context of diplomatic advances by the Burmese King that were thought to have been machinated by Wu Shangxian, a mining boss of Maolong (See research by Sylvie Pasquet). The mines reportedly were the most productive site in the borderlands, on par with Lema.

Fieldwork by Yang Yuda and Nanny Kim, 2011.4.17.-18., supported by Aixin Xishi of the Cangyuan District Government and by Mr. Tang 唐 of Huguangcun

2011.4.17.-18 Gengma 耿马 to Cangyuan 沧源 to Huguangcun 湖广村 (Maolong mines 茂隆厂), return to Cangyuan

The Cangyuan District government was very supportive and immediately arranged for us to be put up at Huguangcun. Aixin Xishi accompanied us for two days. The drive from Cangyuan to Huguangcun takes 2 hours on a good road. The landscape is formed by small rivers that all seem to run in different directions in valleys under 1000 m between ranges at about 2000 m. From the road, which clings to slopes between 1300 and 1700 m, the valley bottoms were often out of sight. These are the Washan 佤山 ranges, certainly very difficult to access before motor roads and when still covered in great forests.

On the Chinese part of the mountain of the Maolong mines, Jiaoshan 焦山 on a NE ridge and Huguang 湖广 on an eastern ridge are regarded as the main sties of historical mining. A long southern spur with the settlement that is still called Jinping is the main centre on the Burmese side of the border.

We stopped at Huguang village, mainly because it was the first turn-off before Jiaoshan. Five natural villages are subsumed administratively under Huguang, with a population that is 30% Han and 60% Wazu. The actual Huguang village is on the eastern slope of the Huguang dashan range 湖广大山 (to 2300 m), a spur of the main massif.



Huguang village on the eastern slope of the Huguang mountain

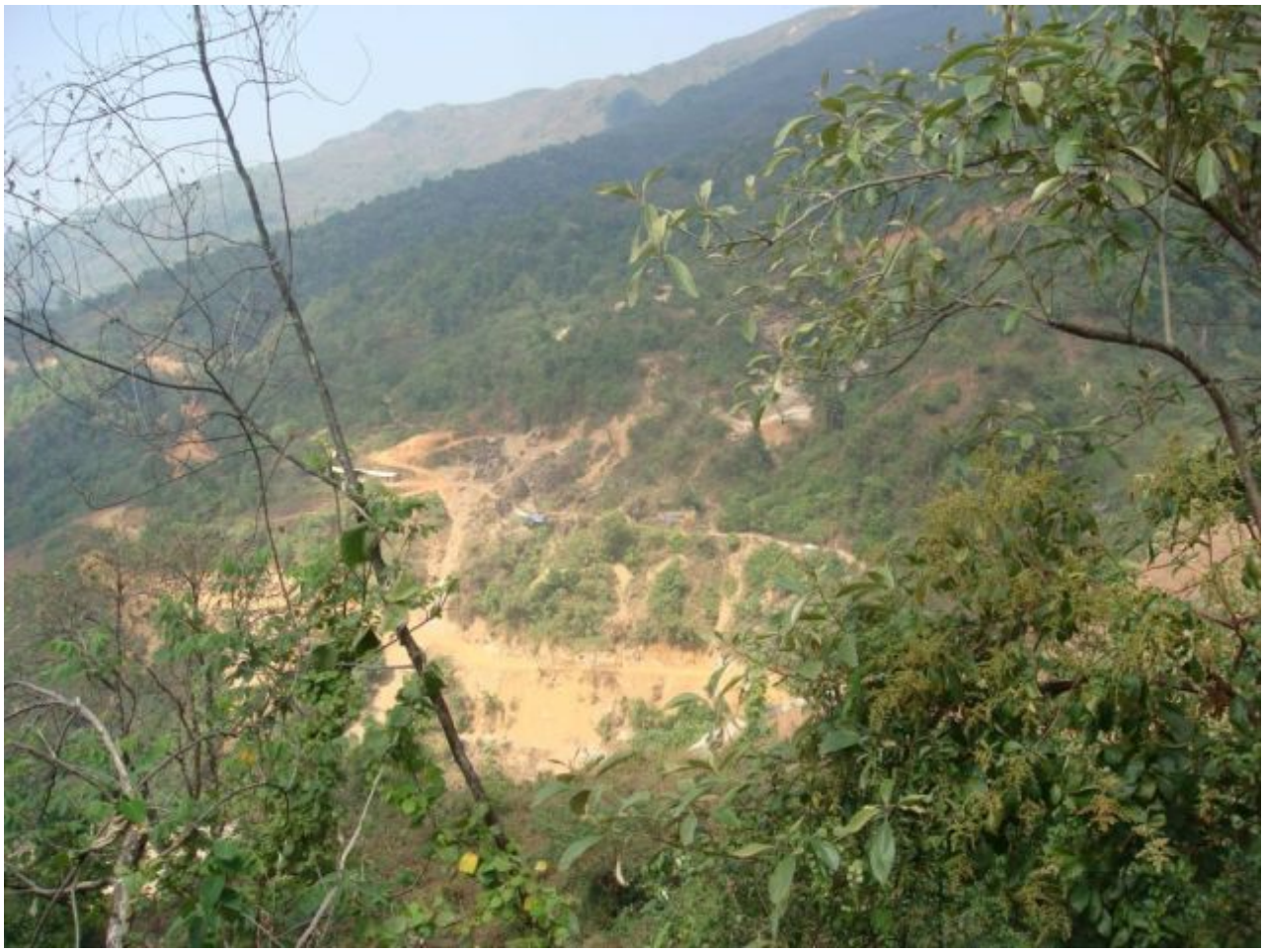
With Poshuijie 泼水节 still going on, all village leaders were at home. Mr. Tang 唐 (born 1968, Han nationality) was the main informant on the area, and Mr. Zi 字 (37 or 39 years old, Han nationality) showed us historic workings nearby. According to the villagers, all families of modern Huguangcun had arrived between 3 and 5 generations ago and had no knowledge of historic mining. Mr Tang and other had however been involved in slag recycling and were quite knowledgeable about slag dumps of the area. They were positive that Jiaoshan was unimportant for slags as well as for mines.

Mr. Tang and Mr. Zi showed us the smelting site of Huguangcun, some 5 km from the present village. The track climbed over the mountain shoulder to a bowl facing mainly south on the mountain spur. The village zone is about two thirds up the mountain, under the steeper ridges covered in young forest and partly exposing limestone cliffs and steep, apparently again predominantly limestone slopes that descend into the deeply cut valleys. The smelting site is approximately in the centre of the semi-circle. There used to be a village nearby, but it had become reduced to two or three households in the 1950s, according to Mr. Zi. The administrative village of Huguangcun is now located on a minor spur about 2 km west of the smelting site. The administrative building, where we were put up, and the primary school are located here, while the number of inhabitants is small.



Mr. Tang and Mr. Zi

According to our informants the historic slags, which had been thoroughly dug up, used to fill two dells, the western quite deep (possibly over 10 m), the eastern wider, the entire area extending over a slope of ca. 40-50 m in height and 150-200 m in width. There were no remains of kilns or furnaces to be seen, but they knew that remains used to be visible at the upper end of the slag dump.



View over the slag dump from the upper end.



The Huguang range seen from the south

Mr. Zi showed me a few mining galleries under a limestone cliff. He used to come here to catch bats. The workings were very irregular, a maze of mostly narrow adits winding down. There was at least one chimney, which would not have been passable for a person my size, probably for ventilation, and two larger adits leading almost straight down to an unseen deeper level. These obviously were not manageable without ladders. Some way on, the tunnel actually opened to several wider chambers. Some adits were so low we had to crawl, probably half filled with debris washed down, most were high enough to walk bent double, and the chambers were 3-3 m high. Side adits opened every few metres, with the longest sections of a straight tunnel under 10 m.



An old mining gallery



Bats hanging on the ceiling of old workings



Limestone cliff in the forest at the bottom of which mine entrances reportedly exist.

When we reached the village again in the evening, the festival was in full swing.



Poshuijie in Huanguang village

We collected some more information on the Huaguagncu area and on Jinchangba.

Another dell some 3 km east of the first dell that used to be the slag dump looked like a possible site for a temple, but no remains could be found.

Jinchangba 金厂坝 was the main mining site. Since the 1980s, but especially over the last decades, Chinese have been shipping slags and discarded ores from this site to smelting plants in China. Transportation is on muleback to Banlao, where the motor road begins, and continues by truck.



View along the Huguang dashan range. The shoulder that leads to the present Huguang village is at the lower end of the range in the right of the photo.



View SW to the last range in Chinese territory and the ranges in Burma beyond. The bluish range to the left of the range with the last Chinese village is Jinchangba

The Munai Mines 慕乃厂 in Lancang District 澜沧县

The first borderland mine that appeared in the Qing tax registers. The local lord reportedly offered a small tribute tax, half of which was accepted by the Yongzheng emperor. Lead recycling from slags became a local industry with outputs of several hundred to several thousand tons from the late 19th century to the 1940s.

Fieldwork by Yang Yuda and Nanny Kim, 2011.4.20., supported by the Cangyuan Lead Mining Company

2011.4.19. Cangyuan 沧源 to Lancang 澜沧

Lancang is a small town, similar in size to Cangyuan on a small plateau, about 30,000 to 40,000 inhabitants. The Cangyuan Lead Mining Company is located outside the town. The deputy director, Mr. Lin Zeyin 林泽银 received us and organized the visit at the mines.

2011.4.20. Lancang 澜沧, Laochang 老厂 near Zhutang 竹塘 (Munai Mines 慕乃厂)

Director Lin had contacted Mr. Luo Huizeng 罗辉增 (78 years old), a retired engineer who had worked at the mines for many decades. Engineer Luo was most pleased to talk about the past. He first came to the area in late 1954, shortly after devastating epidemics. They walked in from Pu'er. During his time at Munai, he had been in a great many old galleries but had not paid much attention to remains of smelters or traditional smelting techniques. He remembered an experiment by a young graduate (?) at smelting lead and silver in a trough-shaped furnace that in fact produced a little lump of silver. The details of this experiment had escaped Luo. He was positive that slags had been recycled for lead well before his time, and that the minor slag heaps near settlements around old mines were results of secondary exploitation, as there were no mines beyond the three central hills. He was also positive that the Munai New Mines were a minor site compared to the Old Mines.

Company engineers took us to the mines. The site is beyond Zhuyuan, at about 1800 m, in between karst cones that stand no higher than 1900 m. The day was foggy with a few showers, so that the group of karst cones was never fully in sight.

According to Mr. Luo, the old mines all between three karst cones called Shizi shan 狮子山 (Lion Mountain), Shuishi shan 睡狮山 (Sleeping Lion Mountain) and Lianhua shan 莲花山 (Lotus Mountain). The entire area and its surroundings have been dug up repeatedly, especially the area around the feet of the hills and between, but also extending into the surroundings and with even the cones partly altered in shape. The state company had given leases to various private company that exploit remaining slags and discarded ores. The underground mines now exploit a slate layer in the primary zone for lead. The main business activity is the lead smelting facility, while the crushing plants apparently are working at a loss.



The dell between Shizi shan and Shuishi shan, where numerous mine entrances used to be visible.



Shizi Mountain seen from the mine headquarters



Lianghua Mountain

According to engineers at the min, ore recycling had been undertaken in three stages here: First, since the Republican period and partly involving a British company was the resmelting of slags of the major slage heaps, which filled the lower slopes and a dell under the Shizi and Shuishi Mountains. In the second step locals dug up the soil containing slags and washed them out with bamboo sieves. Finally, small bits of slags were again washed out and collected for resmelting.

The far end of the recently worked area from the mine headquarters at Shizi Mountain is a large basin, which used to be filled with waste ores that have now been almost completely removed (in the dell below Lianhua shan: 535-543).



Yang Yuda, Luo Huizen and chief engineer Zhou at the far end of the mining area



The far end of the mining area, where the recent removal of old gangue has left a large basin



View from the basin to Shizi Mountain

Mr. Luo knew of two temple locations, a Dongyue miao 东岳庙 on Shuishi Mountains, and a Xiyumiao 西岳庙 in the dell below. The structures that he had himself seen were small buildings with lead plate roofs. We had passed by the site of the Xiyue miao, where nothing remains between new buildings and dug-up ground below former levels. On the Shuishi Mountain, we found the site of the Dongyue Temple, but only a single wall that might have been part of the building.



Site of the Dongyue temple about 2 thirds up Shuishi Mountain



View from Shuishi Mountain to Liangha Mountain



Layers of historic gangue debris under soil on Shuihu Mountain

Engineer Zhou tried to show still existing mine entrances, but the slope got too steep and unstable. A reachable site at the foot of a small limestone cliff in fact had several mine entrances that looked much like the ones we had seen at Maolong. Two of these entered natural fissures and descended steeply.



Small limestone cliff in the lower part of Shuishi Mountain, with several lesser mine entrances.



A specimen of galena ore and three slag specimens held at the mine headquarters; and quartz crystals on rock that we frequent saw in freshly broken up rock on Shuihsi and Lianhua Mountain.(2)



A specimen of galena ore and three slag specimens held at the mine headquarters; and quartz crystals on rock that we frequent saw in freshly broken up rock on Shuihsi and Lianhua Mountain.(1)



A specimen of galena ore and three slag specimens held at the mine headquarters; and quartz crystals on rock that we frequent saw in freshly broken up rock on Shuihsi and Lianhua Mountain.(3)

Results: As the Lema Mines, the Munai Mines were highly concentrated. In agreement with observations by Searls of 1921, it appears probable that exploitations started with placer deposits that were found a fair way up on the karst cones. This is suggested by the fact that slags and gangue were exploited a considerable way up the hills, especially up Shuishi Mountain. The main mines would have exploited fissures in the cementation zone or zones, at various levels in the lower limestone , probably reaching relatively low levels during the historic mining period.

The Kuangshan Mines 矿山厂 in Huize District 会泽县

The mines appear in Qing records, but appear insignificant. Zinc mines reportedly were close-by or used the same workings. Late Qing attempts at reviving the industry brought the Japanese mining engineer Yamaguchi Yoshikatsu 山口义胜 to the mines, who first documented a considerable historical scale of the exploitations. Recent industrial records reflect a massive scale of historic mining on this site.

Fieldwork by Nanny Kim, Yang Yuda, and Li Xiaocen, 2014.8.22.-23., supported by Mr. Gui Shengfu 桂胜负, a Manager of Yunnan Chihong Zinc and Chromium Corporation 云南驰宏锌铬股份有限公司

We reached Zhehai before noon and met Mr. Gui Shengfu. He offered to put us up at the company guesthouse, so that we could spend the first afternoon at the Kuangshan Mines and go to the Woqian Mines 倭铅厂 the following day. Mr Gui is his late thirties, Muslim Chinese and from Kuangshan town. His family used to be involved in mining and caravan transport, he was quite knowledgeable about Zhehai.

We left Zhehai about 2 pm and first drove up to the main ore dressing plant, at about 2300 m, where we met Mr. Hou 侯, the plant manager. They first took us to the Qilin Mines 麒麟厂, a zinc mine that has been in operation since the 1980s (?). The site is beyond the ridge in the Niulanjiang valley, on a precipitous slope at over 60°. Mr. Gui and Mr. Hou confirmed that they know of no premodern mining traces here. Across the river on the Guizhou side is a site called Yinchang (Silver Mine), located on a ledge above the river, at about 2000 m. No historic exploitation was known to them for that site, either.



The valley of the Niulanjiang

We doubled back to the main plant and some way down and west to two open pits, separated by the embankment of a driving track. Mr. Gui exploined that the original ridge continued in a straight line from the southwestern knob across the present pit to the ridge above.

The area occupied by the pit is some 5000 m^2, and the depth from the top of the ridge about 200 m. The pit was originally exploited by the state company, but work ceased around 1990. Exploitation by locals using traditional mining techniques and low-level mechanization continues. Mr. Gui and Mr. Hou pointed out altogether five layers, that are in part recognizeable in the pit wall. They told us that the topmost layer, and the zone some 40-50 m into the second layer where riddled with old galleries. Timbering was from pine trunks not over 10 cm in diameter. It appeared hardly decayed. Mining adits either descended gradually or formed steps from layer to layer.



The lower pit. The knob above the pit is the former height of the ridge.



View towards the higher ridge across the upper pit, showing some traces of mines, that might be either old or recent illegal exploitations.



View from the pits across to the company buildings. The ridge behind the buildings directly descends to the Niulanjiang.

Mr. Gui pointed out the location of the former Longwang Temple (Dragon King) just to the east of the mining area, now a newly washed out gully next to a still working private zinc smelting plant. He stated that the gully had also been a site of historical mining.



The gully before the remainder of the mountain flank at the pit.



Detail of the eroded rock, showing a band of greenish and darkish crumbly rock between massive reddish layers.

At the next side valley further up the valley is a large burial ground. It is by now mostly destroyed by grave robbers who had been most active in the 1990s. We took a closer look a handful of still intact grave stelea. The oldest stele is the grave of a couple, with the husband's dates QL15/7/9-JQ23/6/12 (1750-1818), and the wife's QL 32/3/26-DG6/3/19 (1767-1826). Most but not all graves are Muslim Chinese.



Scattered remains on the cemetery slope.

Mr. Gui had heard of a Longwang Temple and a mosque in the area, but of no other temples of guild halls. The mosque used to be located on the same slope as the temple, close to the grave area but higher up, probably used to be a small promontory overlooking the side valley. Some 40-60 m of the original surface have been removed in connection with the open pit mining, therefore hard to tell.



View down the valley from the cemetery slope. The mosque would have been where the new dump is now.

The stream in the Kuangshan valley cuts its bed through compact layers of slags. According to Mr. Gui, the layers that still form the bottom of the stream are the oldest slags. At the point where we got to the stream, four layers were discernible: The top layer is now about 80cm thick, but unevenly washed away, which means that it may have been thicker. The next lower layer is thin, more compounded and made up of slags blacker in colour. The lowest visible layer is a mixture of bricks, slags and other materials. Li Xiaocen took some samples for analysis.



The stream with its eroded bank.



Slag layers exposed by water erosion.

Mr. Gui told us that when he was a child, the stream valley used to be filled completely with slags, almost all the way down to Zhehai town. At Laohuzui 老虎嘴 near the lower end of the valley, three dams were built across the valley in the late 1970s to retain the slags. Locals were permitted to collected slags only below the dams. The slag layers behind the dams used to reach depths of 10 m. Re-exploitation began in the Republican period and lasted to 1994, with the 1970s to 1994 the most intensive phase. Smelting was mainly for lead, secondarily for zinc.

Mr. Gui and Mr. Hou then remembered that about 30 years ago they used to know a relatively large grave behind the small town Kuangshanzhen. We drove down to the nearby town and the explained it would be on the small ridge. According to their memory of what locals had deciphered from the inscription, it the term eunuch 太监 appeared. This would date the grave to the Ming period. It was unfortunately too late in the day to start looking for the site.

2014.8.22.

Woqiancun 倭铅村 is the first village on the road to Daibu, about 18 km from Zhehai and after the first ascent from the plateau. The old road probably differed from the motor road on the ascent, but joined in the approach to the village. A washed out gully opened below the lower end of the village, displaying slag layers at least 7 m thick. According to Mr. Gui, the slag dumps used to fill the valley to a depth of about 10 m. In the 1990s, local re-smelting had been widespread, using the traditional method of clay distillation pipes. Pipes in fact were stacked up as walls in many places. Success

apparently was limited and the industry has since been abandoned. He showed us the upper end of the slag dumps where the hills narrow the valley. The slags extend from the upper end of the present village up both slopes to well below the lower end of the village. The total extension is about 1 km along the valley and up to 0.5 km across at wider upper end. The surrounding red soil is planted with maize, while the more compact slag dumps are barren. According to Mr. Gui the village used to be famous for its carrots, which were planted in the slag soil.



Gully at the lower end of the village where slags have been dug up, also the main site of recent re-smelting.



Detail of slag layer, probably old.



detail of slag layer, probably recent.

Mr. Gui was positive that no mines were known around the site, that the slags were from zinc smelting, and that the ore was from the Kuangshan Mines. He did not know why the smelting of silver-lead ores and of zinc ores used to be performed at different sites, but confirmed that coal was mined at Yulu 雨碌 south some 15 km along the road.

Results: The findings confirm historical records that differentiate between the Zhehai zinc mines and the Kuangshan Mines. Huang Mengju (1849) recorded that the zinc mines where one day stage from Huize and one from the Kuangshan Mines. The information on time requirements for travel and transport is in agreement with the visited sites. We can thus conclude that Woqianchang was a zinc smelting site and that the location was at 1 day stage from the mines so as to reduce the distance of coal transports. (Zinc distillation smelting was the only metallurgical process that by using coal had become independent from charcoal).

The zinc mines of Zhehai are documented with high probability in the 1720s and with certainty by the 1740. Zinc outputs were considerable and supplied the Dongchuan mint, while silver outputs appear negligible in the records. The presence of massive amounts of slags of both lead and zinc smelting is positive evidence of continuous, large-scale exploitation of both silver and zinc, which certainly lasted from the early 18th to the mid-19th century, and possibly began much earlier.

The Gejiu Mines 个旧厂 in Gejiu City 个旧市

The Gejiu Mines are primarily known as tin mines because this metal was exclusively exploited from the early 1900s through much of the 20th century. In a period, when mining across the Southwest of China had dwindled to a local village industry, the Gejiu Mines still employed some 30,000 miners.

The archaeological record documents the exploitation of copper since the Han period. Silver was probably the main objective of mining from the Yuan period, and is attested in the Ming. The scale of the exploitations, and the distributions of mines that worked copper, silver and tin ores is uncertain.

Fieldwork by Yang Yuda and Nanny Kim, with Ma Qi 马骑, Zhang Kefeng 张轲风, Nie Xun 聂迅, Xia Zijin 夏自金, Jiang Jianguo 姜建国, 2015.11.6.-7., supported by the Yunnan Tin Corporation and the Gejiu City government

2015.11.6.

Gejiu: The first day is spent with two museums that are interesting for Han period archaeological finds, and sites of the Republican period. History at Gejiu is mostly considered in terms of tin and the miseries and glory associated with it in the Republican period.



The limestone cliff that deliminates Gejiu city to the South and forms the foot of the mountain of Laochang. Photo by Nie Xun.



View across Gejiu City facing NW. Photo by Nie Xun.

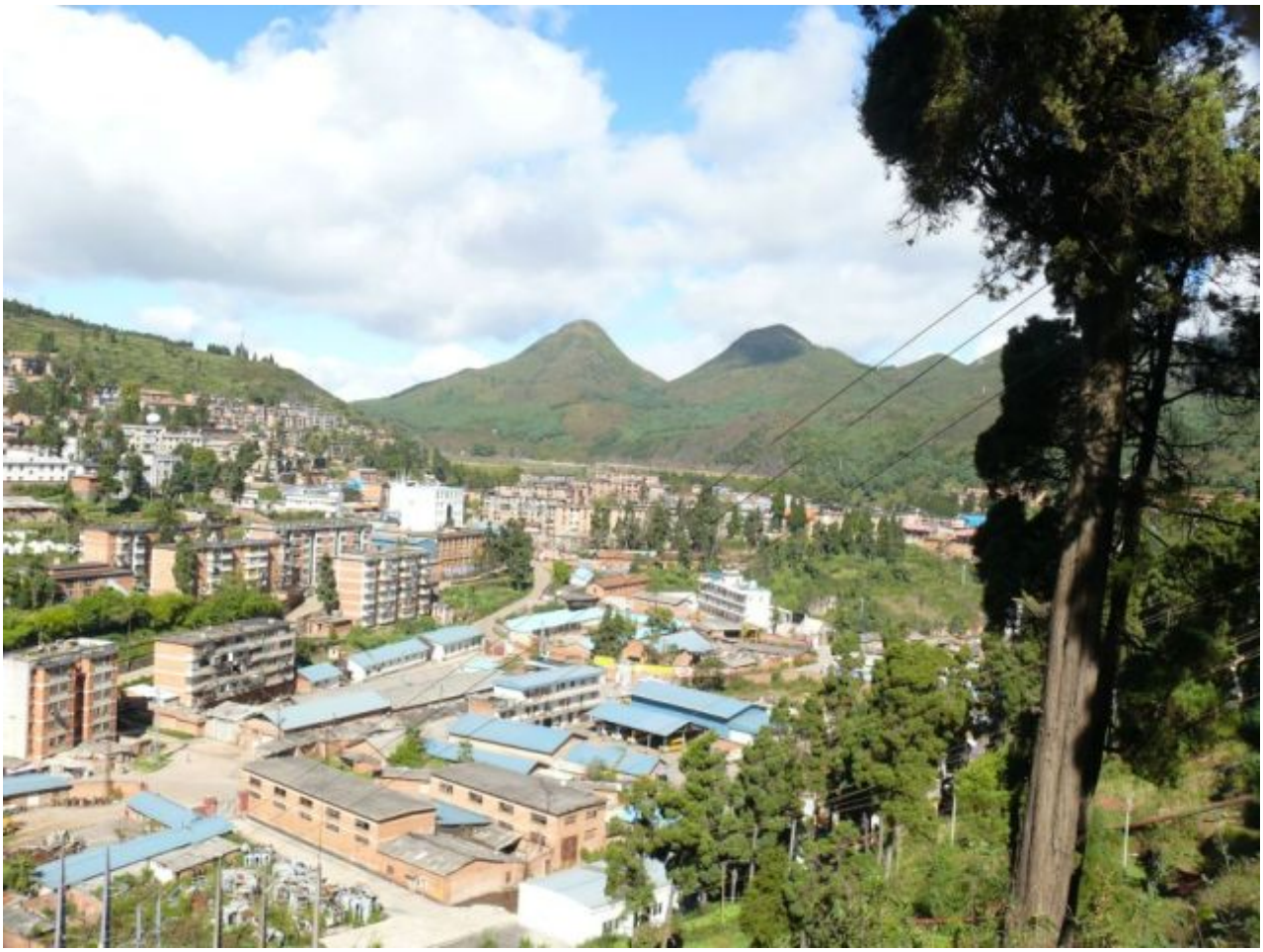


A pavilion at a temple above the old city: The only old structure in that dates to the Qing period. Photo by Nie Xun.

2015.11.7.

Fieldwork at Laochang 老厂 and Kafang 卡房, supported by Mr. Tang 小唐 of the city government and director Liu 刘, an engineer who has been director of the Xinshan Mines at Kafang for 25 years.

First stop at Laochang 老厂 (Old Mine) town, at about 2300 m. The local company director first shows us two mining towers, with cable elevators that descend to a depth of 260 m. They were built in 1939 (?) and used until ca. 1990, now still serving as ventilation shafts. Of historic mining, he knew the Damingcao 大明槽 (Great open ditch) at the southern end of the modern town. This is a trench filled with dolomite spikes that appear to have been eroded underground, about 150 m wide and of unclear length because of ongoing modern open pit mining on the slope to the west, while the lower end is defined by narrow point in the valley. The existing length is between 400 and 500 m, the depth is 30-40 m from the present brink at the town level. The ore mined here was soft or mudlike, presumably washed out oxidized tin ore. The two company managers know about sites of old mines around Laochang, believe nothing is left by now because of extensive open pit mining, and because remaining entrances would were blown up to stop illegal small time mining. The state of the tracks was another concern.



View across Laochang town



The Laomingcao, facing south upon a huge dump from open pit mining



View on the Laomingcao from a hillside above the town

They take us to Langshedong 狼蛇硐 (Wolf and Snake Mine), a site near the main road in a steep crescent slope a little way down descent towards Gejiu. A little way below is the village Mudengdong 木登硐 (Mudeng Mine), a village that has been moved away and whose inhabitants are mostly involved in small-time mining of iron ore. Driving to the site we pass the Haozi Temple 耗子庙, near the top of the main ascent. It used to be a major temple but the present structures are recent.

At Langshedong we park at a small mine. The boss, who is from Mudengdong, happened to be there. He evidently was very knowledgeable. He told us that old mine entrances start from about 20 m above the place where we stand and used to be spread all up the slope, almost to the top. Three of us climb to the top without finding any mines, partly due to thick vegetation, partly to the shortage of time. According to all informants Langshedong has always been a tin mine.



A small, operating iron mine at Langshedong. Photo by Nie Xun.



The forested hillside of Langshedong



View towards Kafang from the hillside at Langshedong



View towards Laochang from the top of the hill of Langshedong



View towards Gejiu (no visible in its deep valley) from the top of the hill of Langshedong.

Director Liu decides to take us to Kafang but not up to the mines because of the road condition. From the company headquarters at Kafang, he points out the old mining areas on the Xinshan (New Mountain), which is separated from the Laochang mountain to the north by a narrow valley, while also distinct from the mountains that descend towards the Yuanjiang (Honghe) and carry little ore. He also tells us that the mountain that now stands about 600 m above Tangfang, with a cone left, used to have another cone that was 100 m higher, but has gone as a result of recent open pit mining. Old mining sites extend from Heimajing 黑马井 to Longshujiao 龙树脚, and include a site known as Jinchaipo 金钗坡 not far from Longshujiao, all more or less on the edge of the relatively flat mountain top. The majority of Han perios graves were found near Heimajing, probably reflecting that copper mining existed here around 2000 years ago. Jinchaipo is the name of a very important copper mine in the 18th to early 19th century. For reasons of time and safety, we could not walk up to look for remains.



The gap that separates the Laochang mountain to the north from the Xinshan to the south, seen from Kafang.



The Xinshan seen from Kafang. The mountain profile consists of a knob at the northern end (left in the photo) with an extensive flattened part following, the cone removed by open pit mining



The Xinshan and its southward extension to Heimajing and Jinchai. Photo by Nie Xun.

Director Liu was definite that Laochang has always been worked primarily for tin, while Xinshan used to be worked worked for copper, silver, and tin. Lead also found in places, but he thinks that lead mining is recent and was never carried on a larger scale. Recycled slags according to him present the same picture, but he is not that precise with this information, presumably because re-smelting was finished before his time.

Results: Due to the intensive industrial exploitation, actual fieldwork findings are extremely limited at Gejiu. The collected information and preliminary impression of the geography however, some aspects of historical mining can be reconstructed. The earliest exploitation clearly was for copper and is safely dated to the Han period. The later exploitation, that began in the Yuan period, was for silver and initially probably in fact started in Gejiu along the limestone walls in this valley. Exploitation gradually expanded to the Laochang and Xinshan areas, focussing on silver to about 1700. The Jinchai copper mine became important in the 18th century, alongside silver mines that might still have centered in the Laoshan area. Exploitation may have followed silver. More probably, it developed with the market demand for tinfoil, in fact at Laomingcao, a site that Leclère still recorded as the main tin mining site in 1901. Underground mining that used former silver mines to access tin ores in deeper layers appear as a phenomenon of the 20th century.

The Bainiu Mines 白牛厂 in Mengzi District 蒙自县

Historic records contain no indication of the existence of these mines. They were identified by Yang Yuda from industrial materials that mentioned the existence of massive slag dumps.

Fieldwork by Yang Yuda and Nanny Kim, with Ma Qi 马骑, Zhang Kefeng 张轲风, Nie Xun 聂迅, Xia Zijin 夏自金, Jiang Jianguo 姜建国, 2015.11.9., supported by the Mengzi District government and the Bainiu Mining Company

The drive from Mengzi to the mines is about 65 km by mountain tar road, arrive towards 11 am. Engineer Luo shows us around.

He points out that massive amounts of slags used to cover the low ridge opposite. The village Bainiu used to be located in the valley that the plant now occupies, about 2 km upstream, and is mostly deserted now. He thinks that old galleries might still exist under a rock near end of the ridge. To get there, we drive to a power plant and then walk down amongst fields and brambles around a small limestone cliff. In the ground along the nose, slags and debris are still scattered around, but most have been taken away. The mine entrance is situated in a small natural cave.

Three of our group take a look at the upper end of the former slag dumps and walk around the karst cone. The ridge is still covered in slags here, and the upper end of the slag dump can be roughly established as the lower end of steeper scree fields that may be natural, as the brittle rock erodes quickly. We cannot establish more by checking the base of the cliff section of the cone. Come out at the reportedly old village of Zhongzhai (Middle Village, corresponding Xiazhai and Shangzhai also still exist), find no slags all around the cone or on the other side of the ridge.



View from the company headquarters across the valley onto the karst cone of Bainiu and ridge that used to be covered in slags. Photo by Nie Xun.



The slag dump extended from the foot of the karst cone to the end of the ridge that in the photo appears covered in small, regular houses (an abandoned dorm settlement). The ridge continues a little further, turning into the larger valley. Photo by Nie Xun.



Mine entrance in a small karst cave. The cliff is at the low end of the ridge, facing away from the photo above.

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04.jpg: Remains of a furnace recognizable from the red colour of the clay. Photo by Nie Xun.??



The upper end of the slag dump. Photo by Nie Xun.

The Dulong Mines 都竜厂 in Maguan District 马关县

The existence of the mines is known from Qing and Annamese records. Qing government reports of the 1740s reflect the presence of several ten-thousand men in the mines.

The mines were within the territory of Annam and known to exploit copper and silver. They are thought to have been a mains source of copper for the Annamese copper currency. The distribution of sites where copper and silver, and lead ores were exploited is uncertain.

Fieldwork by Yang Yuda and Nanny Kim, with Ma Qi 马骑, Zhang Kefeng 张轲风, Nie Xun 聂迅, Xia Zijin 夏自金, Jiang Jianguo 姜建国, 2015.11.11., supported by the Dulong Tin and Indium Mining Company

2015.11.10.

Reach Maguan 马关 after dusk.

2015.11.11.

Maguan-Dulong. The day started with unseasonal rain, and stayed overcast with some rain. Laojunshan 老君山, the mountain towering over the area to the east, never revealed its peak. We were all put up at the guesthouse of the Dulong Tin and Indium Mining Company and thus able to spend two days in Dulong. Mr. Hu 胡, the technical director, provided guidance.

In Dulong, all historic mining is attributed to “the French.” This attribution is even extended to other historic remains, such as a fortification tower on a hill overlooking the road from Maguan to Dulong, which almost certainly is a Qing border fortification built when Dulong was considered part of Annam.

Mr. Hu took us to the place that according to all informants involved in mining considered the main site of historical smelting and mining, named Tongjie 铜街 (copper market). The road leaving Dulong town to the south leads up a spur of the Laojunshan. The first side valley is Shuidongchang 水洞厂 (Water Cave Mine). According to Mr. Hu, the slope facing SW used to be covered in slags, much of which were dug up and sold by local entrepreneurs since the 1990s. From specimens found along the road and in the fields, these appear to be slags from copper smelting. There is a possibility that these were left by relatively early re-smelting.



The Shuidongchang valley



Nie Xun in the fields covered in slags in the Shuidongchang valley.



A large specimen. Photo by Nie Xun.

Not far further up and on the other side of the ridge is Tongjie. A village of this name used to exist on what is now the western end of a huge open pit mine. Mr. Hu took us to a point where could overlook the extensive slope and the mine below. According to his memory, the point where we were standing was near the upper end of the historic slags, which extended down the slope over about 300 m (in height) and along a width of 2 km or more. Most of the slope had been dug up and changed, with a small stand of fir trees according to Mr. Hu the only undisturbed strip. An old smelting site according to his knowledge was still visible a long way down and around the bend near the lower end of the southern spur of the mountain.



The open pit mine.



Mr Hu pointing out sites of old mines and smelters on the slopes across the smaller pit. Photo by Nie Xun.



The site Mr. Hu indicated was near the small white building on the slope. Photo by Nie Xun.

Two of us went for a quick exploration heading further up, and heard that old mine entrances were to be found a considerable way up the mountain side in the forest. Among fast-growing trees and tree ferns, we were unable to reliably establish the presence or absence of slags on the forest floor. We picked up some specimens from the upper end of the slag field, walked down about 50 me to gain an impression of further down, and later entered the area from the bottom corner. The slope is quite instable and ends in a pond that catches waste water, with numerous traces of copper mineralization in the lower parts.



Slags thins spread in the ground near the top of the Tongjie slope.



Copper oxide mineralization in the lower end of the slop. Photo by Nie Xun.



Alternating undisturbed layers of gangue and slags near the lower end of the slope.

According to Mr Hu, the metal content in the slags is low, and re-exploitation no longer viable even as a small-scale local occupation. Some activity nontheless is still visible on the slope, even some galleries were driven into the unstable rock.

As it was still early in the afternoon, we went on to Laojie 老街 (old market), which I guessed might have been the old center. It turned out that Laojie actually has been turned into fields when the present town of Dulong took over the market function, while present-day Laojie is a small village below. Coming to this place nevertheless was a stroke of luck, because Mr. Hu called on an acquaintance, doctor Huang, who had been in mining. It turned out that doctor Huang not only was one of the rare persons whose family had been in the area for many generation, but also possessed a genealogy that his wife thankfully found.



Mr. Hu, doctor Huang, Zhang Kefeng and Ma Qi in the house of doctor Huang. Photo by Jiang Jianguo

2015.11.12. Dulong, in the evening to Wenshan

In the morning met a group of four elderly men who knew something about the mines. Like doctor Huang of Laojie, they all referred to historic mines as “French mines,” and had some detailed stories. These confirmed that Tongjie was the main copper mine. They all agreed that the number of old mine entrances was greatest at Tongjie. Most entered the mountain in an inclined angle, and the deepest were some 400 m deep. Silver ore was mined at the Nandang 南当厂 and Wawa Mines 娃娃厂. A story about Nandang involved the find of a huge pillar base that was part of the French storehouse, while the name Wawa was derived from the grave of a French princess found there, which contained a golden statue. They were in agreement that historic mining was for copper and lead, while zinc and tin ores were were discarded. Concerning lead content they though that ores mined at Tongjie would not have contained noticeable amounts of lead, while the lead content may have been higher at Nandang, but relatively low throughout.



Meeting with the four informants at Dulong. Photo by Jiang Jianguo

In the afternoon, we headed out to Nandang, some 15 km SW of Dulong. Took a detour to Lazizhai 辣子寨 to pick up the secretary of the village compound. He was certainly unkeen and in plastic slippers but nice enough to indulge our strange interest. Nandang village is in the process of being moved up to the ridge because a hole opened in the mountainside below that the old village. The story turned out to be true.

There is a small water reservoir that has d up below the ridge. The pillar base was said to be found here. Old Nandang village is about 2 km down on the southern slope of a deep valley. The secretary took us as far as the slag dumps just below the eastern end of the village. The crater below the village was visible in the fields. A quick exploration some way beyond the western end of the village and along the slope covered in trrassed fields below the village established the presence of slags over the entire slope.



View down the valley from the water reservoir. Nandang is in the next valley.



The top houses of the abandoned village.



Fields covered in slags some way below the ruined houses.



The crater below the old village



Soil section exposed by a recent widening of the path showing slags at a depth of about 2 m under the original surface.

The team that had stayed in the village meanwhile sighted old galleries in a cliff, presumably exposed by a rockfall.



Mining galleries in a cliff above the old village. Photo by Nie Xun.

Several sites could not be visited due to time constraints. The Wawa Mines are on the same ridge some way further down and thought to be the lesser of the two sites. Some 30 km further along the ridge is a town called Jinchang 金厂 (Gold or Silver Mine) that we also could not visit this time due to time constraints. Some 10 km south of Maguan is a site known as lead mines.

Results: Tongjie could be established as a very important copper mine. This finding is supported by geological surveys and estimates of the volume of the slags. Nandang could be established as a silver mine of some importance, while many aspects about silver mining in the Dulong area remain open, including the possibility of silver-copper ores at Tongjie, the apparently missing but necessary supply of lead for silver cupellation, and the possibility of further mines at Jinchang.

The Jinniu Mines in Huize 会泽县金牛厂

Records and questions:

The Mines were officially opened in 1798 and appear in the tax records of 1829 and are reported to have been productive in the Jiaqing and Daoguang periods (Daoguang Yunnan tongzhi 1835 and Xinzuan Yunnan tongzi 1940). A tax income of 289.814 liang is recorded for 1829. Huang Mengju's Diannan shishi, however, reflects more detail and a rather different history. Huang, who served as magistrate of Huize from 1843 to 1846, recorded that the mines were productive from 1788 or 1789, reached an output of 1000 liang per day in 1797 or 1798, but encountered serious problems in intruding water from 1799 and barely paid taxes of 7 to 8 liang twenty years before his time of writing. that they were no longer productive during his period in office. With the tax quota of 289 liang still in the books, other mines in the vicinity in fact had to produce the metal. He mentions a site at 开仓箐, at 20 li from Jinniu, where small workings existed in his time.

Jinniu is a site that probably was productive for only a relatively short period and at the same time a rare case of specific records. The goal of the fieldwork was gaining an impression of the scope of workings and to find evidence that would support or contraditct the reliability of Huang Mengju's record.

Fieldwork by Nanny Kim, with Yu Hua 余华, Zhang Yemei 张叶梅 and Zhang Zhicheng 邓智成 of the History Department of Yunnan University, 12 -13 November 2016

Supported by: the Department of History of Yunnan University by providing a car with driver and by the village government of Jinniu

Main informant: Xu Donghai 徐东海 of Jinniu village

The group reached Jinniu towards 2 pm, with the car having a flat on the road from Daibu 待补 along the valley that runs straight SSE towards the southern end of the Guniuzhaishan 姑牛寨山 Massif. Jinniu is a large village with many new buildings on a tongue just above the confluence of two streams. It happened to be market day. Yemei started asking about old mines and quickly hit on a group of old men drinking and chatting. One guy became specific almost instantly: Xu Donghai 徐东海, 63 years, 4rth generation in the village, his ancestors moved in from Daibu. His son is the village mayor (cunzhang 村长), so he arranged for us to stay and promised to lead us around to show all sites of old mining on the next day. He claimed that walking into the mining area would take 2 hours at least, so at about 3:30 pm is was too late for today. He alluded that he had lost money in an attempt at exploiting ores and mentioned that a couple of "intellectuals" from Hebei had spent 2 days to explore the historic mines a few years ago. [Presumably these were prospecting for a mining company]. He told us two stories: about 3 brothers who entered an old mine and died in there, presumably this happened relatively recently. The other involved a saying that 28 (?) tables were needed at mealtime at the smelters when the mines were in operation, suggesting large numbers of workers. [He repeated this story the following day with a different number of tables, "some 20"]

In the afternoon went for a stroll along the slope to the east of the village. Two streams join a short way above, on coming through a gap in the ridge to the east. We got a good look into the valley of the Qingshuihe 清水河, where the historic mines were located.

We were put up in the village government building that was still partly under construction and empty at night, but equipped with 5 beds.

Met Old Xu Left about 8 am and followed him a couple of km into the valley, then up a steep side valley to the south, seemingly leading right up a southern flank of Guniuzhaishan. Old Xu pointed out a caved in mine entrance on the western slope right next to the path. A rectangle in the rocky slope, about 4-5 m high and 5-8 m wide, covered in debris, evidently not a natural dent in the slope, boggy at the bottom. Shortly above this site we crossed the stream and followed a zig-zag path up the eastern slope. The path had a name that I forgot. Partly visibly cut into the rock. About 150 m up the slope, the valley widens into a half-bowl. Old Xu told us that there were 8 known mine entrances in this bowel. He took us to the lowest, a quite large entrance, about 2 m across, 1.5 m high, partly waterlogged. Potato terraces all around the amphitheatre, also in the side valleys above and below, now all abandoned. According to Old Xu, they were abandoned about 10 years ago and are now used for grazing cattle and goats. Passed by 2 more mine entrances. At the first, Old Xu noted that the three brothers died in this mine. He also pointed out several more further up the slope, facing roughly north. Xu pointed out saddles on the ridge southwestwards, about 100 m above our level. These were called Dayingpan 大营盘 and Xiaoyingpan 小营盘 and according to local traditions were the sites of housing for the miners and shops. We climbed out of the bowl on the eastern slope and around a nose above the valley of the Qingshuihe. Turning back along the ridge we got to a saddle on that according to Old Xu was the former temple site. The name of the temple was not known to him. Beyond the saddle, the ridge becomes very steep, rising to the lower peaks at well over 3000 m. From this point a well visible caravan trail heads down towards Jinniu village. Old Xu told us that the ore used to be carried down this road. We walked down and reached the village in roughly half an hour. Old Xu pointed out two more mining entrances on the slope of this side-valley, at a similar height as the lower mines of Jinniu. These mines were called Luoma dong [if I understood correctly].

The smelting site was on both banks of the stream (Qingshuihe) near the valley mouth, on the fields along the northern bank still lots of slags. Some people came and bought up slags in the 1990s. The site on the other bank is now built up with new houses. Xu completed his story: there used to be 18 furnaces, 28 tables.

Also told a story that the name of the mine owner was Xiao Fu 萧富, he dug for ore for 8 days but didn’t strike any, then a man from Xuanwei 宣威 came by and told him to dig on, yet after 5 days they still found nothing. The man told them they would strike silver ores on the 6th day and left, and they did. Later on, this man was enticed to come back from Xuanwei, and stayed at Jinniuchang for 10 years, pointing out the sites of new mines. Finally, another mine in Xuanwei enticed him away again, and Jinniu went in decline.

At breakfast-lunch at the village government, Old Xu received a call that his son had an accident, whereupon he had to go to the hospital at Daibu. Small Xiyue gong [Hunan temple] is in present center of the village. The temple is now used as a meeting place for the elderly, but key could not be found. Reportedly and as far as visible, no stele had survived. The structure consisted of a single, quite small courtyard. Old Xu had also mentioned another site without any remains called Lao guanfang at the upper end of the village, and a rather large mine above Dapengzi, a village of 40 households about 5 km into the valley of the Qingshuihe. This mine is known as the Hongxingdong

宏兴洞. Another village used to exist even further up the valley [forgot the name]. Due to the accident we did not see these sites but instead decided to explore the next valley downstream.

Headed back about 2 pm, stopped at the next turnoff and inquired for Qingmenkou 箐门口 and Dapingzi 大坪子/Daopingzi 道坪子/Pingkai 坪街 and mining up that valley. An old couple at/before Qingmenkou directed us on the track to Pinggai, headed up the valley, easy walking. Asked several more old people, Could not identify the villages. Short way before Pinggai got told yes, there were to mining entrances nearby, now overgrown. Not certain about the dating. Further up (beyond Pinggai) got told that there were a number of mines further up, and slags near the old graves. Found the site easily. Graves quite old, no legible inscriptions left, but some with small tablets, some still being looked after. Slags on slope below, extension small, possibly in and along a small brook and extending under the graves. Decided to walk up a little further, met an old man (who told us he was 75, looked very well, his family moved in 5 generations ago) that this village was Lufang 炉房/Liufang 六房, that a few years ago (about 2010) a mine had been operated, there people built the driving track, gave up because of permit problems (presumably illegal). We reached the main valley and the car about 4:30 pm and drove on to Huize.

Results:

No oral histories of conflict, therefore an end of mining before the civil wars probable. Also all informants confirmed that mining had ended by the time their ancestors moved into the area.

A relatively brief history of exploitations from the late 18th to the early 19th century hence appears probable, with the 8 mines of Jinniu under a single owner not improbable. It also appears convincing that these mines, possibly together with the Hongxingdong at Dapengzi were the main productive workings. The amount of slags at Jinniu is not known. The former slag dump as indicated by Mr. Xu is sizeable but not huge, supporting a relatively brief period of intensive exploitation. The slag dump near Liufang was relatively small. The distance and the name of Guancangqing in the vicinity strongly suggests that this is the site of which Huang Mengju recorded minor exploitations in the 1840s. The fieldwork findings support the situation reported by Huang Mengju.

This result has major implications for the reliability of tax records: If Huang Mengju's account is correct, the Jinniu Mines began exploitation on a sizeable scale in 1788/9 and became highly profitable around 1797/8, before underground mining had to be abandoned due to intruding water only a year or two later. The official opening of the mines involved the setting up of a mine yamen on site and took place in 1798, soon after the profitability became known. The tax quota evidently was set then. It remained in place through the following three decades, despite the fact that outputs plummeted the following year. We have to conclude that the tax quota was set when a mine became sufficiently productive to require formal supervision or legitimation. It might reflect the output at this moment, but cannot be extrapolated in any way across the time period during which the quota remained in place.

The distribution of mines, the temple, the yamen, and the smelting site at Jinniu were clear and complete and therefore important for a better understanding of the geography of a mine of moderate size.

To further ascertain the local traditions, the collection of more oral histories in both valleys would be useful. Finding the families who tend the graves near Liufang and hear their stories would be particularly useful.

The Mianhuadi Mines in Huidong

Fieldwork by Nanny Kim and Yang Yuda, 19 November 2016
Main informants: Xin Wang 辛旺 and Deng Chengzuo 邓成佐, villagers of Mianhuadi

Mianhuadi village is located on the northern slope sits half way down a short side valley of the Jinshajiang, which descends not quite 10 km from a watershed range of over 3000 m straight east into the main valley. Although only about 5 km in a direct line far from the Jinshajiang, road access is only possible from Huidong. We reached the site from Daqiao大桥/Qianxinzhen 铅锌镇 in Huidong. As the village is too small to be known, we asked driver Mao to take us towards Xinshan 新山 (2200), the sub-county on the ridge above Mianhuadi. Mr. Mao knew the route and expected to take some 3 hours. The valley of the Daqiaohe descending to the Jinshajiang becomes very narrow a immediately downriver of Daqiao, with huge slopes to both sides. The watershed that rises up behind Xiaojiexiang 小街乡 (used to be a sub-county but is now abolished), seemingly close to Mianhuadi, is in fact over 2800 m high. Driver Mao had vigorously stated that there was no way of staying overnight in Xiaojie, and passing through he was obviously right. There is a new school, but hardly anything else that would make this a market village.

The Daqiaohe bends steadily southwards. The road clings to the northern slope, gradually gaining in height and winding in and out of many small side gullies. A former labour camp was sitting ominously on the southern slope in the morning light. Many small villages on the steep slopes, the new houses bright and visible – yet evidently not built to last. Some 30 km down the valley (probably no more than 10 km as the crow flies), the road climbs up on the ridge at Songping 松坪 (2050 m), momentarily looking right down upon the Menggu Plateau. A short way into the track that led along the southern slope we encountered a motor cyclist, who could not decide which way to circumvent our car, which had already come to a halt, and fell, but mildly, damaging only one of his mirrors.

As this was the first and only person we met, we asked anyhow, and the gentlemen was very helpful. He was in fact from Xinshan. He directed us to take another track down and even rang a relative in Mianhuadi to ask about the state of that driving track. They could not tell but stated that tractors could pass. Then he guided us back to Songping to make sure we got the right turn-off (he was heading to Songping). He also mentioned that some years back several thousand tons of slags had been sold by the villagers of 棉花厂 Mianhuachang.

From the turnoff at Songping at 2000 m, the track zig-zagged down a steep, barren nose, in fact Laotanshan 老炭市. It ended near the bottom where an apparently un-successful attempts at iron mining had cut off the last 30 m of the slope that turned into a cliff just above.
At about 10 am we left driver Mao and the car at about 1550 m and walked the motorcycle track to the village a little way up the north slope. (valley bottom about 1520 m, the lowest house of Mianhuadi village at about 1600 m). Two women with their goats left, but we found an elderly gentleman in the last of the 3 lowest houses. After initial communication problems were solved – Yuda switched to Yunnanhua (though later on he understood me, too) – he turned out to have the time and interest to be our guide. Mr. Xin Wang 辛旺, 67 years old (year of the ox), his family had moved to Mianhuadi 4 generations ago, when the mines were already closed.

Mr Xin knew about slag dumps (he referred to a “burnt slope” 烧坡) and about the old temples, and took us to all sites. We first set off to the slag site a little way up and to the east of the slight ridge on which the eastern village is built. There is a slight dell to the east with much stone and rock that leads to a massive instable slope that descends all the way from the top of the ridge to the brook below.

On the way, he told us that there used to be lots of slags when he was a kid, later a company boss bought them up, and the villagers carried them down to the Jinshajiang by mules. He paid 10 Yuan per 100 jin (50 kg), this was over 10 years ago, in the 1990s. He took part in this and maintained a mule, which he since sold. A good mule could carry 200-300 jin (100-150 kg) and it took 2 hours down to the river; they only made one trip per day. Per 100 jin some 10 Yuan porterage were paid. The trip to Menggu is reckoned as 60 li, takes from dawn to dusk [including the ferry].

Mianhuadi has about 30 households and is distributed over two small ridges. In the past, 10,000 worked the mines, and there was a Jiangxi Temple 江西庙, a Temple of the God of Wealth 财神庙, a Temple of the Mountain God 珙王庙, and a Temple of the Black God 黑神庙. Each temple had a stage.

The area in the center of the rill was still covered in slags. The extent of the slags across and especially the length (height) of the slag field could not be clearly established. The maximum width would have been across the entire rill, the length at present was about 50 m, the upper end being a recently planted orchard. Another unused area above the orchard suggests that the slags used to extend further up, possibly over more than 100 height metres. Depth in the middle was at least 30 cm, to which recent diggings extended. There were numerous ceramic sticks among the slags, many very thick, Mr. Xin knew that these shatiao 沙条 were used in smelting silver.

Mr. Xin was not clear about mines. He said that he had not seen any, but there was a story about a highly productive mine up on the instable slope, which was destroyed by a major landslide that also was the end of mining. He told us that the charcoal used to come from the opposite slope, the 炭市 [Old charcoal market].

From the slag dump, he took us back to the eastern ridge to show us the remains of the temples. The lowest was the Hongwang Temple, which extended over three terraces, beginning at about the second group of houses. Mr. Xin showed us the corner of the stage, a stone wall now about 6-7 m in height, perhaps up to 20 m wide.

Further up was the Caishen Temple. Mr. Xin explained that a wide flight of stairs used to lead down the middle of the ridge through the terraced courtyards of the temples. Some bases of the Caishen temple were still relatively intact, with built walls about 2-3 m in height and over 40 m wide and about 20 m deep. Four terraces were still in existence, with the remains of a vault gate (caomen 嶆门) in the centre of the second from the top. The temple area ended with the highest group of houses, where the ridge became even steeper. Yuda estimated the temple are at 2500 m2. We asked Mr. Xin which of the temples was the largest but he could not say. He remembered that the Caishen Temple used to have a bell that weighed 80 jin (40 kg), which could be heard several 10 Li away. It was taken away by the sub-county government.

Mr. Xin then took us to the western ridge and to the site of the Heishen Temple. This temple consisted of 5 to 6 courtyards, wich were also arranged on terraces and reached a width of over 40 m. In and near a house at the top end, we saw three small pillar bases.

In the middle group of houses, Mr. Xin took us to the home of a very old couple, where a pillar base with a diameter of 35 cm was placed. The old gentlemen's name is Deng Chuanming 邓传明, 84 years old (year of the monkey, born in 1932), the oldest man in the village. We briefly sat down in his house, and Mr. Deng recalled that his ancestor used to be the tax master (kezhang 课长) of the mine and had come from Huguang. His name was Deng Chengzuo 邓成佐, and he oversaw the taxes of the Mines of Mianhuadi and of Shuanglong 双龙, 棉花地 [We had never heard of Shuanglong Mines in this area]. By the time of his grandfather, they were peasants and classified as landlords. They lost their land but were allowed to keep the house, which was built in the Jiaqing period. The timber of the house did not look ancient, but some parts were executed with some care.

Mr. Deng told us that there used to be 10,000 men at this mine, and 36 streets with 72 alleys, and 48 furnaces. The tax master was in charge of the furnaces. He also heard that many were Muslims. He still knew of Muslim graves, several 10 Mu of land, which are now levelled. When asked whether the miners were mostly Hui or mostly Han and where the Muslims prayed, he did not know. He remembered, however, that a stele used to exist near the house of one of his younger relatives.

This was Shen Daoming 沈道明, 70 years old. He confirmed that there was a stone tablet nearby at a small brook where the women used to wash. We went to the place at a short distance from the houses. It turned out to be a grave stele that was partly buried.

Mr. Xin or Mr. Shen then thought of another stele and we went around the group of houses. The stele was broken but carried an interesting settlement of a conflict with the charcoal burners.

As it was already 3 pm, we had to head back, as we were not keen to travel on the mountain roads in the dark. We briefly passed by Mr. Xin's home again as he said that he had some things to show. He had lead pieces and some ore, specimen he had presumably picked from the slag dumps. We acquired a layered piece of lead that appeared to have been formed at a snout or pipe to let off the lead.
We reached the car at 3:40 and returned to Daqiao at dusk.

Results:

The existence of exceptionally large temples consisting several courtyards is certain, even if some details related by Mr. Xin were incorrect. These document an outstanding importance of the mines as well as a relatively long period of exploitation. The findings correlate with the oral tradition related by Mr. Deng. Strangely, however, the amount of slags appears relatively small, while no mines or waste heaps could be located. The extreme gradient of the slopes and the possibility that the main mining area may have been located on the instable slope to the east might explain this. The rockfall and the end of mining probably happened before the mid-19th century, as no stories of Han-Hui conflict were known.

It may be added that we also found remains of unusually large and very lavish temples at the small town of Daqiao. Including a Guanyin temple, a Jiangxi Temple, a Caishen Temple, and a Sichuan Temple. These indicate a former importance of this town, either as a mining centre itself or as the transport node of the area. We suspect that the Xiaotongchang copper mines and the Dayingchang

silver mines some 20 to 30 km south of this town were far more important that a single mentioning of the place name in the Dongchuan gazetteer suggests.

The New Shiyang Mines in Shuangbai

Records and questions:

The Shiyang Mines have a certain notoriety because these were the mines where armed conflict between Han and Muslim groups first led to large scale organized fights of militias. They are also quite mysterious because the tax quota dropped from 22,393.32 liang in the late 17th century to merely 5.5 liang by 1829, while reportedly some 10,000 men were involved in the fighting in 1849. When we visited the Old Shiyang Mines in 2011, we learnt about the New Mines and the Tianguan Mines to the east of the river.

The visit aimed to clarify the relative importance of the New Mines as compared to the Old Mines.

Fieldwork by Yang Yuda and Nanny Kim, 24 – 25 November 2016

Support by: Luo Xingfu 罗兴福, party secretary of Dutian sub-county 独田乡

Main informants: Luo Xingfu, Li Xun 李俊, head of the cultural bureau of Dutian sub-county

We reached Shuangbai just after 12. Since 2011, the country road from Chuxiong to Shuangbai has been replaced by an (almost finished) wide motor road. Luo Xingfu 罗兴福, the party secretary of Dutian 独田乡, was waiting for us with others. Over lunch secretary Luo told us that it would take 2 hours to Dutian and another 2 into the New Shiyang Mines, while the road to Dutian was just being under construction and therefore closed until 6 pm.

We therefore went for a walk around the tip of the natural lake 查姆湖 in Shuangbai, which is now a park (was a building site in 2011) to bridge the siesta break. At 2 pm we went to the local gazetteer office. A new gazetteer had just come out, which listed numerous old mines. The local historians stated that in addition to the Shiyang Mines, the Malong Mines 马龙厂, the Yeniu Mines 野牛厂, and the Tianguan Mines 添官厂 were important. Tianguan is a site south of the Malong River, in fact quite close to Shiyang, but rather difficult to reach by car. We decided to visit the Malong and the Yeniu Mines. We also obtained recent reprints of historical gazetteers.

At 3:30 we went to the Cultural Institute. It was a brand new building, and an ethnic exhibition was just under construction. The specialists of the Cultural Relics Office were away, but Mr. Su of the institute knew something about the New Shiyang Mines, specifically that old furnaces were still on site.

We met with secretary Luo for dinner and followed their car to Dutian in the dark. Dutian is a large village along a single main street, with one private guest house, new and clean, with wifi.

2016.11.25. Xin Shiyang Mines 新石羊厂

Secretary Luo had arranged for Li Xun 李俊 the head of the local cultural bureau and Mr Guo of the village administration to accompany us to the mines. The road to Baiheqing 白鹤箐, the last village before the mines followed the valley of the Malong river, then an upper branch heading west and eventually entered the valley of the Shiyangjiang, now turning south. The area almost entirely forested and very thinly inhabited. The forest looks to be under 20 years old.

During the long drive, teacher Li told oral traditions of Baiheqing. In 1994, a group of the Shuangbai Cultural Institute had visited the oldest inhabitant of Baiheqing, then 79 years old, who was the last descendent of local miners. The present inhabitants of Baiheqing, none has a family line with the mines. The foundation story of the mines: A story that a mule driver emperor looked for a suitable grave site for himself. He ordered someone to follow a water buffalo. The man was to walk as long as the buffalo kept walking and recognized the place blessed by fengshui by the buffalo lying down. The buffalo came down from Xiaguan 下关 and never stopped until it reached a place called Koumuzhuang 口木庄, where it lay down and would not get up again. All were convinced that they had found the blessed spot and the emperor hired many men to dig up a grave. However, every night the earth that had been dug up would grow back again. After digging had led to nothing for several months, the emperor became angry and set even more men to work. The digging still had no effect. One day, an old man who had to work on the grave realized that he had lost his pipe in the evening, so he went back on his own. Back on the site, he heard a voice saying: “We’re not afraid of a thousand men digging or a ten-thousand digging, we only fear copper nails and iron nails.” (千人万人挖都不怕，就怕铜钉铁钉钉下). He reported this and the man in charge found two newborn children, a boy named Tongding 铜钉 and a girl named Tieding 铁钉. He bought them from their parents, had two pits dug on the grave site, and buried the infants head down. They heard a terrible cry and blood spilled out of the mountain at two places, one named Xuechong 血冲, which is now renamed 德冲 (a village on the Malonghe) and the other [xxx]. In between the two sites, a white crane flew out of the mountain, the mountain dove, and it flew off towards Xiaguan. The fengshui spell was thus broken. The place where the crane flew out of the mountain was called Baiheqing, the place formerly called Koumuzhuang.

He also related the oral history concerning the conflict between Hui and Han. All miners were Hui, and the local Han in the area became jealous, so Li Wenxue 李文学 led others to take over the Hui mines. In the first battle, the Hui lost, and many were killed. A second battle followed, when the Hui returned with reinforcements to take revenge, and killed large numbers. In the mining area, many graves were left by these battles. [Yuda: this is a mixture. Li Wenxue is an Yi hero identified by Liu Yaohan 刘尧汉, who had nothing to do with the mining conflicts. Nanny: The graves near the mines appear to be from different periods, the dated ones were erected after the civil wars.]

Li Xun also told us that reportedly there used to be a huge stone mill at the New Shiyang Mines, with a stone over 10 tons, which was later covered by other material. [Guo and the village mayor stated later that they had not seen such a millstone.]. In the old times, the ore was carried out from the mines, then pounded into small pieces and washed to get rid of soil and light fractions, then ground by a mill that was worked by humans. After grounding, the ore was sieved, using five to six different sieves, that were graded more and more finely. Only the finest ore concentrated in this process entered the smelters. [Yuda: they later mentioned mills worked by oxen.]

According to local sayings, the Shiyang Mines had exploited only one of the hind legs of ten silver goats.

Li Xun also mentioned that two large old temples used to exist in the mines, the Old and the New Temple. In the New Temple, a copper bell of about 100 jin used to exist that was later taken to the primary school. At some point, an iron rod was used to strike the bell and eventually the bell cracked and was sold for waste copper.

Asked about other temples in the area of Dutian, he said that there was a temple at Zhulin’ao, which had been burnt but was now rebuilt and well frequented, and several shrines, one of which used to

have 4 copper Buddhist statues, about the height of an adult, which were sold by the village government in the 1980 to finance the first phone.

The area of Dutian is 260 km2, the population 4700. Many villagers now make good incomes by selling mushrooms, timber and by raising cattle and goats. Goats sell alive at 32 Yuan per kg, not reached in the more remote corners.

Li Xun reckons that Baiheqing is at 1000 m, the Shiyanjiang at 650 and the New Shiyang Mines at 890 m. Upon asking, he stated that charcoal burning went on everywhere in the area, and that charburners from near and far used to sell to the mines.

We reached Baiheqing about 10 am. The village mayor 村长 was waiting for us and led the way on his motorbike (He also possesses a small truck and a car.) The track gradually descended along the ridge. Where the ridge became slightly wider, the mayor made s stop at the Old Temple 老大庙. The site was some 20 m above the track in the forest. Remains of a small building with earth walls consisting of 3 rooms were still standing, the main hall according to our informants. The dimensions were: height between 2.5 and under 1 m, thickness about 0.7 m, depth inside 5.6 m, total width 10.2 m. There were no remains of tiles or bricks on the forest floor, and the informants confirmed that the buildings used to have thatched roofs. Downhill of the temple site are many old graves. Some of the graves were within the temple compound, and would have been erected after the temple had fallen in disrepair. It turned out that we were at the upper end of the “Grave Mountain,” which extended down the slope and towards the river for roughly 1 km. According to teacher Li, there were some 2000 graves altogether. Nanny found three graves with small stone tablets, a readable inscription was of the Tongzhi period.

We got back in the car and followed the track down some way, until teacher Li stopped us at the site of the New temple 新大庙 and the market street. The temple site much resembled that of the old temple. The street consisted of a visible street some 2 to 2.5 m wide, with the bases of small cubicles to both houses, suggesting shops. The informants stated that this street used to be about 350 m long, but was how interrupted by the driving track. Graves extended right down to the street area. A broken up stele inscription had been assembled by teacher Li. Though missing parts, it was partly legible, recording the rebuilding of the Xiyue Temple 西岳宫 (Huguang guildhall) in the year Renshen ([lost] 一年岁次壬申, i.e. probably 1892).

Li Xun was convinced that ox carts used to be used to transport ores from the mines to the smelters and that the street had just the width for carts to pass.

A short distance on, on the SE shoulder of the ridge was a smelting site with several rows of cupellation hearths still recognizable. About 6 rows identifiable. Yuda and Mr. Guo measured the best preserved hearths:

Dome inside height 105 cm, diameter 125 cm, thickness of the front wall 35 cm, side wall 40 cm, 3 holes in the dome visible from the inside, with diameters between 1.5 and 3.6 cm. Triangular hole in the back wall, 13 cm wide. The other hearths in part showed larger inner diameters and heights. In the ceiling of the domes was a layer of ends of shatiao, around 10 cm in length, placed on end and plastered together with clay.

Slags, though apparently not in a thick layer as well as numerous shatiao around the furnaces. Below the street, the ridge falls off steeply into the Malonghe to the south and the Shiyangjiang in the west. From the lower end of rows of furnaces to about 40 height metres below the somewhat flattened and in part hollowed middle of the ridge is covered in slags. Apparently formerly in a thick

layer, which has been recently dug up and shipped away for re-smelting. The driving track was evidently built for this purpose, as well as installations for loading trucks and some houses. The present surface mainly consists of waste rock from sorting, which covers the red soil to up to 2 m. The layer peters out towards the lower end of the dug up section. [Nanny: due to the steep terrain, it is impossible to say to which extent erosion has taken down waste materials.]

There were some more remains of cupellation hearths and other structures near the lower western end of the slag field. Among these was a smelting furnace with a large, square base over 2 m in width and length. According to our informants, this furnace dated to 1958. Teacher Le stated that when he first visited the site in 1995, there were some 200 tons of lead cakes piled up next to the furnace, left from the Great Leap. These would have been sold later. He also mentioned that he heard from old people that a wooden ramp was built down to the Shiyangjiang at the time to send the slags down.

A short way further down was a rectangular structure of stone walls, 4.8 m in length, 2.75 cm in width and about 1.9 m high. The height of the walls was still relatively regular, suggesting an open structure. On the eastern wall were two openings framed in bricks, 35 x 60 cm, with a square hole of 10 cm. On the northern wall facing uphill was a domed entrance, 90 cm wide, 100 cm high, about 110 cm deep, the inside opening covered with a millstone. The walls were about 60 cm thick, and there were two raised sections inside, about 80 cm deep and 60 wide, leaving a channel of about 50 cm in the middle, which was filled with earth. The purpose of this structure was unknown. [Yuda thinks that it may have been a roasting kiln] A nearby grave stele dated to 1857.

A little way down the western slope were 3 more hearths, similar in dimensions to the higher ones.

The informants told us that there were two other slag dumps in the area, but that this was the largest. Concerning the recent she selling of the slags, Mr. Guo stated that the company worked them for about 3 years, filling one [?] large truck per day. According to the village mayor, they may have sold 5000 tons of slags as well as old waste ores. The metal content [presumably lead] of known waste rock was about 3%, which was concentrated to 30% for selling. The loose rock that was visible near the smelting site was this waste rock.

The Tianguan Mines 添官厂 on a small nose above the Malonghe were pointed out to us. All informants confirmed that the Old Shiyang Mines were the largest and had the largest slag dumps, the New Shiyang Mines came second and the Tianguan Mines were somewhat smaller. [Yudan commented: according to the gazetteer, the slag dumps of the Old and New Shiyang Mines were some 4000 to 5000 tons, while there were 8000 tons at the Tianguan Mines.]

The village mayor took Nanny to look at a few mine entrances on the Western slope, clambering along northwards for a short stretch. The mining entrances began from the lower end of the graves almost down to the river, which was still at least 200 m below. According to the mayor, there were 70 to 80 on this slope. The six entrances seen were at the same level and quite close together, leading into the mountain at a slightly downward angle and about 25 m apart from each other, some as close as 5 m. Where the terrain was slightly less steep, massive fields of waste rock covered the slope. Rock of light grey with some quartz, similar to the waste rock at the Old Shiyang Mines. The mayor said that he had been inside the mines; the galleries were mostly narrow, but at times opened to large halls. The largest would be “as high as the trees,” which were around 15 m in this forest.

We returned to Baiheqing about 2 pm and had late lunch in the courtyard of the mayor. Near the village and in the forest beyond, we had a look at a recent charcoal kiln and at the remains of two

kilns, which according to Li and Guo dated to the Qing. These were earth and rock structures about 2 m in diameter, with a flat dome, a door in the front and a chimney in the back. According to the mayor, a kiln produced about 500 kg of charcoal. He had not considered the amount of fresh wood that was required. He detailed that different sizes of wood could be used, as long as they were properly arranged, indicating diameters of perhaps 15 cm to thin sticks. We were also told that some of the old kilns were twice this size. We reached Dutian about 6 pm and Shuangbai towards 10 pm.

Results:

Findings and the information on re-smelted slags confirm that the Old Mines were considerably larger than the New Mines, while the Tianguan Mines apparently were again smaller. The scale of exploitations nevertheless was very considerable. The presence of kilns and the similar shape and arrangements of mining entrances suggests technical and organizational similarities.

The small temple remains in Nanny's opinion are explained by the fact that these are the remains of restored buildings that date to the period after the civil wars, when re-exploitation of slags was practiced as a village industry (see Xinzuan Yunnan tongzhi, juan 64)

The Malong Mines 马龙厂

Records and questions:

The Malong Mines probably were important in the Ming period and reportedly flourished in the Qianlong to Jiaqing periods (1736-1820). When the conflict between Han and Muslim groups in the mining areas escalated into armed conflict in 1849, these mines were involved. The recorded tax quota dropped from 698 liang in 1707 to 16 liang in 1829. Based on the records, we expected a site of moderate importance, possibly with a long history of exploitation.

Fieldwork by Nanny Kim and Yang Yuda, 26 November 2016

Main informants: Mr. Peng 彭, director of the village administration and Mr. Duan Bichao 段必朝, villager of Malongchang

Support by: Mr. Luo Xingfu, party secretary of Dutian sub-county and Mr. Peng of Malong village

Malong village is 32 km from Shuangbai (over 1900 m) and some 1000 lower, on the Xiaoshahe 小沙河 (at about 900 m), a branch of the Malonghe. We picked up director Peng 彭主任 as well as a young clerk with her 4-year-old daughter. Reached the administrative part of the village on the northern rim of the valley about 11 am, the descent on the new but narrow concrete road took well over an hour.

Peng is a man of few words, but turned out knowledgeable and helpful. On the descent on the eastern slope into the valley of the Xiaoshahe, Peng pointed out lighter areas on the opposite slope and explained that most of the old mines were on that slope and these were waste heaps. He also stated that the geological team No. 301 had been in the village area for 6 years and blocked up all mines that they identified. There were still quite some that were visible. There was a plant on the northwestern slope about 3 km east of the village administration. Peng said that this was an ore processing plant which operated a huge washing pond. The company had been in the area for about 20 years. They formerly operated a pond lower down, but had to close that because of pollution. According to Peng, they were now washing silver ores with chemicals in the higher pond.

He added that in 2002 and 2003, locals sold old slags. At the time, 20 carrying pole loads were reckoned 1 ton and people were paid several 10 Yuan per ton, several thousand tons were bought up at the time.

The village government building is brand new, with a small settlement behind, but clearly not the old village. The valley is under 900 m, hot and arid. The main source of income is the raising of goats and pigs. After some talking and waiting around, we had lunch and set out. Together with another young member of the poverty relief team of the district and a local cadre, Peng systematically took us to all visible sites of historic mining.

We first drove into a side valley leading straight north. At the upper end of the flat-bottomed valley (1250m), Peng directed us onto a track that ascended the eastern slope. Some 50 m up the slope (1300 m) he pointed out the first slag dump. It reached to the bottom of the valley and extended further up. Peng told us that this entire slope used to be covered in slags. It apparently was the first

slag dump that was worked, as it is the closest to the valley and to roads. Part of the slope is redeveloped into terrassed fields, the steeper sections are visibly dug up and covered in grass and sparse bush. According to Peng, the portion we were looking down on was the smaller part, further up there were another 30 to 40 Mu covered in slags, with a thickness of up to 2 m. Most of these were also sold, with digging up lasting about 7 months. [Yuda: an area of 25,000 m2 covered in 0.5 m at a weight of 0.4 kg would mean 25,000 tons of slags for this dump alone].

Above on the slope is a village called Changdacun 厂大村. The slope is very steep of about 200 m in height, before opening into a steep bowl with several streams descending. We reached a shoulder at the lower end of the bowl (1450 m), where Peng had us stop again and pointed out the next slag field. It would have covered the entire eastern slope and reached some way around the bow. From the point where we were standing to a cliff on the northern slope of the opposite shoulder. Peng and the young official pointed out some mine entrances and showed us one just above the driving track, which turned out to be shallow.

The entire slope appeared to be covered in waste rock. Peng stated that the waste rock extended from the point where we were standing (1450) to the gully below (ca. 1350), to the village and up the opposite slope all the way up (1650).

There were some houses in the corner of the track (the main village remained out of sight on a nose further up). We drove further up, zig-zagging up the slope covered in debris. The car had to stop near the top of the ridge (about 1650 m). We walked along the track for a short distance, where our informants showed us a perpendicular mining shaft. It was overgrown with small bushes and relatively narrow. By throwing in stones they demonstrated its depth: It is called ventilation shaft 风洞口. According to Peng, the geological team had let down 12 length of 12 m ropes without reaching the bottom. The mouth was partly blocked to prevent accidents.

A short way along the track, still gently climbing up the ridge, we came across a test drilling site, operated by the mining company involved in ore washing in the main valley. Beyond this point, the mountain becomes wooded, with the peak of 1950 m seemingly quite close. A path around the shoulder got us to Malongchang village. In the fields above the village, Duan Bichao 段必朝 (born in 1951), whom Peng had called earlier, was waiting for us.

Malongchang, at about 1630 m, sits on a small brook in a relatively mild open valley, the level above the dramatically incised slopes. From the shoulder above the village, Mr. Duan pointed out the sites of the former temples. He knew of a Guanyin temple 观音庙 on the southern slope just behind us that used to hold a temple fair on the 19th of the second month, when his grandmother was still a little girl. The Caishen temple 财神庙 used to be near the southern end of the village. In the village were the Guansheng Temple 关圣庙 and the Jinhe Temple 金河寺. On a nose to the east used to be the mosque 礼拜寺, and the Xiyue Temple was on the ridge to the west. On the ridge were also theWapiao Temple 瓦瓢庙 and the Dragon King Temple 龙王庙.

The site of the Guanyin Temple was marked by two old trees just to the SE a short way up the ridge that we were standing on. Mr. Duan took Nanny to show the remains. Behind the two trees is a wall of a foundation terrace. About 5 m behind the wall the small wall in the ridge has partly collapsed. The western corner of the terrace is still standing, almost behind the more westerly tree. The existing wall is 10 to 15 m long and about 10 m behind the two trees. The more easterly is a Huanglianshu 黄楝树 (pistachia chinensis), the more westerly is different and probably younger. [Nanny: the Huanglianshu may have been planted at the entrance or in the first courtyards of the

temple, the more westerly probably has grown since the temple was ruined.] Mr. Duan enteres the bush to show a Kongque weiba 孔雀尾巴, a large-leaved ornamental plant that according to him used to grow in the temple courtyard and is quite old. He said that a monk still looked after this temple in the years just after liberation, and that his older brother had still seen him in his hut that was right next to the peackock plant. He added that the temple used to a be very large compound. He deduced that from the fact that in the fields to the east of the site, up to the saddle, they had found pieces of brick and roof tiles.

In the meantime, Yuda had obtained more information from Peng. He stated that the market street in Malongchang used to be paved with large slabs, which eventually had been used in private houses. Peng had also heard that the mine right under the Guanyin Temple used to be extremely productive, and in fact the entire slope was covered in a layer of waste rock that had a thickness of at least 2 to 3 m. however, the mine entrance had never been found.There was another very large mining gallery further down, called Dragon Gate 龙门洞, that was spacious inside, but filled with water. There used to be a great many mines, and some had caves inside as large as a house, presumably where massive amounts of ore had been extracted. He had been inside to hunt boars.

Mr. Peng and Mr. Duan pointed out two slag dumps at the village, mainly on the western bank of the brook and a dell below the village. The dell was left after the slags had been sold. He also mentioned that the red hills beyond the village were covered in grave and that some had marble inscription tablets.

The Caishen temple site was a little way down the path, near the southern end of the village. A recently built workshop showed that the layer of waste rock was at least 2.5 m thick. Part of the walls of a foundation were still standing, the lower wall relatively clearly not quite 15 m long, the depth uncertain.

The main village is densely built. After crossing the brook, Peng pointed out a mine entrance at most 1.5 m above the stream, which went into the mountain gently inclined upwards. The main building of the Guansheng Temple is still standing, though the roof is mostly gone. There is a perfectly preserved inscription on the restoration of the temple in DG 22 (1844), still in its original place in the inner wall of the main hall. The mention of Zhenjun 真君 identified the temple as the Jiangxi guild hall. Remains of one or two broken stelea are lying on the path in front of the temple. The standing hall is 13-15 m wide and 8 to 9 m deep, on foundations that are about 20 m wide and of which 1.5 to 2 m are still standing. Mr. Duan told Yuda that the foundation platform was still complete when he was a child, and that similar foundation platforms existed to both sides of the temple. There used to be side halls on each, with shrines and figures. [Yuda: the original dimensions appear to have covered 1500 to 2000 m2, the restoration in the DG 22 may have been partial]. According to Mr. Duan, the pillars were from “阔松” pines from the Zixi Mountain at Chuxiong 楚雄紫溪山, some 45 cm in diameter, and had been carried here.

As it was already after 3 pm, Nanny went with Peng and the young official to take a look at the graves, while Yuda collected information in the village. In Duan’s house, Yuda was joined by another village elder. He recounted that in former times, 10,000 worked the mines, and the place was very lively. The surrounding villages all grew vegetables to sell here, for this reason they are called Caiyuan and Xinyuan (菜园村、新园村).

On the Xiyue Temple, Mr. Duan said that it used to consist of three terrasses of foundation platforms, that were no smaller than those of the Guansheng Temple. Under the large tree there

used to be a stone unicorn that was well visible from the market street in the village. That large tree used to be enormous, but is died and was no more. The trees on the site that we can see now are not very old.

It was said that exploitation began in the Qing period, and that the Cai family was from Guizhou, the Yi family from Hubei, and the Yang family from Nanjing. The present members of these families didn't know any more about their family histories. Mr. Duan's grandfather had come from Dali, so he was recent, only the third generation. When his grandfather arrived, mining was waning. He opened as small shop. Later he bought 12 gong of land and rented it out, and therefore was classified a landlord. The arrival of the family would date under 100 years. Duan had hear that when the mines flourished, up to 100,000 lived in the area. Malong was only a branch mine then, the main mine was at Majitian 马家田村, and the temples there were bigger than the ones at Malong. Their courtyards alone were over 100 m2. The mine official resided there. The largest output would have been produced there. But slags were not that much, perhaps ores were transported to Malong for smelting. It took a good hour to walk from Malong to the great temple, which according to what he heard used to consist of 4 or 5 courtyards and was very elaborate.

Mr Duan also remembered that when they levelled the threshing ground behind his house, they found an old furnace. We had a look and indeed found the remains of hardened and burnt red soil, apparently of a separating hearth.

Afterwards, Mr. Duan took Yuda to see the Jinhe Temple. The Hygiene office was built on the temple grounds, a row of 5 rooms, about 15 m wide. The building was obviously erected on the old foundation. There was a single pillar base left, with a diameter of about 45 cm, and 7 to 8 steps with a drainage channel, overgrown and not easy to discern. The floor tiles were ornamented bricks, now used in the toilet. Behind the building no remains could be found. According to Mr. Duan there used to be a courtyard in front of the hall, with large trees, and many people from many places came to worship the Golden River Mother 金河娘娘. The area appeared to be of 300 to 400 m2, a small but probably finely executed temple.

Yuda also had a look at the slope behind the village, where slags and shatiao were abundant, showing that this used to be a smelting site.

According to oral traditions, the mine had its main flourishing period for 40 years and enjoyed prosperity for another 40, and is was people from other provinces who worked the mines.

The charcoal was mainly from Honglishu 红栗树炭 and transported on muleback. There were old charburning kilns in many places.

Mr. Duan had heard that silver ores of Malong had to be smelted with lead cakes that were brought from the Shiyang Mines at Ejia in order to extract the silver. He had not heard of a differentiation between old and new mines around Malong. According to Duan, slag dumps were largest around Malong village, Changdacun would come second, and there were comparatively few around the great temple. [Yuda, later on, Peng told us that this estimate was not correct.] Also, there were no mines around Changdacun. Mr. Duan therefore thought that perhaps the ore was carried there for washing and smelting. In the meantime, Mr. Peng took Nanny and the young officials to the heavily eroded ridge about 500 m NW of the village. On the path leaving the village, slags and waste rock was still abundant. The red soil area beyond is extremely erosive. The ridge reaches about 1700 m. Three small side ridges towards the village are covered in graves, mostly small structures that contain a stone pile. Many on the slopes have been entirely or partly washed down, many are just

recognizable by a few stones and some hardy small woody plant that clings to the rocks. Towards the top and to the eastern rim of the ridges, were the gradient is less and vegetation better, different sizes are discernible. Some A good number of graves had stone tablets, but some were made from sandstone and mostly effaced, and some were stolen, leaving only the standstone back. In the less eroded area on the eastern rim, different ages could be made out, with some graves buried at least 0.5 m, and perhaps up to 1 m deep, while the latest were on the surface.

Peng took Nanny to 4 graves with inscriptions, of which one had been lost since his last visit. The largest grave by far dated to DG 23 and its owner was a mine owner. Not for from this grave was another quite elaborate grave of which only the top lintel was still above ground appeared quite old. A double grave of a couple on another ridge was from the same period. And a small grave with just name and date apparently dated to the TZ period. On the way down, Peng showed me the remains of two small domed structures, diameter about 1.5 m, probably small charburning kilns, though possibly separation hearths.

We did not have the time to visit the site of the temples on the ridge above the village. But proceeded to the “New Mines”. A driving track got us over the ridge at a somewhat lower point. The slope descends straight to another arm of the Xiaoshahe. The slope appeared covered in waste rock. Peng stopped us about ¾ up the slope at a slight rill and told us that this used to be covered in a deep layer of slags. Further up the hill, the mining company was exploiting waste rock. A few hundred metres on, he stopped again at a few barracks. In the next easterly rill he again indicated a mostly removed slag dump. The dells were narrow and extended a long way up and down the slope, difficult to estimate the extent in the dusk. According to Nanny’s notes, the first was up to 40 m across and had a depth of up to 5 m, while the second was about 20 m across. The fields of waste rock extended over some 200 m in height and where the road or digging had cut into them the thickness appeared at least 5 m.

The local cadre told us that he had once worked for the mining company for 6 days. They now exploit old waste rock, which they treat in chemical solutions. The pond hold over 20,000 tons and is changed over every 2 months. They have been operating in this fashion for close to 2 years, processing several 100,000 tons. The amount of waste rock on the slope appeared hardly affected.

The site of the “great temple” was on the slope above Majiatian village, a mostly overgrown area. Bits ow wall were visible, but the dimensions could not be reconstructed. We were told that a flight of stairs used to lead all the way up from the valley bottom to the temple, some 3 m wide, and from the temple up the ridge to Malongchang village. Remains of smooth steps and stone walls in fact suggested a very large temple.

As it was almost 6 pm and dusk, we had to leave it at that. Dropping by the village government, ad returning to Shuangbai a bit past 8 pm. Dominik Brod had arrived in the afternoon and joined us for the remaining trip.

Results:

The scope of the exploitations greatly exceeded expectations based on the few available records. The huge amount of gangue is evidence of a long period of exploitation, confirmed by the large slag dumps. Due to the steep terrain, older slag dumps quite probably are covered under later layers of gangue. It appears probable that the slope above Majiatian was the main mining area of the Qing

period, while Malong was still worked but had shrunk in importance. Exploitation in the Ming period could not be ascertained but appears highly probable.

The Yeniu Mines 野牛厂 in Shuangbai District 双柏县

Nanny Kim, draft May 2018

Records and questions

Not much is known about The Yeniu Mines in the south of Shuangbai District. Two gazetteers of the Republican Period mention the site. According to the county gazetteer of 1922, exploitation ended about 1870, and an attempt by local gentry at reviving the mines in the early years of the Republican period was unsuccessful (同治末年停办，于民国初年地方绅首集资开办，折本而歇).[1]

According to the provincial gazetteer of 1949, the mines "flourished in the Daoguang period, when the numbers of workers exceeded 10,000." The site was abandoded during the civil wars and an attempt as resuming the exploitation in the Republican Period failed. (野牛廠在道光旺時人工在萬人以上因咸同兵亂亦停民初恢復開辦因折本復停).[2]

Place names appearing on various maps are Yinniu 银牛 (Silver Ox), Laochang 老厂 (Old Mines) and Yinjiangcun 银匠村 (Silversmiths' village), suggesting historical mining on some scale. The fieldwork was undertaken without expectations, hoping to find comparative materials for further assessment of the Shiyang and the Malong Mines.

Fieldwork by Yang Yuda and Nanny Kim, with Dominik Brod, 27 November 2016

Supported by: Mr. Pu Shunyong and Mr. Luo Xingfu, local officials of Yeniu village

Main informants: Mr. Pu Shunyong 普顺勇, director of the village government, Mr. Pu Zhengfu 普正富 of Yeniu village, Mr. Li Zhengchang 李正昌 of Laochang village

To avoid a road closure about half-way to Yeniu, we had to leave early. We left Shuangbai at 7 am and reached Yeniu village shortly after 9 am. The higher ridges were shrouded in mist and part of the day was cloudy. Yeniu village sits at about 1660 m high up under a forested ridge. The slope steeply descends from the village into a narrow valley at under 900 m. The first descent to the next little terrace on the slope, however, is only 100 m. The river below is the Liuzhijiang 六支江, which joins another of the many upper arms of the Yuanjiang/Red River.

Director Pu Shunyong received us at the village government building in the lower part of Yeniu. Born in 1963, Yi nationality, and very tall (ca 1.85 m), Director Pu had served in the army for four years. He was friendly, had an interest in local history, and readily switched between dialect and nearly standard pronunciation. We forgot to ask whether he also speaks Yi. He was well-informed and had been around the area with all geological and mining surveys.

Mr. Pu told us that Yeniu used to be called Yinniu 银牛, but right after liberation the geographers misunderstood the local pronunciation and that's how the name got changed [Nanny: this ppears likely, but the misunderstanding would have occurred earlier, as the name had already changed to Yeniu by 1922.]. He explained that silver used to be worked at two sites, around Yeniu, which is also called Changjie 厂街, and at Laochang. The ores used to be worked for silver, and the mines used to have to pay 3 packhorse loads to the emperor each year [Yuda: this would be some 6,000 *liang*, which would indeed indicate a high productivity. Nanny: pack horses carried about 72-90 kg, i.e. 60-80 kg of silver without packaging.]. Up to 15,000 men worked in the mines. There is a lot of gangue that was extracted from the mines. The village itself is in fact built on gangue. A company from Hunan had opened six new mines but extracted ore of very low grade only. The operators took to processing old gangue instead and made 20 million Yuan from concentrated ores discarded with gangue. His own

[1] *Mochu xiandizhi* 摩芻縣地志 (Gazetteer of Mochu County), compiled by Wang Guodong 王国栋. Orig. 1922. Reprint, Chuxiong 2014, 19.
[2] *Xinzuan yunnan tongzhi, juan* 64, 7a.

truck team transported 200,000 tons per year. At the time, the company employed 2 truck teams, the other team had 20 trucks, his had 30, but the other team started work almost a year before his joined. Altogether Mr. Pu reckons that over 500,000 tons of discarded ores were removed.

He also detailed that the administrative village Yeniu has 907 inhabitants, and 38 km^2 of the total area of 78 km^2 are mining areas. Most inhabitants are Yi nationality, Laochang is the only Han village inthe administrative village area. There were old slags noear both Changjie and Laochang. In addition, there were graves near Da'aozi 大凹子, among these a Jiaqing period (1796-1820) grave is said to belong to a mine owner.

Mr. Pu suggested we first look at the sites near Yeniu and then go on to Lachang. He first took us to a slag dump to the west of the primary school at Caiyuan 菜园, no longer a village, under 2 km east of Yeniu. The site is a small dell in the slope around a bamboo grove. According to Pu, some 1000 tons were removed here; and the amount of slags shipped from Laochang would be about 5000 t [Yuda: informant at Laochang later stated that the amount was only 2000 t]. The remaining layer of slags is up to 50 cm thick. The dump extends over 30 to 50 m across and some 15 height metres. Mr. Pu picked up some bits of glazed soil, clearly part of a furnace wall. There was no known mine nearby, but several entrances were on the slope behind Dawafang 大瓦房, one of which was called Bainiandong 百年洞, and the highest Dachangqing (?). further up the slope now still almost in the mist. A large mine entrance was a long way below, near the bottom of the slope, called Daxuedong 大血洞.

Director Pu suggested we walk on to the mines near Dawafeng, the next village to the east. A short way out into the forest, he showed us a large mine entrance, about 2 m across and 1.5 m high, leading gently down and branching into 3 adits almost immediately. The gangue heap in the forest outside the mine was not extensive. Another, disturbed by recent test excavations was some 20 m below and a bit to the west in a rill. According to Pu, some 2000 tons of ore had been shipped to Yao'an in the course of the "test," which then had been stopped. Below the villages, the terrain descends increasingly steeply, furrowed by many small brooks that converge in the stream below.

There was a temple site in the upper part of Wafang. Amongst some unkempt old graves two earth walls, only about 4 m apart, were still standing. The site appeared to be no more than a village shrine.

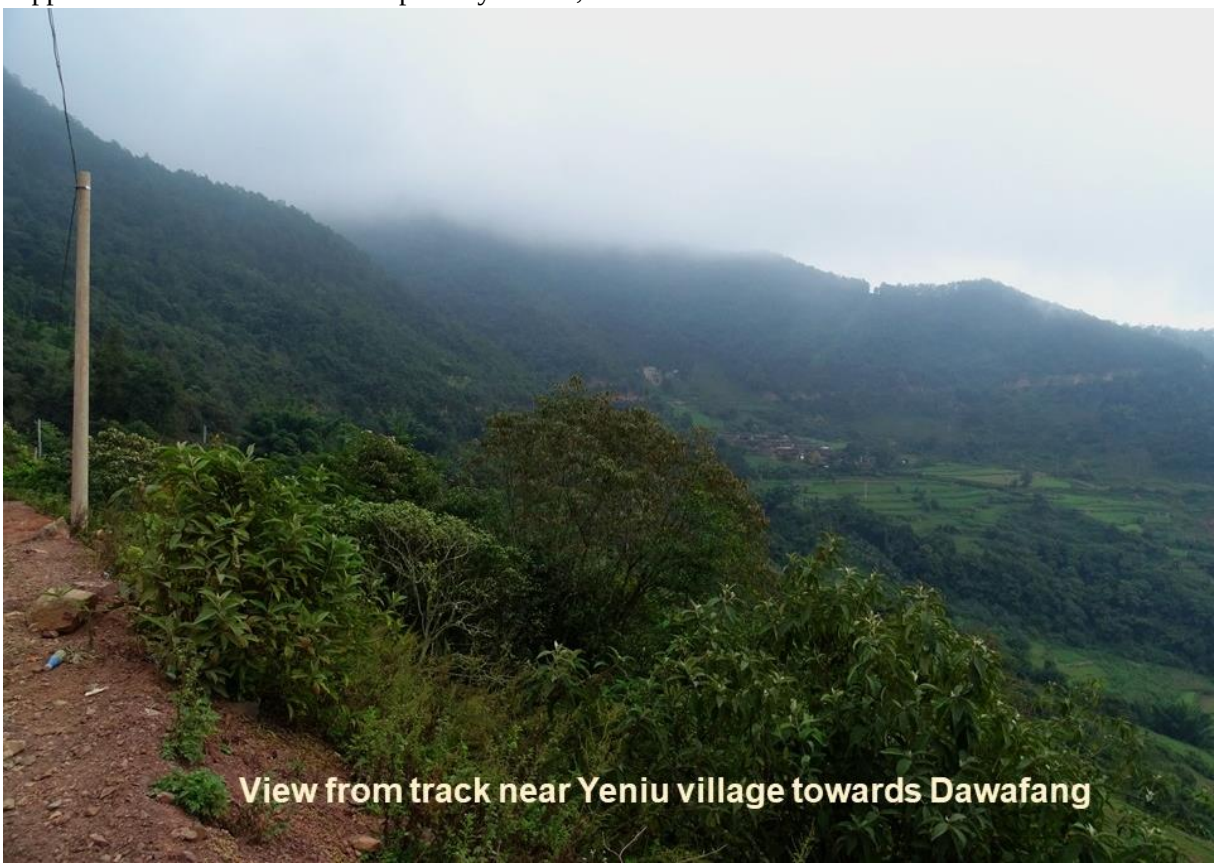
Director Pu then took us to the Bainian Mine, which had been recently re-exploited by the Hunanese company. After the gallery that followed the old mine had caved in inside the mountain, the company had driven in another mine about 70 m to the west, which joined the other gallery some 70 m into the mountain. Exploitation had however been abandoned, as the metal content was too low. The company had taken to re-exploiting old gangue. The partly dug up gangue heap outside the mine were still extensive. Director Pu told us that the mining boss now offers a prize of several thousand Yuan for locals who can show him any old mine, yet none had been found so far. The situation indicates that ores extracted by modern mining from old workings or from deposits in the vicinity of old workings in fact have a lower metal content than the historic gangue. Both the Bainian Mine and the mine further up on the slope used to consist of two galleries on top of each other. Director Pu explained that the lower one would have been the drainage gallery [presumably the interpretation of the geological team].



Mr. Pu Shunyong 普顺勇 with Yang Yuda above Yeniu village

We walked back to Yeniu to see the site of the "great temple" (damiao 大庙), now just above the

village in the forest. There were tiles and pieces of brick but remains were insufficient to distinguish the dimensions of structures. According to Mr. Pu, the temple had been demolished in 1958, and a copper bell had been taken to the primary school, where it was still in use when director Pu attended it.



View from track near Yeniu village towards Dawafang



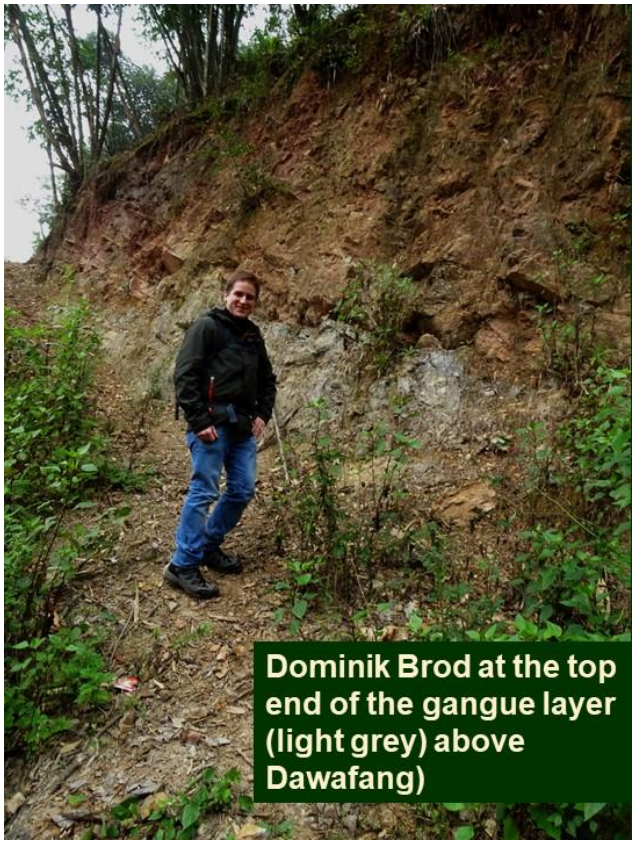
View from Dawafang towards the school at Caiyuan and Yeniu village (in the clouds)



Old mine near Dawafang, opened in recent trial mining



Mine entrance on slope above Dawafang



Dominik Brod at the top end of the gangue layer (light grey) above Dawafang)



Entrance of Bainian Mine and gangue dug up for re-smelting



View from slope at Bainian Mine onto Dawafang village



View into the valley from the lower end of Yeniu village





Site of a temple at the upper end of Yeniu village

We returned to the village administration, where director Pu had invited Pu Zhengfu 普正富, born in 1947, who formerly was the village blacksmith. Communication was somewhat difficult, as Yuda's questions had to be translated into local dialict to Mr. Pu, and not all of his answers were understandable, even to Yuda. Mr. Pu was eager to tell us what he knew, even though he was frail.

Mr. Pu stated that his ancestors had come to Yeniu some 2 to 3 generations ago, to work in the mines. Form the geologists he had heard the composition of the ores was complex, containing silver, copper, lead, tin and zinc.

According to tradition, the mine exploited the leg of a silver ox. At first, searching for this leg remained unsuccessful for a long time, but the miners eventually hit it in the mountain above Yeniu

village. The mining boss had a dream of a silver ox, and heard a voice telling him that he had to fix one leg and one horn in place with two [unidentified objects] 两根肋巴, so that it could no longer run away. So he assembled a great many men for working the mines. A genie in heaven heard about this, and sent someone to sell peaches 蟠桃 outside the mines. The young miners could not resist and came out, while the older ones were less greedy and stayed at work. When all peaches were sold, the seller lifted her carrying pole, and in turned to leave, she vanished. At the same time, there was a great grumble underground, and the mine collapsed. Everyone still inside was killed, and for seven days and seven nights, blood and water spurted out from the thicket under Changjie. The spot was later called Dashuixue 大水血.

In about 1952, when Mr. Pu was still a young child, an old man, who was his grandfather's generation and about 80 at the time, knew all these stories. It was handed down from generation to generation that the silver ox was buried here.

Mr. Pu explained that formerly old slags were mostly found to both sides of the spot where the administrative building now stands. They were carried to Caiyuan in 1958 for re-smelting for lead. [Hence the remains of furnace walls ween there would be from the traditional lead-smelting furnaces used during the Great Leap.]

Mr. Pu also remembered that there used to be a Caishen temple on the road to Shuangbai, where people still worshipped when he was young. The deity of the "great temple" was for the God of Ores 矿神, and there used to be a statue of a silver ox, as well as a copper bell.

Upon being asked about the roads before motorization, Mr. Pu said that the road went around the ridge (岭岗). Because of the mine on the ridge, traffic had to pass around. The southward road descended from Caiyuan.

Yuda asked Mr. Pu which ores were the richest. He stated that would be the lead ores of the Bainiandong were the richest. Back in 1858 prisoners were made to mine there.

Mr. Pu also stated that the lead mine consisted of 2 stories, the upper gallery was worked for ore, the lower served for ventilation. The upper gallery was larger than the lower.

It was said that when exploitation was flourishing, the miners consumed 7 pieces of cattle a day. As soon as you approached Dawafang, you would hear the din and the voices.

Past the Bainiandong on the other side of the ridge there was another mine, the 打厂箐, but there were no slags there.



Mr. Pu Shunyong and Mr. Pu Zhengfu 普正富 in conversation

We had lunch at 12:30 and proceeded to Laochang.

Leaving Yeniu northwestwards, Director Pu stopped the car at the first bend, where the track was dug into the gangue. Pu pointed out that this material, with an average diameter under 1 cm was found everywhere. In places where the track cut into the mountain flank for 4 to 5 m, it was still in the gangue layer. Looking over the Yeniu slope, director Director Pu explained that this entire slope consisted of gangue. When they had the new village government building built, anchoring holes were drilled for the foundations, but the usual machinery could not reach solid rock. In the end, a company from Henan drilled 30 m deep and still brought up the same material. The entire slope, to the next level 100 m below is a gangue field. The same probably applies to Dawafang and Caiyuan. Director Pu added that the mines that produced all this material have not been found. You would expect them in the wooded slope just above, but despite the prize, nobody has been able to find them. [Yuda: Conservatively assuming an average thickness of 5 m, the gangue heap of Yeniu would amount to several 100,000 m^3.] The Hunan company has processed about 500,000 tons without leaving much of a dent.

At the shoulder of the ridge, the gangue field ended.

On the forested ridge, at a place called Da'aozi 大凹子, the pine forest is dotted with graves. The area is also called grave mountain 大坟山. Director Pu stopped for the aforementioned grave of the Jiaqing period but the stele turned out to be lost. Someone reportedly stole the marble plate to use it for a grave of their own family. Upon asking whether this was not highly unlucky, director Pu confirmed that it was, and in fact three members of that family died one after the other soon thereafter. Looking around produced a single grave with a legible inscription, dating to QL 15 (1750). The grave owner was from Hengyang in Hunan.

Director Pu mentioned that in addition to this grave mountain, there was also a Muslim graveyard near Changjie with even more graves, but none of the graves had inscriptions.



Nanny at the upper end of the gangue layer just west of Yeniu village



A grave with a still legible stele


Graves in the forest at Shangda'ao

Upon entering the Laochang valley, the village itself remained out of sight. In the fields near the forest edge, we met a group of people. One of them was Li Zhengchang 李正昌, born in 1966 and from Laochang, whom director Pu had contacted. The car had stopped where the road turned around a sharp shoulder into the Laochang valley, there was a strip of fields reaching some way down near the shoulder, while most of the slope to a rill was abandoned, mostly overgrown by weeds and small bush. The place was called Laotianjia 老田家.

Mr. Li had organized the selling of slags at Laochang. It turned out that he had also worked in the transporting of slags at the old Shiyang Mines. Mr. Li told us that the mines were older than the village. He also knew that the slags at Caiyuan were carried there on muleback in 1958 for smelting.

Mr. Li stated that he had sold 1000 tons of Caiyuanzi in 2002, some 500 of the slope below the spot we were standing on, and some 1500 from the wasteland of the old temple site (庙后荒地). At the time, he made 1000 Yuan per ton, which he considered a very good price. They only collected glassy slags, not the dull or bubbly type. Metal content [presumably of lead] was around 17%. Mr. Li had also sold some 50 tons of copper slags from a different site north of Laochang.

Mr. Li had heard that in the old times the mines had been operated by a family by the name of Tian 田 from Yimen. The graves on Dafenshan were graves of miners, and the mines supposedly were 300 years old. In the old days they had been worked for silver and lead. There used to be a market street in front of the old "great temple" 大庙, where the miners of Yeniu came to market.

Mr. Li took me down the slope to show the slags. We descended some 40 to 60 m. He pointed out that the glassy slags were the ones that he sold, while the dull ones found higher up were low in lead and not wanted. Mr. Li explained that the slag layer extended under the fields, but was under the soil. On a tiny saddle down the hardly perceptible ridge he told me that the slag layer used to be up to 2 m thick, and he figured there used to be a furnace operated here. The slags in this spot were glassy and thickly packed. He pointed to the line of trees across the rill to the SW and stated that the slags extended from above the driving track to the brook north of us to the trees on the small ridge we were

facing. Later on director Pu and others confirmed that slags extended all the way down that slope. The total height would be around 150 m.

Mr. Li also took me a short way along the slope north of the brook, which was also unused, but steeper and all covered in gangue. He told me that the gangue extended from the forest all the way down. He showed me the trail that he still used when he carried the slags to the village on muleback in 2008. A good mule could carry 300 jin (150 kg), within half an hour they would get to the village. The driving track above was built since. Mr. Li pointed out a mine entrance and a heap of whitish rock, telling me that a Hunan mining boss had operated this mine in 2012 and that the ore contained silver. The mine of 2012 followed an old gallery.

On the way back, Mr. Li told me that his family had come to Laochong 6 generations ago and that mining had ended by the time that his ancestors arrived. In present-day Lachang there were no descendants of former miners any more.

Mr. Li knew that the place of the turnoff to Shuangbai is called Guanting 官厅, which means that the people had to organize the reception of officials there.

We drove on to the temple site on a small shoulder just above the track. Remains of foundation walls in the young forest and small bushland could be found, but the dimensions are impossible to establish. There were indeed a great many “copper plants” (铜草) and slags, which formed a firm, not really thick layer on top of gangue.

We drove on to Laochang village, which sits on a small knob down a steep slope, at about 1500 m. It consists of some 30 households. The village faces almost due north and for this reason remains out of sight from the south. We spent some time in Mr. Li’s courtyard, mostly confirming information.

Concerning Muslim Chinese in the mines, director Pu thinks that in the Qianlong period, Muslims were suppressed and made to work in the mines. For this reason, Huimin became the majority of miners.

Mr. Li noted that on the other side of the ridge at Banliyuan 板栗园 [site unidentified] there are also 3 mine entrances.

Responding to the question which mine they consider the largest in Shuangbai, Mr. Li told us that he worked in the Old Shiyang Mines in 2008, selling about 210 tons of slags there, at 500 Yuan per ton. At that time, the slags there were mostly all dug up already. He had not been to the other mines, so he would not be able to compare. He knew however, that the metal content in the slags of the Baima Mines at Dashahe 大沙河白马厂 [site unidentified] was particularly high. The slag dump was not large and by now would be mostly gone. The site was 10 km from Yeniu as the crow flies.


The slope of Shangda‘ao

Asked about the route south, he said that you descended to Pingdicun 平地村, and that there were old mines there, too.

Returning to Shuangbai, we could take a more direct road north out of Laochang, as the roadworks were finished for the day. Our informants showed us a grinding stone that villagers had found on the gangue-covered slopes. It was fairly rough and had been used from two sides, quite probably for grinding ores.

Director Pu and Mr. Li also took us to the small dump of copper slags near the driving track about 1 km along the track to the north of the village in the forest. The dump appeared small and not deep.

Director Pu continued to a road construction site, we returned to Shuangbai.



Site of the "great temple" 大庙 and remains of a wall (in the clump of bushes)



Valley of Laochang (village hidden behind the side ridge)



Mr. Li Zhengchang 李正昌 at the wasteland behind the old temple site (庙后荒地)



Slags at the old temple site

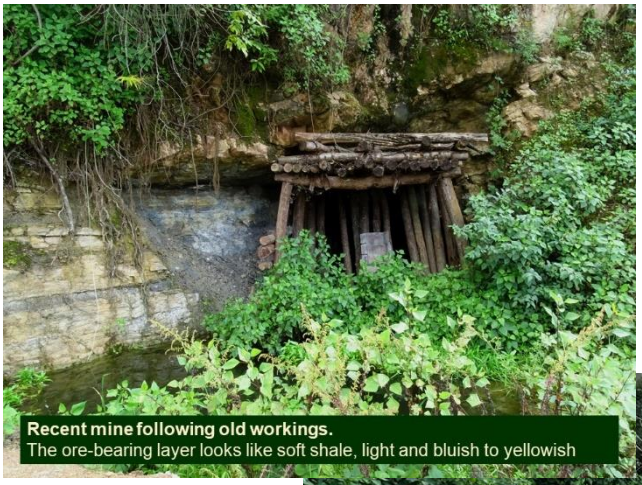




Porose slags of poor lead content on the upper art of the slope and glassy slags of high lead content of the site that Mr. Li mainly exploited



View down the slope covered in slags and gangue
Laochang village is behind the small side-ridge in the midground. The slag area covers the bushland to the rill and the fields to the stand of trees to the left.



Recent mine following old workings.
The ore-bearing layer looks like soft shale, light and bluish to yellowish



The wasteland behind the old temple site (庙后荒地) on a small protrusion overlooking the slope covered in slags and gangue.

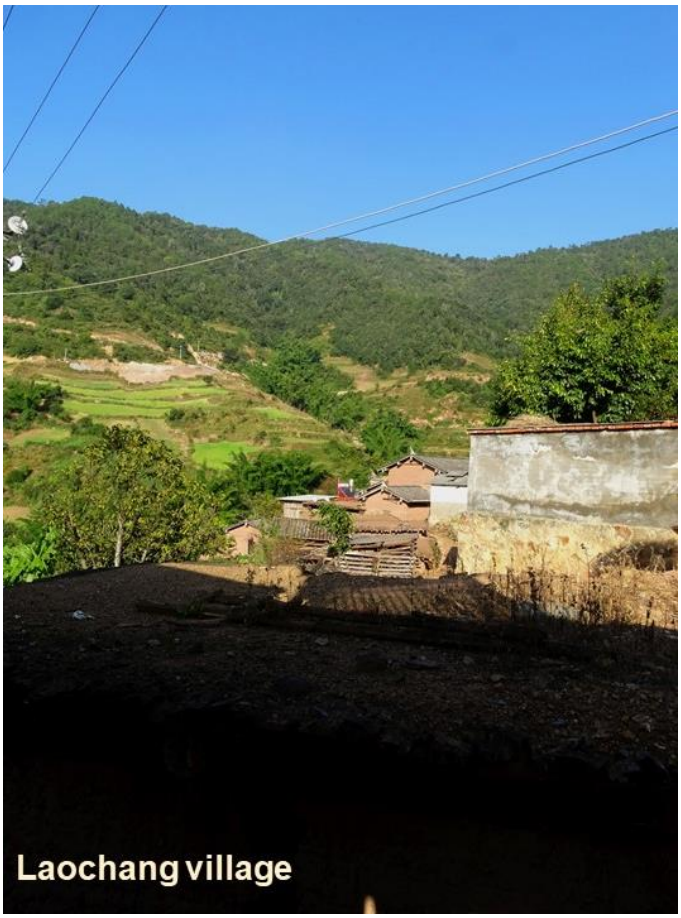
“Copper plants” (铜草)



View southeastwards along the slope of slags and gangue from the temple site



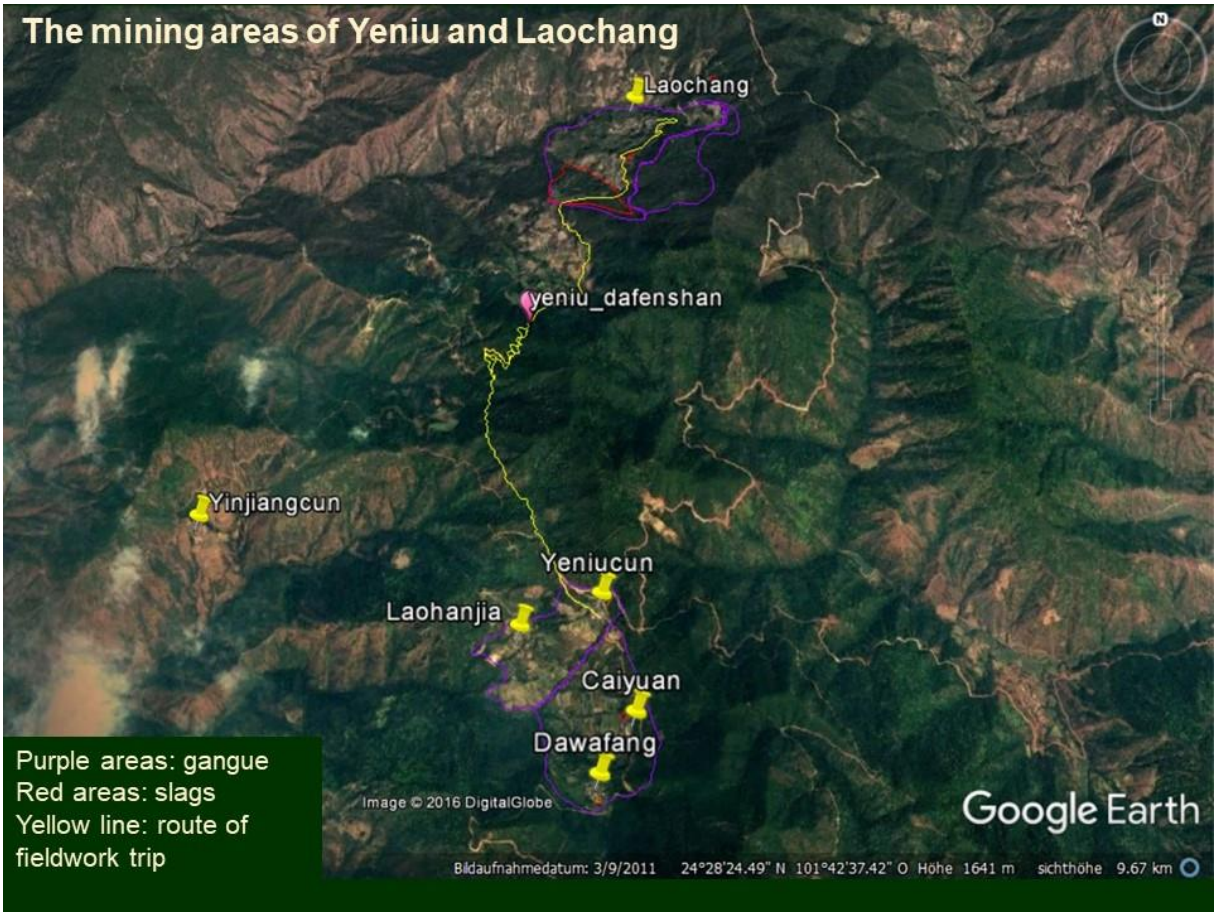
Gangue

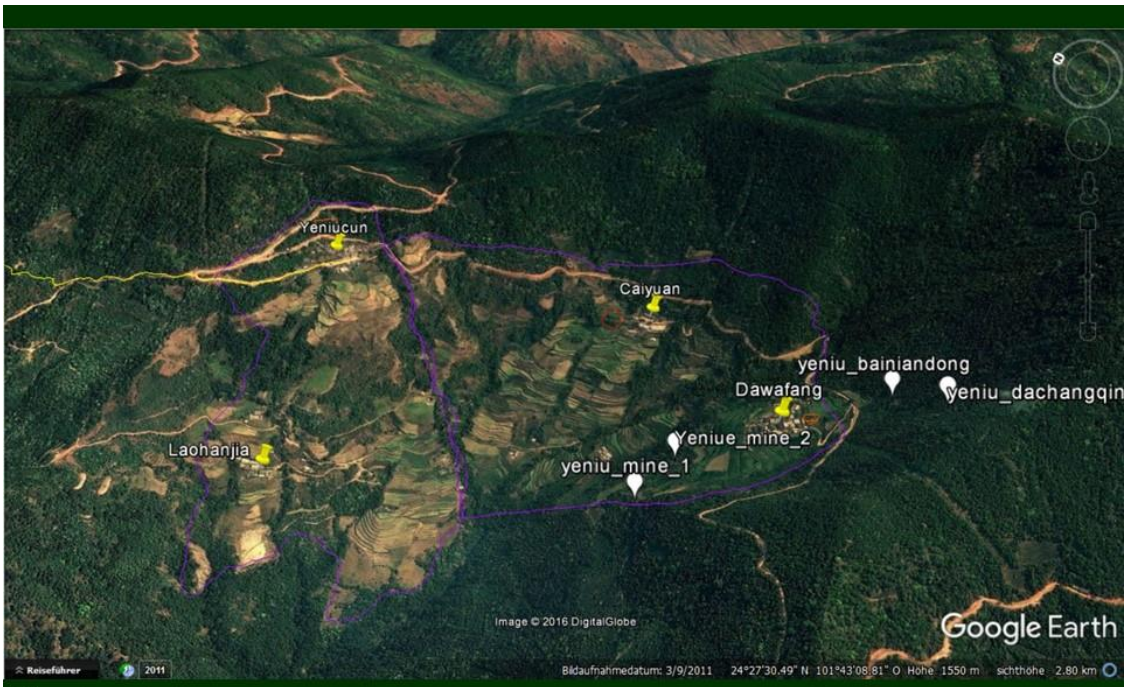


Laochang village

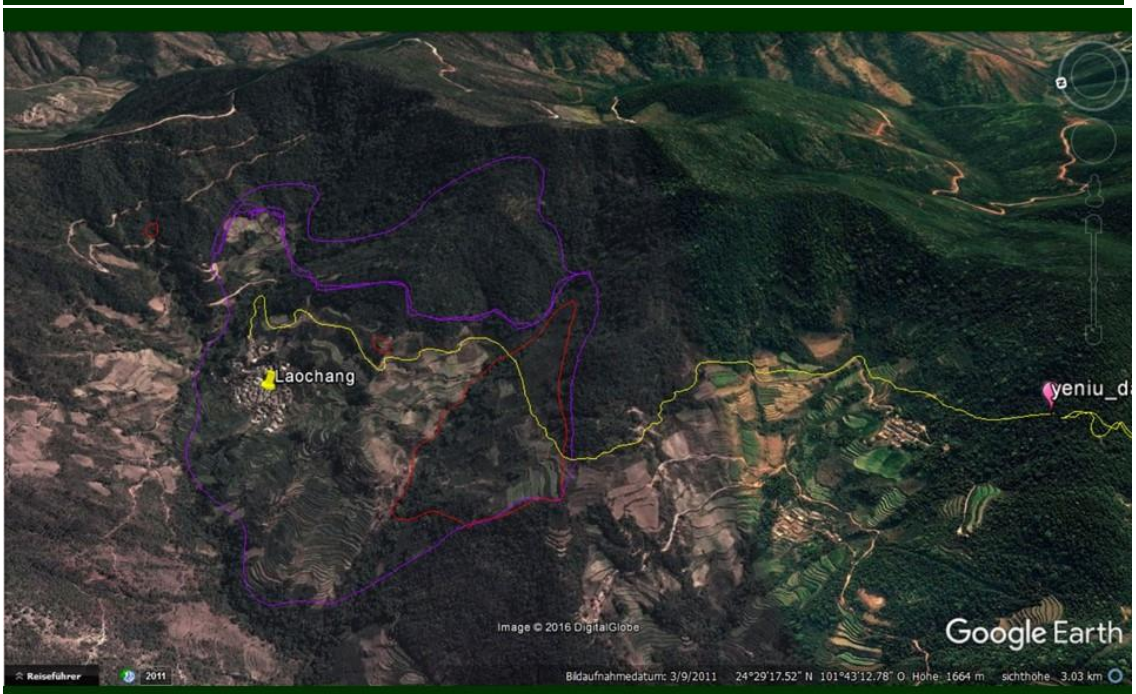


Grinding stone at Laochang village, found in the gangue heaps





Yeniu mining area
Red areas: Slag dumps
Purple areas: Gangue heaps
Yellow line: route of fieldwork trip



Laochang mining area
Red areas: Slag dumps
Purple areas: Gangue heaps
Yellow line: route of fieldwork trip

Results:

The thickness and the extent of gangue heaps that cover entire slopes are evidence of long and large-scale exploitation. The scarcity of known workings suggests that much of the gangue was produced a relatively long time ago. The unsuccessful hunt for historic workings at Yeniu and the fact that few mines are known at Laochang also reflects that these workings were lost, covered by later mining, or

collapsed and hence that the main exploitation ended several centuries ago. The scarcity of oral traditions and of temple remains point to the same direction.

At the same time, oral traditions positively confirm that the sites were still worked in the early 19th century. It appears probable, that mining was revived, possibly at Yeniu only, concentrating on the still known workings that enter the mountain slope below and above Dawafang at an almost level angle. The slag dumps near Yeniu that Mr. Pu remembered would have been on top of the gangue layer and hence produced by activities that date later than the ones that produced the gangue. In this case, the slag dumps of the earlier period of exploitation at Yeniue would be expected on the lower ledge near Daxiedong or would covered under eroding lag layers. The situation at Laochang is relatively similar, although the thickness of gangue and slag layers is more uncertain.

The amount of known slags is relatively small, out of relation to the amount of discarded material. On account of the steep terrain it seems probable, that the known slag dumps are the results of late stages of exploitation, while the older dumps would have been covered by eroding gangue layers descending form the higher slopes. The presence of copper slags relatively high up on the slope above Laochang suggests that copper exploitation was a late development in the mining area.

The silver and zinc mines in the Luozehe valley south of Yiliang 彝良
The Old Yiliang Zinc Mines 老彝良鉛廠?

Nanny Kim, draft May 2018

Records and questions

The Qianlong gazetteer of Zhenxiong 鎮雄州志 (1784) records only a single mine for the department, a lesser copper mine named Changfapo 長發坡 that had a tax copper quota of 11,000 to 12,000 jin (6.6-7.2 tons).[1] *Diannan kuangchang tulue* records two mines. In addition to the Changfapo copper mines, it lists the Tongchangpo 銅廠坡 silver mines, 300 li west of the department city of Zhenxiong, between the Changfapo mines southwest of Niujie 牛街 and the copper and zinc mines 老彝良銅鉛廠 of Old Yiliang 老彝良.[2] The mines were opened in 1794 and fulfilled a tax quota of 1119 *liang*.

The Guangxu gazetteer of Zhenxiong 鎮雄州志 (1887), notes an old tradition of silver and copper mining in the area, and adds some details on the Tongchangpo and the Old Yiliang mines. According to this source, the Tongchangpo silver mines were opened in 1794 (乾隆五十九年), with the tax quota of 1119.398 *liang* set in 1800 (嘉慶五年), while the Old Yiliang zinc mines 老彝良鉛廠 were opened in 1802 (嘉慶七年) and had a tax quota of 540 *liang*. Both mines were long abandoned by 1887.[3]

The provincial gazetteer of 1949 records Changfapo and Tongchangpo, noting for Tongchangpo that these silver mines were abandoned during the civil war period.[4]

From the official records, we thus know of three mines in the western part of Zhenxiong, which apparently were in relatively close proximity, and worked copper, silver and zinc. The tax rate of over 1000 liang (370 kg!) indicate an important mine or high hopes raised during a (perhaps short-lived) bonanza.

None of the sites are securely localized, but Changfapo southwest of Niujie is with fair probability at Huaguangwan 湖广湾 village just under 60 km by road southwest of Niujie.[5] The localization of the other sites is difficult, as place names suggestive of mining, especially of silver mining, abound in the area between Yiliang and Niujie.

Francis Garnier (1839-1873) and Louis de Carné (1844-1870/71), who travelled through northeastern Yunnan in April 1868, heard of formerly extraordinarily productive silver mines in the vicinity of the confluence of the Daguanhe 大关河 and the Luozehe 洛泽河 a short way north of Daguan.

Garnier records that a larger river joins the Ta-kouan ho (Daguanhe 大關河) a short way downriver of Kouang-ho-ki (Huanggexi 黄葛溪), recording it's name as River Co-kouy (Gekuihe 戈魁河[6]) joins the 大關河. He adds that it runs through a country rich in metals: "The mines of silverized lead at Sin-cai-tsé (probably 新街子, or possibly 新寨子) are famous throughout China. Before the war, these mines employed over 1200 men just to work the drainage pumps."[7] De Carné records the same information, adding that the mines were "situated eighteen miles from Coqui (Gekui 戈魁？), and near Tchao-Tong (Zhaotong 昭通)."[8]

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[1] Zhenxiong zhouzhi, QL ed., juan 3, 1004.
[2] 滇南矿产图略，卷下，102: 銅廠坡廠在昭通府鎮雄西三百餘里，牛街西南介長發坡、老彝良銅鉛廠之中。鎮雄州知州理之。乾隆五十九年開，每銀一兩抽課銀一錢五分撒散三分，額課銀一千一百一十九兩餘。
[3] Zhenxiong zhouzhi, GX ed., juan 3, 1159.
[4] Xinzuan Yunnan tongzhi 新纂雲南通志, *juan* 64, p. 5a.
[5] E 104.35017522899717, N 27.694241274332725.
[6] Daguan xianzhi 大關縣志 records this river and permits the identification as the Luozehe.
[7] Garnier 1873, 619-620. Translation from French by Nanny Kim.
[8] de Carné 1877, 244. Translation from French by Nanny Kim.

Garnier and his team had no knowledge of Chinese but were joined by père Leguilcher from Dongchuan, a missionary who had been based in northern Yunnan but left because of the civil war. Leguilcher certainly had good command of spoken Chinese and presumably transmitted the information on the mines. Their location, is uncertain, as is the identification of both Gekui and Xinjiezi (?). The specific information on the great numbers of men working the drainage pumps and the fame of the mines still remembered as recent but past is particularly interesting.

Émile-René Pourias, (1843-1884), a missionary who lived in Yunnan since 1868 or 1869, based in Qujing until 1876 and later in Dongchuan, also records mines in the region. He writes: "Ko-kouy is a large market town 18 leagues from Zhaotong. Just a few years ago it was still flourishing, but it was burnt and ruined during the revolt of the Miaozi in 1866. 60 li from the market town are the silver mines Changfadong, formerly rich and exploited on a vast scale, today abandoned following the upheavals that lately ravaged the country. Quite close to Gegui and still visible are copper mines, which are also abandoned and unproductive."[9]

The difficulty with he information on the distance between Zhatong and Gekui (?) is the length unit. The leagues could be used to reflect the Chinese li or roughly 0.5 km, the old French league of 4.2 km or the metricalized league of 4 km. The distance of 18 li from Zhaotong appears improbably close, moreover distances in traditional Chinese sources are commonly given in rounded figures. The 18 leagues therefore presumably refer to a distance that is presumably based on Chinese records translating to between 72 and 80 km. In this range, modern Yiliang is the most probable candidate.

The name Tongchangpo indicates an older copper mine that might have been on the same site or in the vicinity. The name appears in the context of the war campaign against Wumeng in 1726. In reporting on the march of the troops led towards the Zaotong Plateau by Hayuansheng 哈元生, E'ertai mentioned both Gekuihe 戈魁河 and Tongchanggou 铜厂沟, specifying that several hundred barbarians were captured alive at Tongchanggou. The Chinese name and the apparent ease of progress could suggest the presence of a Han Chinese community. The identification of the Tongchanggou mentioned in 1726 and the later silver mine is not entirely certain, but probable. If the sites were the same of in close proximity, we would expect Tongchanggou to be located between Kuixiang and Luozexun (now Luozehe), as this was the army route that later became a copper transport route.[10]

On the basis of the official records and the French accounts, fieldwork in the area around modern-day Yiliang and near Kuixiang appeared most hopeful. Modern maps show two villages by the name of Tongchanggou 铜厂沟, some 15 km south of Yiliang and some 25 km northeast respectively, but no Tongchangpo. Place names that indicate silver mining are Yinchangwan 银厂湾 and Xinzhaizi 新寨子 (possibly the place mentioned by Garnier and de Carné) in the Luozehe valley some 5 km downriver north of Yiliang, Yinchangwan 银厂湾 and Yinchangpo 银厂坡 near Longjie some 50 km southeast of Yiliang and under 20 km northwest of Kuixiang, and some five names strongly suggestive of silver mining near Wanchang 碗厂乡, almost 80 km east of Yiliang, including Yinchanggou 银厂沟, Guanfang 官房 and others.

Fieldwork by Nanny Kim, Li Xiaocen 李晓岑 and Liu Peifeng 六培峰, 6-7 October 2017

Supported by: Ding Changfen 丁长芬, director of the Zhaotong Museum, Mr. Lu Hanyun 禄汉云, retired member of the Relics Office of Yiliang

Main informants: Zhu Renwen 朱仁文 (aged 71) of Tongchanggou 铜厂沟, Mr. Yin Fuzhang 易富章 (aged 68) of Huangmukuai, Mr, Zhu Kuaiyou 朱快友 (aged 64)y of Zujiaying, Mr. Liu xx 刘 (early 50s) of Erpingzi)

[9] Pourias 1892, 136. Translation from French by Nanny Kim.
[10] See Kim, Mountain Rivers (forthcoming).

We met Mr. Lu at 8 am. He was in poor health but pleased to share his knowledge. He started off with copper mines, stating that there were numerous sites, none of which were important, and in many cases identified only by the place name with no known remains. He also mentioned some graves (location unclear), and a silver smelting site near the Mining Plant. He contacted Mr. Zhu Renwen to take us around and guided us to the latter's place.

Zhu Renwen 朱仁文, 71 sui, born in the year of the dog, Miaozu, from Tongchanggou mainly knows about Tongchanggou. He confirmed copper smelting sites and workings, several of 1958 and the Republican period, one of the Qing, but no known temples. His wife arranged for what turned out their son-in-law and daughter to drive us. After a while and after having breakfast they turned up with a very new and large car.

About 10 am headed off for Tongchanggou. Drove south on the east bank of the Luozuehe. Stopped once shortly after Xinchang 新场 to point out remains on the slope west of the river (Nanny forgot what remains).



The Tongchanggou valley. With the Luozehe on the left and Zhongzhai village well visible east of Tongchanggou, with the abandoned village on two ridges above.

Continued past Maoping 毛坪 (Luozehe 洛泽和镇) and turned into a track into a small eastern side-valley. Mr. Zhu could give no name to the stream in this valley. Driving about 5 km up, he stopped several times to point out sites of mining and smelting of 1958 and a gallery worked during the Republican period.

At a barrier, we had to leave the car within sight of Zhongzhai 中寨 village. The valley continues to ascend fairly steeply. Zhongzhai 中寨 is a Miao village, with only 1 Han family by the name of Yang. The old lady was in, but her husband had gone to Kunming. The village had been moved from a nose further up that had become unstable only a few years ago. About 1 km above the village and just past the abandoned village, the valley forks into a nrothern and a southern arm. Just into the northern arm and where a small side-stream descends from the north, we came upon the spot of old slags. Partly reddish and very glassified. Thickness of layer unclear, but probably within 30 cm, extending about 8 m along the trail. The slags are visible

on the walking trail only. Nothing to be seen in the terrassed maize fields, ca. 1-1.7 m above the path, or in the small stream about 4 m below. The steep overgrown slope between the path and the stream could not be checked.





GPS measurements by Peifeng: N 27° 32.1305, E 104° 01.9326, 1258 m

Li Xiaocen and Zhu Renwen at the copper smelting site and exposed slags in the path.

Some or most of the site might have been covered by soil under the terrassed fields or eroded down the valley. Nevertheless the site appears small. The gallery may or may not be connected. Locals have no knowledge about this mine, therefore date it to the Qing. In fact, any date before local memory is possible.

Found a gallery going some 15 m into the rock at the east of the stream, only some 50 m from the smelting site. It was unknown to Mr. Zhu, but appeared recent to Nanny.





Mining gallery, entrance and interior. Photos by Liu Peifeng.

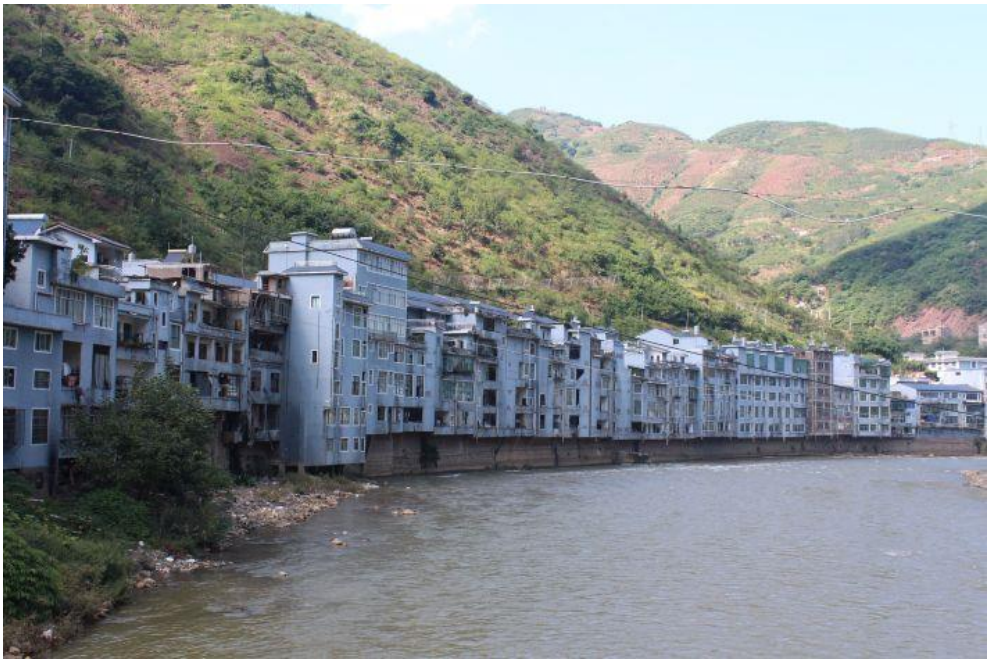
On the way down went by Tongchanggou village. No new information.

Drove down to Maoping, and we decided to go on to the mining plant, rented a car from Maoping, departing about 3 pm



View down Zhongzhai village from Zhongzhai.

Maoping town on the Luozehe.



Liu Peifeng eventually managed to hire a car and we headed out about 3 pm. The plant turned out to be a good 5 km further up the Luozehe valley, on the eastern slope. Asked a fellow around 60 sitting at the single house at the roadside right opposite the plant. He said that the old mines were Laomingcao 老明槽 on the eastern slope, high up on the very steep slope, and there were also mines up on the western slope above us, at Huangmukuai 黄木块 some 8 km along a driving track.





Above: Li Xiaocen on the slope above Zhujiaying facing the slope above the mining plant (Photo by Liu Peifeng).

Left: The northern end of this slope identified as Laomingcao ("old open workings") by informants.

We decided to try the Western slope. Drove up to Erpingzi 二坪子, where the concrete track ends and the track got too bad and narrow for the car. Upon asking for the way to Huangmukuai, some people mentioned slags that one of them had at their yard. The small heap definitely consisted of lead smelting slags. It turned out that they had bought them from Huangmukuai. Mr. Liu (ca. 48, a villager of Erpingzi who works part time at the mines) agreed to drive us up in his mianbaoche. Huangmukuai sits on the southern rim of an amphitheatre-shaped milder section of the mountain flank. Mr. Liu drove through the small village to a huge reddish zinc-smelting dump. He dates it to some 60 years old, because he is almost 50 and has not seen smelting. He had not heard about silver smelting. After ringing somebody, however, he pointed out some maize fields not far below. Also explained that the village on the slope north of this bay-like slope is Zhujiaying 朱家营. The zinc-smelting cones lying around were relatively large and therefore probably recent, but the size of the dump did not suggest recent exploitation. Liu Peifeng went back to the village to find more information, I followed but missed him, ended up asking an elderly man sitting in his courtyard right above the track with his little dog. Mr. Yi Fuzhang 易富章 (68 years old, the family came from Jiangxi 6 generations ago and has been involved in

zinc smelting since 5 generations ago) told me that the zinc mines would be at least 200 years old.



View across the zinc smelting dump onto Huangmukuai.



Remains on the zinc smelting dump: Debris in close-up; layer of debris with retorts in the upper layer; retorts.

Heading back to meet the others, I caught up with Peifeng, and we figured that we would make best use of the remaining daylight with one of us should continue talking to Yi Fuzhang, while the others looked for the silver smelting site. Peifeng met Xiaocen, while I stumbled past and right down to what turned out to be the silver smelting site. Asked an elderly couple harvesting maize, understood little of their answer but learnt that the mines and more smelting sites were at Guanyinshan beyond their village.

In the meantime, Peifeng had also met Mr. Zhu Kuaiyou 朱快友, 64 sui, of Zhujiaying, who knew about the silver smelting site etc. Caught up with them on the track.

Xiaocen came heading down to the smelting site with Mr. Yi Fuzhang, who was going to show us the silver smelting site. We all met and headed there, actually in the maize fields, with the elderly couple also joining. Decided to come back the next day.



Mr. Liu, a villager of Zhujiaying, Mr. Yin Fuzhang, Li Xiaocen and Liu Peifeng on the site of silver smelting slags below Zhujiaying.



View towards Zhujiaying from the zinc smelting dump. The track on the slope leads to Guanyinshan.




Lead/silver-smelting slags in the corn field below Zhujiaying.

Xiaocen's conversation with Mr. Yi Fuzhang (68 years old): Family from Taihe xian 6 generations ago, used to smelt silver, his father still smelted zinc and also some silver, he himself was not involved. The village is entirely Han, and mainly consists of 4 family names. They used to work the zinc (and silver) because salt was very dear, they would sell their zinc to Yibin and return with salt and other goods. When they needed to go to Yiliang, they used to set out before daylight and would be back home in after dark.

Mr. Liu drove us all the way back to Yiliang, which we reached at 5:30 pm.

2017.10.07 (Sat): Zinc and silver mining and smelting sites at Huangmukuai, Zhujiaying and Guanyinshan in Yiliang 彝良黄木块

Arranged with Mr. Liu of Erpingzi to meet again at 9 am. Got to the turnoff up to Erpingzi by public transport and walked up to Liu's house. Drove right up to Zhujiaying. Zhu Kuaiyou turned up from his fields, his wife, called an older relative (71 years old), who lives in the next house, more neighbours turned up Zhu's granddaughter, a couple of young guys, and 2 young children.




Conversation in the Zhus' courtyard, and a piece of oxidized zinc ore of Guanyinshan.

Zhu Youkuai and old Mr. Zhu provided the following information: Zhujiaying has about 300 inhabitants, with Zhu the almost exclusive family name. The Zhu family came from Beichong in Zhenxiong 5 generations ago. They are still in contact with the Beichong Zhus; the latter have a genealogy.

Both Zhu's had been professional zinc smelters, old Zhu for 40 years. They were vague about the silver smelting site, had never seen silver smelting, no furnaces, no shatiao. All they had

heard that silver was extracted from lead. They were very specific about zinc smelting. “Horse trough furnaces” were used that were loaded with 2 rows of retorts, 20 to 50 retorts in a row, filled with 20 kg of ore, ground to the size of a pea, and some additives. 1 retort would produce between 1.2 and 4 kg of zinc. The coal came from coal mines right above the smelting site, the ore from Guanyinshan. They explained the ventilation system at the bottom of the smelters. In earlier times, retorts used to be smaller, they showed diameters of almost 40 cm for the late retorts, 20 cm for older ones, the latter were flat-bottomed and had a charge of about 10 kg.



Zhu Kuaiyou got out a piece of ore, not from here, while the young relative brought two pieces from Guanyinshan, crystalline and full of holes.

Old Zhu asserted that there were silver-smelting slags at Guanyinshan, so we set off, guided by Zhu Kuaiyou who was very doubtful, probably mainly concerned that it would be too far for us to walk.

Heading up to Guanyinshan, Liu Peifeng, Li Xiaocen and Zhu Youkuai. Guanyinshan village.



Guanyinshan is some 350 height metres above Zhujiayiang on the ridge, facing northeast across the Luozehe valley. A driving track leads up but is not passable by cars. Slags evident in soil before the first house of the village. Distributed relatively evenly through a layer that is up to 2 m in the visible recent cut by the driving track. Also on the walking track below for about 100 m to 150 into the first fields on the nose below the village.

Visited 梅春银 in the first house, 51 years old, his wife, daughter, son-in-law and 3 kids. Ancestors had come from Yiliang, story unclear, 6 generations ago. Connection to mining, but zinc rather than silver and some generations back. Heard a story that Guanyinshan used to have 38 streets and 72 alleys 三十八条街、七十二条巷. Now 35 families, about 160 persons. Seems that only the Meis and another family named Chen are left over from the mining period

Used to be quite large. No knowledge of temples or when the mines flourished. Workings were near the village, some smaller surface workings all around, and several galleries, now all blocked up. Apparently under or in the limestone layer. Not very clear.



They brought up a story that the people who ran the mines reported to the emperor that the silver mines were exhausted, so that they would not have to pay taxes. When they came back, it turned out that the silver ores were in fact exhausted.

Guanyinshan also used to be called Yinlushan ("Silver smelters").

Zhu Kuaiyou mentioned on the way that the ore at the surface was poor, but got better as you got into the mountain, with both oxidized and suphurized ores.

Had lunch at Mei's house and walked back.

Site of old slags: Slags distributed evenly in layer of soil, no clear layer, distribution quite thin. N 27 30.7735 E 103 58.7145, 1774 m

Lead/silver-smelting slags in the soil at Guanyinshan.

Back down, Xiaocen went to Huangmukuai for further interviews, while Peifeng and me attempted a quick assessment of the dimensions of the zinc smelting site. Above the top end and to the south are coal mines. The site extends for over 200 m in length, forming a hill in the bay-like slope between two mountain spurs. Thickness reaches over 10 m at the lower centre where the driving track cuts through the area. A layer between 30 cm and 1 m extend considerably further down, with the entire slope looking disturbed. Two erosion gullys in the main dump do not expose the bottom below.

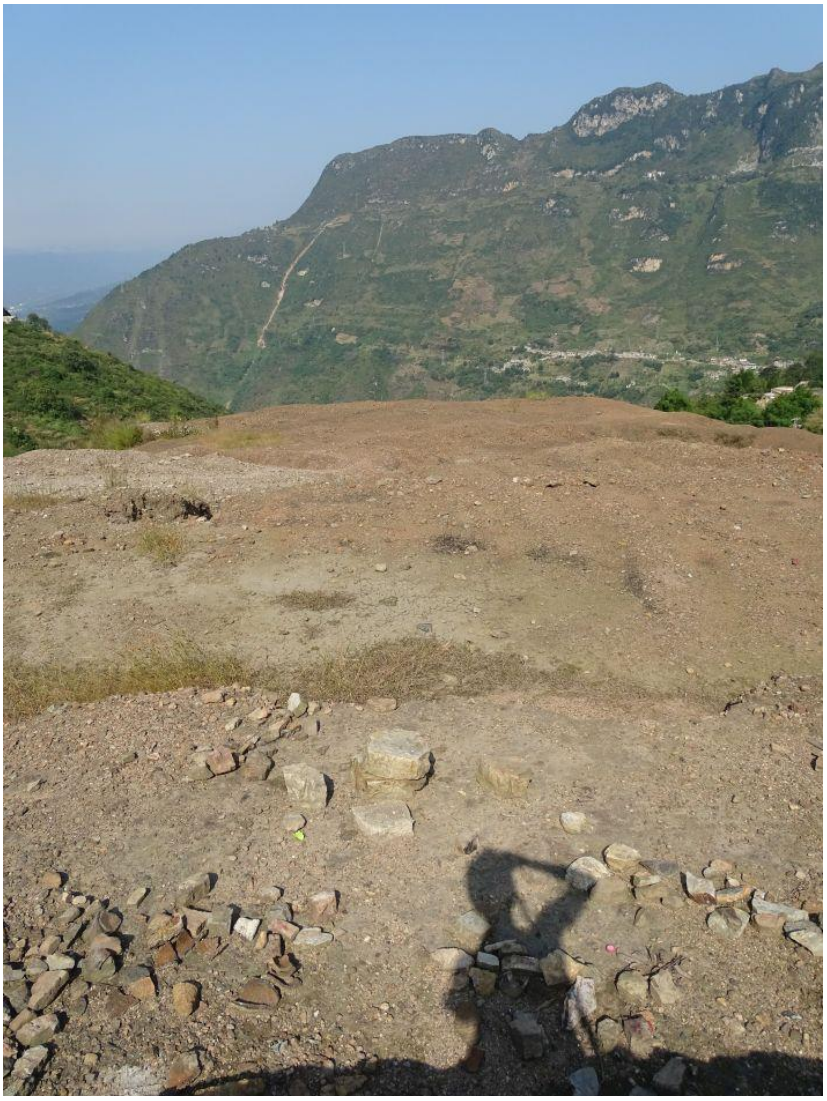
Upper end of the dump: N°27 30.2210, E°103 59.0320, height 1388 m



View NE from the ridge just below Guanyinshan, onto Guanfang and the mining slope behind the plant, with Maoping and Tongchanggou valley just visible in the next river bend.

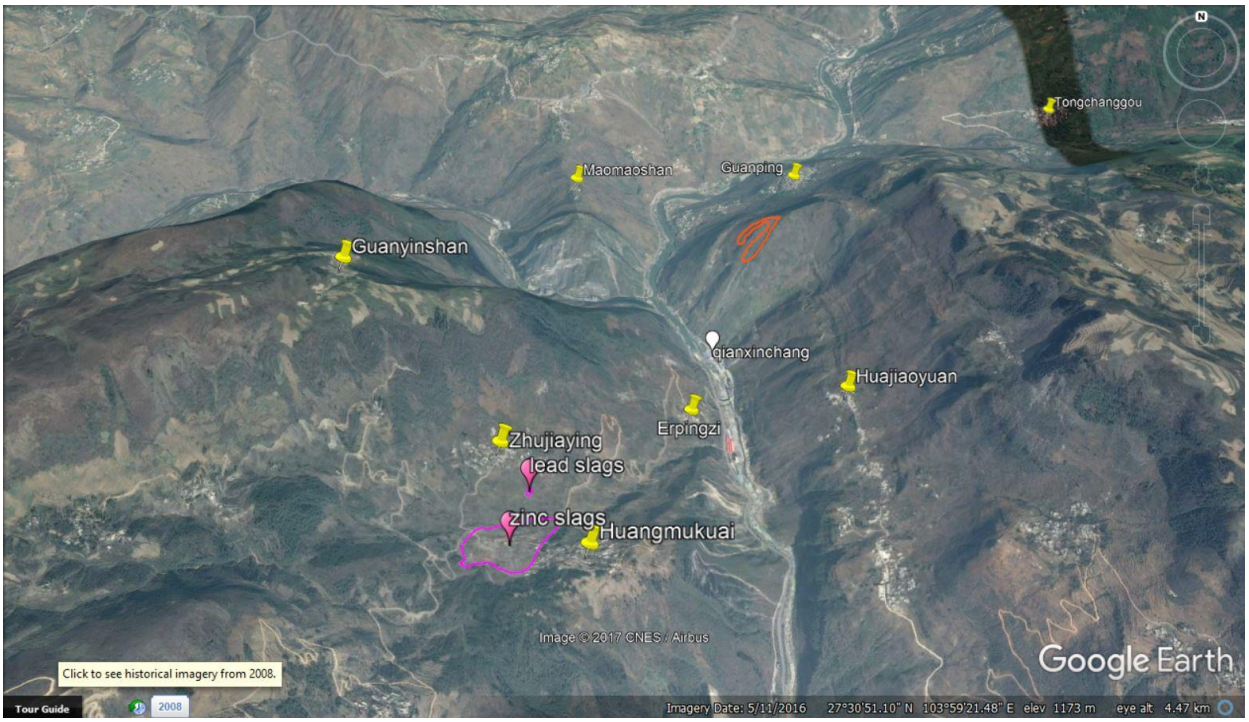


View south along the Luozehe valley from the same ridge.



View down the dump from the top end.

Li Xiaocen interviewed a villager of about 60 years in Huangmukuai: His family had also come 6 generations ago, were zinc smelting or mining workers, he himself was not. Moved down from Guanyinshan 4 years ago. Adamant that zinc smelting ended 40 years ago. [which is in contradiction with the statements of the Zhu's who should know because they were involved. Appears however that the scale of recent smelting was relatively modest]. Mentioned that they used to use horses to carry things, but could no longer after liberation, only learnt to use horses again some 20 years ago.



The sites around Huangmukuai. Purple areas: slag dumps. Red area: Laomingcao (historic open or collapsed mines).



The slope opposite Huangmukuai on the eastern bank of the Luozehe, which is presently exploited for zinc and lead and the most probable site of the historic silver mines of Yiliang. Red area: Laomingcao (historic open ditch mining).

Results

The site at Huangmukuai with fair probability is the Old Yiliang zinc mine. The name Lao Yiliang may refer to Maoping rather than the later walled town of Yiliang/Gekui. Fieldwork finds show the presence of lead slags, documenting some exploitation of lead-silver ores at Zhujiayiang and

Guanyinshan. Silver was probably the initial target of exploitation. The situation on the eastern slope is more uncertain, as slags are no longer on site. The exploitation at Laomingcao can be assumed to have targeted silver. In the absence of industrial records, the scope of exploitation cannot be established.

The silver and zinc mines near Longjie
The Tongchangpo silver mines 銅廠坡廠?

Nanny Kim, draft May 2018

Records and questions

For a discussion of the records, see 20_huangmukuai.pdf.

Fieldwork results of 6 and 7 October had shown that Tongchanggou south of Yiliang was a lesser site of copper exploitation and certainly unrelated to silver mining, while Huangmukuai was mainly a zinc smelting site, with some silver exploitation, but apparently not on massive scale. Since Mr. Lu Hanyun had mentioned the possibility of silver mining near Longjie, we decided to visit possible locations there. We added a sulphur mine half-way to Longjie, which Mr. Lu had also mentioned.

Fieldwork by Nanny Kim, Li Xiaocen 李晓岑 and Liu Peifeng 刘培峰, 8 October 2017

Supported by: Ding Changfen 丁长芬, director of the Zhaotong Museum, Mr. Lu Hanyun 禄汉云, retired member of the Relics Office of Yiliang

Main informants: Mr. Li Daigao 李代高 (aged 56), Mr. Zhang (in his 60s), of Yichangpo, Mr. Zhang Guoping 张国平 (aged 49) and Mr. Zhang Guozhao 张国照 (aged 52), both of Houzhai.

We hired a car for the day to go to Longjie and left Yiliang about 8 am. The Luozehe valley is narrow throughout, forming a gorge between sheer cliffs between a small tributary not far south of the mining plant and Pengjiapo 彭家坡, with a slight interruption at a knee where a tributary joins from the east in a tectonic valley at the town of Shuinichang 水泥厂.

Yuanbaocun 元宝村 is near the top of the ascent up the eastern slope of the river. Got there about 9:30. The village used to be called Luozehe and has been renamed recently.

Peifeng's GPS: N° 27 30.2659, E° 103 59.1021, 1350 m



View from the slope just above Yuanbaocun over the top end of the village south, with the Luozehe valley to the right.

Asked at the village government, where the young and muscular official recommended looking for Li Daigao 李代高 56 sui. Found him in a small workshop tending to a harrow. He knew about the sulphur mine and took up op the slope where iron smelting had been carried on until fairly recently (about 1990?). Two rows of sulphur smelters used to be in operation, using the same technology as in the old times. Remains of a square structure formed two walls in the corner of a maize field, walls ca 2.5 m, with a rectangular groove about 60 cm from the present field level and 50 cm wide. The receiving end of this channel according to xxx was a little house with water about 4-5 m further up the hill. The furnace would be filled with 3-4 tons of ore and coal (the coal came from Guizhou), distillation took a week, no ventilation required. The sulphur mines were about 1 km away towards the steep end of the slope (location specific). Iron ore was (and probably is still being worked) a little way further up the slope; numerous abandoned structures of the iron mines, ore storage, and sorting possibly wet treatment facilities.



Mr. Li Daigao.





The wall remains of the sulphur smelter seen from the corn field; and sulphur crystals that had formed on an old dump.

On the way down right behind some of these buildings Li Daigao pointed out a dump of silver smelting slags. The heap was compact, with crystal growth in the overhanging section (similar to the dump at Xiaogongmiao in Mingguang, Tengchong), established depth about 80 cm but probably more. The heap was cut into in the course of digging the path, its existing extent is at least ca. 8 m long along the slope, lower and upper ends disturbed due to buildings.





The heap of silver smelting slags, and whitish cristalline formations in the protected cavities of the slag heap.



Yuanbaoshan village above the Luozehe.

We continued to Longjie to visit the several villages with Yinchang in their names and that Mr. Lu had mentioned as possible silver-mining sites. Reached Longjie about 12:00, where it happened to be market day.

Yinchangpo being the village nearest to the town, we went there first. Younger people told us to look for the grandfather in the white house. Met Mr. Zhang (in his 60s) at lunch with his son (in his 40s). Their family had come 10 generations ago, unclear from where, first mentioned Huguang, then Fujian, then said probably Wenzhou. There had been silver mines but this was a very long time ago. There used to be a Xianshuimiao and a Guanyinmiao. Yinchangpo village is exclusively Han, most have the family name Zhang, there used to be two directors (*guanshi* 管事) and an official. Longjie is also mostly Han.

Mr. Zhang knew where the mines and the smelting site was and agreed to take us there.



Returned in direction of Longjie to the low ridge between the upper end of Longjiexiang and Yinchangpo, with three karst cones. Stopped at a transformer station and headed down the slope a little way. Met another elderly villager, who came along for a little while.

Mr. Zhang.



Peifeng with two locals on their way to the market near the top of the ridge above the mining slope.

Coming out of the bush we were looking along a very disturbed slope. Mr. Zhang pointed out workings and told us that part of the slope collapsed only a few years ago because of the old workings. Had a look at the workings just below, clearly old and exposed because of earlier rockfalls. Two further places along the slope, one smaller, the other considerably larger. There was a story about water from these larger workings, which I didn't understand.

The workings are evidently extensive, and in the limestone layer.



Old workings exposed by erosion

Went on back to the road and down near the rubbish dump. Some 40 m below the road along a young pine forest Mr. Zhang told us that all along there used to be silver smelting slags. Now some coal and stuff that looked like zinc smelting slags. Coal useless, according to Mr. Zhang. After a good long while we still hadn't found any slags but finally understood that the slope had been dug up for zinc ore during the Great Leap, lots of shallow pits, the ore had been taken away, not smelted on site. No exploitation since.



View along the slope, with several collapsed sections.



Entrance to an old working exposed by a recent rockfall.



Part of the slope of the historic slag dump, disturbed by smelting during the Great Leap and probably recently.

Back on the road we hit on two men and a woman going to the market at Longjie, Zhang Guoping 张国平 (49) and Zhang Guozhao 张国照 (52). When asked about the old silver mines they said that they knew a place where there were slags left. Talked them into showing us. Old Mr. Zhang went off to the market with some family members, so did the woman, while the younger Zhangs took us to their village, Houzhai, at the end of a track leading along and down the slope from the transformer station.



View from the mining slope down the valley. Houzhai is behind the knob to the right.



At the slag dump outside the first house of Houzhai.





Mr. Zhang Guozhao. Slags and remains of a furnace at Houzhai. Photos by Peifeng.

At the entrance of the village near a recently built house they showed us a small dump of glassy slags. The Zhangs have no knowledge of who smelted these and when. From their elders they know about the site of a furnace or hearth nearby, but there is nothing to be seen now.

Their ancestors came from Jiangxi, 10 generations ago, and settled in Houzhai 8 generations ago.

They also knew about another old site where the slags looked different. When we expressed interest, they changed their market plans and took there. We drove through the village and along a dirt track for some 3-4 km back to the main road north of Longjie, along for a short distance, then walked in some 5 min and found ourselves at the edge of an extensive zinc smelting site. The Zhangs knew that the coal was available from a coal mine in the hills nearby, and the ore came from the workings we had just seen. Called Heihongshan 黑硐山. No memories about when this was worked. The zinc slags are heavily eroded, with the bare smooth limestone rock visible in places. The upper end is under a layer of soil, 0.5-1 m thick, the lower end much thicker. [Extent can be measured on satellite photo]



The zinc smelting site near Longjie.





The thickness of the layer in the lower parts of the dump and large debris.



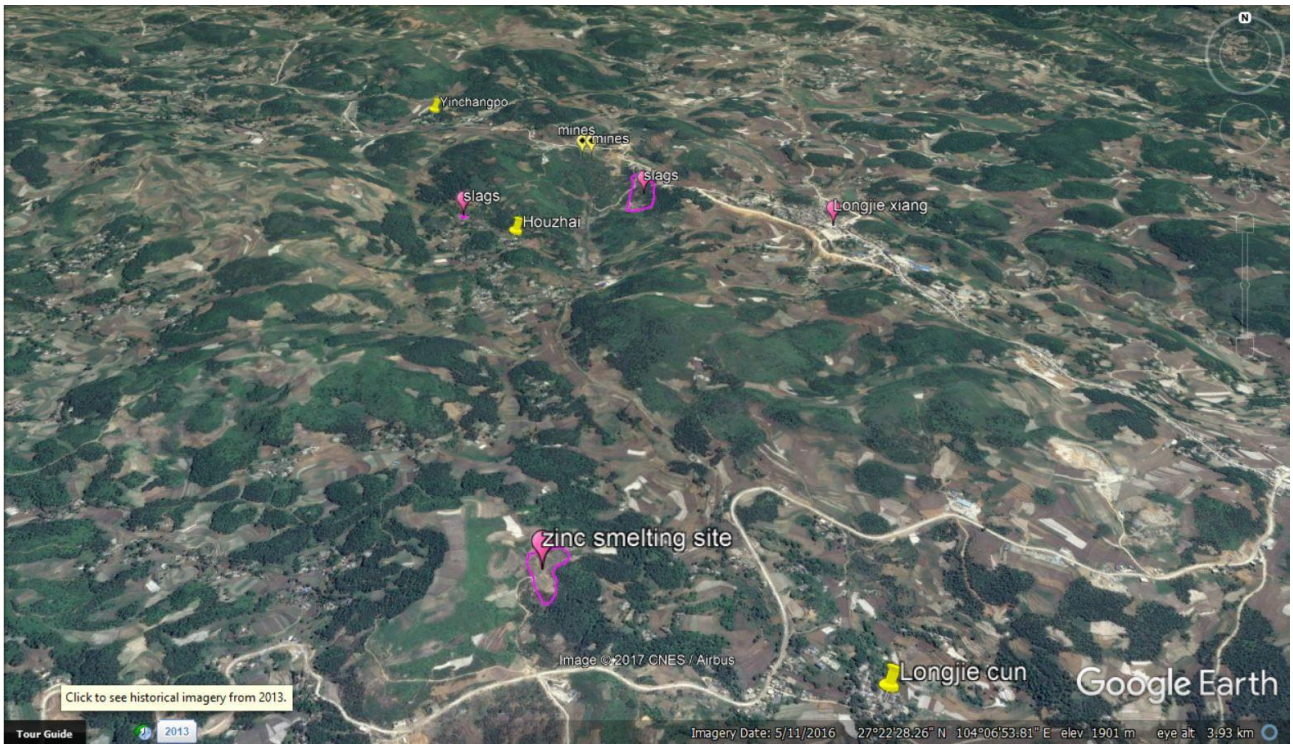
Bedrock exposed by erosion near the top end of the dump.

Site N 27 21.9768 E 104 06.7715, 1893 m

The Zhangs said that their ancestors came when this land was empty, after a war, during which the emperor had driven the Yi out to Liangshan. Afterwards the land was available. Houshan is mostly Han, with only a few Yi families.

Turned out that the Zhangs have a genealogy, so we went back to their house to photograph it. Handwritten by a relative, 2 copies.

Headed back towards 5 pm. For lack of time, did not get to Yichangping and Yinchangwan, two further nearby villages that might be connected to silver mining and are both both near the zinc smelting site.



Sites around Longjie.



The mining and the smelting slopes between Yinchangpo and Longjie. The blue-roofed building is the mosque.



The zinc smelting dump near Longjie.

Results

Yichangpo may be the updated name of Tongchangpo, when copper mining had become a thing of the distant past and the site was worked for silver. There is little doubt that silver mining preceded zinc, yet the scale of silver exploitation is uncertain. Most of the slags have been removed or covered by recent activities. The workings are certainly extensive, but a distinctive attribution is not possible. The oral tradition of two guanshi, however is clear evidence of considerable important at some point of the high Qing.

Fieldwork at Huangmukuai and Longjie has shown silver mining on some scale followed by more important zinc exploitation. The dating of zinc mining from about 1800 is probable, and it continued into the late 20th century.

Family histories suggest that Yinchangpo is relatively old, with Han Chinese having moved in around 1730, and the possibility of more intensive exploitation from this period onwards.

More fieldwork as Wanchang is required to identify the Tongchangpo mines with reasonable certainty.

The Jinsha Mines in Yongshan District 永善县金沙厂

Nanny Kim, draft May 2018

Records and questions

The Jinsha Mines 金沙廠 appear in the official records. According to *Diannan kuangchang tulue*, they were opened in 1742 and fulfilled a tax quota of 1199 *liang*, suggesting a mine of importance.[1] The site is described as near the Jinshajiang and south of the Lema Mines 樂馬廠.

The Yonghsan gazetteer *Yongshan xianzhi lue* of 1803, with additions dating to the 1870 to 1890s records the mines as 60 li southwest of Yongshan city, and possessing over 30 abandoned and worked mine entrances. It specifies that the mines were administrated by a dispatched official (weiyuan) and generated annual tax income above 5000 liang, but that their administration was returned to the county in 1774 (乾隆三十八年). This infers that the provincial treasurer had directly supervised and taxed the mines between 1742 and 1774. The return to local administrators usually indicates dwindling outputs. The entry adds that the smelterers of this mines treated ore that in the first smelting yielded a mix of copper and lead that floated on the surface of the melt and silverized lead that sank to the bottom. These were treated to obtain copper, which was shipped to Luzhou and taxed at 0.2 liang per 100 jin of copper, and silver (该厂炉户煎炼硃砂，其浮而上者为冰燥，沉而下者为底母，详蒙题定准，令商民等收买炼铜运泸，其卖运渣底每百斤抽税二钱，随课批解。)[2]

The Jinsha mines are shown in the map of the Jinshajiang that is datable to roughly 1751 to 1752 and hence clearly were known and presumably important at the time.[3]

According to the provincial gazetteer of 1949, the mines were still in operation in the Daoguang period but abandoned during the civil wars in the 1850s.[4]

The record suggests a silver mine that was very important from about 1740 to 1770 and remained productive into the 1840s.

The site can be identified with high probability as Jinshachang, not much more than 10 km south of Lianfang 莲峰镇 (former Yongshan city) as the crow flies. The fieldwork served to record traces that might document the scope of historic mining.

Fieldwork by Nanny Kim and Liu Peifeng 刘培峰, 10 October 2017

Supported by: Mr. Yao Xinming 尧信明 (born 1965), the deputy village secretary of Jinshachang

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[1] 滇南矿产图略，卷下，102

[2] *Yongshan xianzhi lue* (Brief Gazetteer of Yongshan district), ed. by Cha Shu 查枢 (1800-3 (JQ 5-8) magistrate of Yongshan), with Xu Shou 徐绶, Sun Qianji 孙谦暨 (native of Yonshan, gongsheng 永善人，贡生). Orig. manuscript completed 1803, with many later additions to GX. In *Zhaotong jiuzhi huibian* 3 昭通旧志汇编 (三), pp. 741-814. Juan ???, p. 785: 厂课. The gazetteer also records three small copper mines: Xiaoyanfang 小岩坊 over 600 li northwest of Yongshan, with a production quota of some 19,000 jin, Shaoganxi 绍感溪 and Meizituo 梅子沱, both in Fuguancun (now Suijiang)

[3] The "Complete Map of the Jinshajiang" (*Jinshajiang quantu* 金沙江全圖), which was commissioned by Liu Wengao 劉文誥 and is held by Peter Griebert. According to Li Peng's research, the scroll was commissioned by Liu Wengao 劉文誥 (1704 - ca. 1784), the circuit intendant of Yongning in Southern Sichuan. Liu led an undated inspection tour of along the Jinshajiang from Yibin to the mouth of the Jinshajiang in Dongchuan prefecture that lasted five months. In disagreement with his Yunnan colleagues, he reported that the difficulties were too great to be overcome, particularly in the upper section south of the Jinsha Mines. He was demoted to Songmao in Western Sichuan and left official service in 1754. The map can be roughly dated between 1751 and 1752. Li Peng, 2015, 28-36.

[4] 新纂雲南通志卷六十四，7a. This source also records another silver mine, Yichangba 銀廠壩 at Suijiang (7a), and a gold mine in the same district named 金沙廠 (3a).

Main informants: Mr. Xu Yu 徐煜 (aged 86, of Lianfeng), , Mr. Luo Xianfang 罗现放 (aged 80), Mr. Chen Lianshou 陈连收 (aged 85) and Li Guangde 李光德 (aged 74, all of Jinshachang), Mr. Yao Xinming 尧信明 (born 1965), the deputy village secretary of Jinshachang, Mr. Song xx 宋 (ca. 50 years), village official of Jinshachang.

2017.10.09 (Mon): Yiliang to Lianfeng in Yongshan 彝良县到永善县莲峰镇

We reached Lianfeng at 3 pm and wandered down into the old town to chat with some elderly people. A group of five were sitting outside along the street at the top end of the old city. Upon asking about premodern history of the town, its temples and the Jinsha Mines, someone readily stated that there used to be over 20 temples, but there were no remains except a couple of stone lions. The mines are now being worked by a local state company, for zinc, gold, copper, silver and mangane. They were uncertain about local history and did not know of any family that had come for the mines. A 60-year old woman mentioned that she had been there and into the mining galleries some 20 years ago, at the time when they still ate only maize and no rice or other grain. The old workings were blocked up now. In the past, people came to Lianfeng for trade (shengyi) or fleeing from famine (taohuang).



Satellite image of the .Jinshajiang valley with Lianfeng on the edge of the plateau-like ridge at about 3000 m and the Jinshachang valley at about 500 m. Jinshachang is in the larger semi-amphitheatre-shaped side valley in the centre of the photo.



View across the new town square onto the temple cypresses and the red school gate.

They took us to see the pair of lions and a pair of elephants, both damaged during the Cultural Revolution. They used to belong to the Wenmiao, now the primary school. The cypresses were 300 years old and used to be in the temple grounds, now in front of the school. The stone guardians had apparently been left inplace or put up again, probably at their original place along the street leading up from the northern end of the city to the temple.

They recommended that we ask at the Wenhuazhan for old people who knew more, which we did. Upon stumbling through the small building, we met director Wang in the first floor. She certainly knew nothing, but after some thinking thought of a former school teacher by the name of Liu. Showed us the direction of Liu's house but didn't come along. After some asking we found the house and the son outside.





One of the repaired lions and one of the damaged elephants.

Mr Liu Bengui 刘本贵 (aged 72), was rather uncertain about the temples. Took us by some rural back alleys to his teacher, Xu Yu 徐煜 (aged 86), who lived nearby in the lowest back alleys of the old city and was home with his wife Mrs. Yin Daifen 殷代芬 (aged 83). Mrs. Yin specifically pointed out that they had been married for 61 years. Both quite fit (and understandable). They started enumerating the temples, moving from their neighbourhood at the bottom end of the old town upwards. Peifeng recorded: the City God temple 城隍庙、 Guizhou Guild Temple 黑神庙、 Gog od Money temple 财神庙、 Goddess (probably

Guanyin) temple 娘娘庙、Dragon God Temple 龙王庙、 张爷庙、 Sichuan Guild Temple 川祖庙、 Jiangxi Guild Temple 江西庙、 肖姑庙、 臭水庙、 God of Literature Temple 文庙、 God of War Temple 武庙.The City God temple was built 183 years ago some 20 to 30 years before.





Mr. Xu Yu and Mrs. Yin Daifen (Mr. Liu Bengui did not want his photo taken). Photos by Peifeng.

Then turning to the mines, did not think there was a connection with Lianfeng, but Mr. Xu had two stories. The first was about the opening of the mines. A group of people started digging but found no ores. When they were about to give up, a soothsayer told them that it was not yet time and they should keep digging until somebody with a flag on his shoulder would come by. So they kept working until one day a fellow came by who had taken his trousers off and was carrying them on his shoulders. When they go caught in the wind they billowed like a flag. When they hired this guy to join they found the ores. The second was about Leifengdong 雷封洞, one day, the workers found it closed (by lightening?), shortly afterwards, it collapsed, Guanyin had sealed it to save them.

Mr. Xu had never heard about copper transports.

2017.10.10 (Tue): The Jinsha silver mines in Yongshan District 永善县金沙厂

The brand-new road from Lianfeng to Jinsha village is 35 km and takes 1.5 hours. We hired a car for the day. The road descends steeply in large serpentines for the entire distance, with a

single milder section at Wanhe xiang 万和乡. On the massive slope behind this large village is planted in pine forest that looks around 30 years old. From Wanhe, the road descends towards the Jinshajiang, before turning around a mountain shoulder into the Jinshachang valley.

Jinshachang village is the first village in the valley, clinging to the slope some 50 m above the stream where a smaller stream descends from the north. The Jinshachang valley fans out into several small streams here, a huge amphitheatre that rises right up to the height of the ridge at about 2000 m. Two slightly larger streams descend from the main ridge to the east, separated by a ridge, on the back of which the only milder slopes are found.

The entrance to the village is a gate, followed by industrial buildings of the 1960s to 1980s in the entrance of the side valley, a row of small recent shops and houses and a square to the valley side. We asked people chatting in front of the shops and were told that this was Jinsha village, and that there had been mines in the past, then a forced labour camp, and that the mines were now again worked.



The square and the shops at Jinshachang village.

The village government building was across the square, and Peifeng contacted the official on duty. While waiting, we talked to an elderly inhabitant (about 60) of a small house across the road and were joined by another villager (about 45). They were locals and told us that all inhabitants of Jinshachang village had moved in, either from Jiangxi or from Huguang. They confirmed that there were workings all around, and slags too. In former times, there would have been two rows of furnaces down in the valley (we could not establish what time this description referred to). The largest village in the valley was Guanfang 官房 (official house) and there was a place called Shuifang 税房 (tax station) below. The two large trees (one little more than the ruin of a formerly large tree) were Huangge trees and 300 years old.

Yao Xinming 尧信明 (born 1965), the deputy village secretary arrived, and suggested interviewing some old men who lived nearby. We readily found them a few hundred metres



down the main road getting ready for playing cards at the roadside. They readily packed up and came to the government office for a chat.

Meeting the informants on along the road.

The information was mainly provided by Luo Xianfang 罗现放 (aged 80), with some comments by Chen Lianshou 陈连收 (aged 85) and Li Guangde 李光德 (aged 74): The mines were started about 300 years ago by people from Jiangxi. During the Great Leap, lead was smelted by the traditional method, and also silver. At the time, smelting was re-learnt from old people. The ore worked during the Great Leap was not smelted on site, but only sorted and then transported out, by horse cart to the road and from there by truck. Later, during the time of the labour camp, lead and zinc ore was worked and carried out of the valley. It has been 100 years since the silver mining, there would be no remains. [The earlier and later statement on the smelting are contradictory, it appears probable that local smelting was actually attempted and possibly practiced during the Great Leap, while the transport of the zinc and lead ores to an industrial smelting plant came later, and evidently was the system during the labour camp.]

They could not say whether old slags were re-smelted.

There were several temples before, a Black God Temple [Guizhou Guild] 黑神庙, a Guanyin Temple 观音庙, a Three Kings Temple 三王庙 of the provinces of Yunnan, Guizhou and Sichuan, and a Yanshan Temple 炎山庙.

Other place names that were linked to the mines were Yanshan 炎山 (Fire Mountain), Zhulu (Pig Alley) 猪路 up on the mountain [now 诸路], and Caiyuan 菜园 (vegetable Garden) below.

There was a saying:

有一个说法：“有suan打suan，有引打引，无suan无引，打xx井。” [key terms not identified]

There were also some stories. The story of the opening of the mine was mostly similar with that Mr. Xu Yu had told us the day before. The man who carried his trousers on his shoulders was specified as a beggar. The other stories were of miraculous savings before a mine caved in, by

the mysterious person who sold fresh peaches and by the lightening bolt that sealed the entrance.

Old workings still existed in great numbers all around.

Nothing was left of the temples, but there were a few pillar bases right on the square in front. They showed them to us and dispersed. There were eight bases lined up as stools, the square bases with a side length of about 40 cm, and the round pillar base with a diameter of about 28 cm. The now unused concrete sports ground on the lower level appears to have been the old temple ground. Some large stone steps or thresholds, one with a round hole, presumably of a door, were used in buildings and holding down the football goals.



Mr. Luo Xianfang and Mr. Wang Guangde in the office.



Mr. Yao Xinming at the pillar bases on the square.

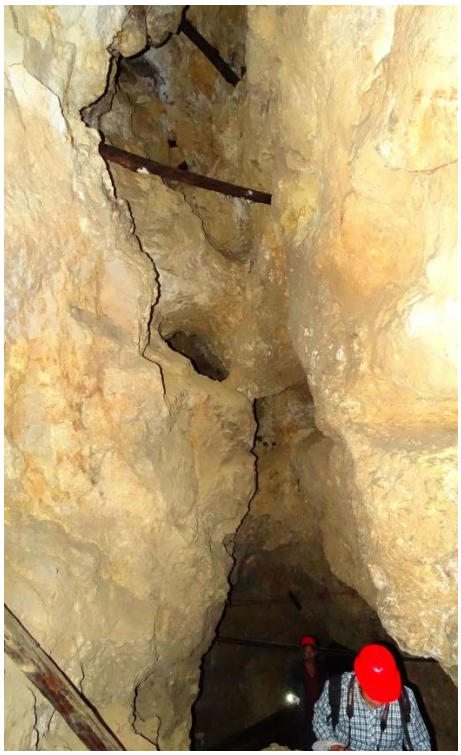


View from the square into the mining valley.

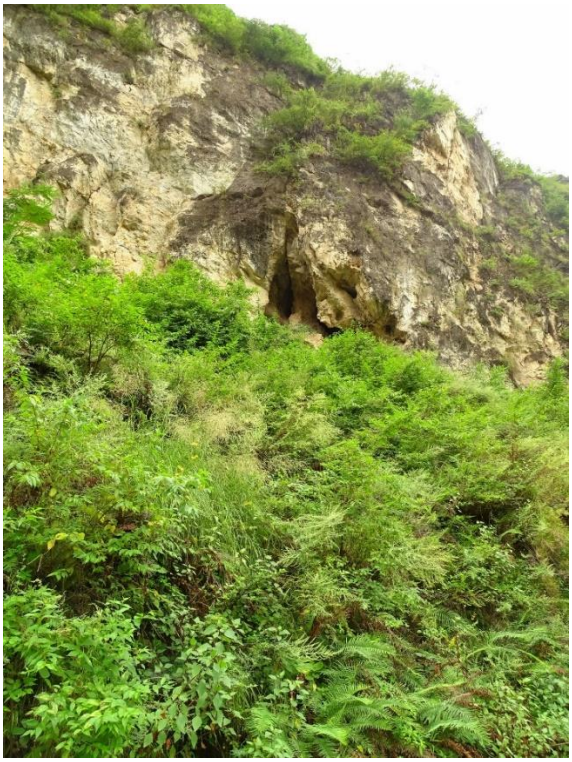
Secretary Yao took us to see some workings on the mountain flank opposite Jinshchang village and below Guanfang. There was a driving track ascending the slightly northern arm of the stream, which soon crossed over to the opposite slope and began ascending towards Guanfang. Mr. Yao first showed us entrances of old workings in the limestone cliffs on the steep slope above, which were out of reach on account of thick vegetation. At mine 026 we met Mr. Chi Shaoneng 迟绍能 (born 1949) who looks after the pumps that are worked from this otherwise

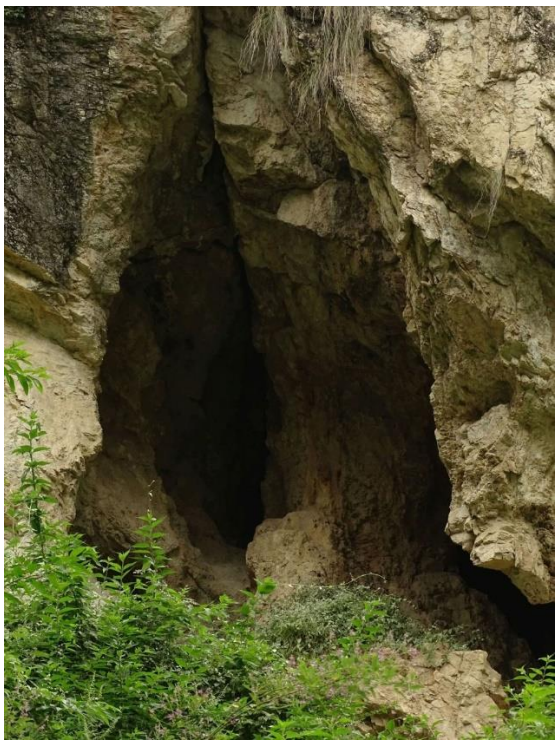
abandoned modern gallery. Mr. Chi consented to let us have a look at historic workings cup open by the modern gallery, getting out helmets to conform with safety regulations. He opened the gate, turned the light on and guided us along two level galleries. The tunnel hit on historic workings in four places, the largest of which were about 50 m into the mountain and widened a massive crack or chimney the extended far above. There were half-rotten beams in the workings. Mr. Chi explained that people had brought them in to climb up fairly recently. The rock was pale yellowish, with quartz near the old workings, and no trace of easily recognizable ores.





The gate of the mine and old workings inside.





Workings in partly natural clefts in the cliffs.



View from Mine 26 eastwards up the northern arm of the Jinsha Stream.

Secretary Yao told us, that they used to walk to Lianfeng in 5 hours, departing before daybreak and retuning home after dark.

We returned to Jinshachang village for lunch with two other village cadres. One of them, Mr.

Song 宋, had an interest in history and a family history at home.

Further inquiries about historic slags received unclear answers. Finally, secretary Yao told us that there used to be massive amounts along the stream, but that almost all were gone after a massive flood in 1990, that washed the valley bottom clean to the rock. There would be some left further up the slope, but he did not know the place.

Mr. Song agreed to take us around a bit more. We first drove up to Guanfang, a quite large village with a primary school, and descended towards Yanfang, that in fact consists of eight groups of houses distributed on the steep southern slope of the Jinshachang valley.

Crossing over from the northern slope of Jinshachang over the northern arm onto the middle ridge of Guanfang and across the southern arm of the stream to Yanshan, the overall geography of the valley became clear.

Mr. Song took us to a mine below Guangfang that had made its owner rich. The Yanshan slope across displayed a slightly raised section som 50 to 100 m wide and at the very least 200 m in height that looked like an ancient rockfall in which the entire section had slid off. The first Yanshan village is located at the top end of this section. There are a number of modern mines, which are being worked, and in places exposed old workings, possibly by recent activities. The whole slope looks massively disturbed.



The ruptured slope of Yanshan.





Overhanging section with exposed old workings.

Shortly after crossing the southern arm of the stream, Song had us stop at turning a corner. He pointed out walls made from large stone blocks, the remains of the Yanshan temple.



Remains of the temple walls and view north across the southern arm of the Jinsha Stream.

We drove on to the western end of this section and stopped at a worked mine.

From this spot, the sorting plant in the valley below was visible. Mr. Song explained that it was on the site of Shuifang. It occupies the only slightly wider section in a bend of the valley, before it breaks through and leaves the main valley to precipitously descend towards the Jinshajiang. Mr. Song also explained that Caiyuan was beyond the narrowest part of the valley on the slope above the Jinshajiang, while Hekou was further down near the river. Both remained out of sight due to the gradient.



View down to the sorting plant, with Jinshachang village partially visible on the slope onthe larger road and the school and some houses visible of Guanfang on the ridge.

On the basis of the information provided by the local cadres, the greatest number of old workings were in the slope facing NW below Guanfang, with lesser numbers in the slope above Jinshachang village and again fewer on the Yanshan slope.

Mr. Song lives in Doupo 豆坡, another relatively large village located on the slope above Guanfang. The name is thought to derive from the fact that this village grew beans for the mines. We walked up from Guanfang to see his family genealogy. The first section of the path has recently been built in concrete steps. Mr. Song told us that the wife of a rich mine owner spent 10,000 RMRB only last year, with the village providing the labour. The new path ends at a tiny

shrine under a rocky overhang, that has been restored with three naive figurines, and a stele recording the donations. There was an older Guanyin shrine on the same site. Part of a foot of the old statue and a most peculiar inscription roughly hewn into the live rock remain of the historic shrine.

Legible parts of the inscription date it to the Jiaxing period, with year above 10, and suggest a list of donators with professional titles:

永乘万古
计开
官房厂炭阁厂众姓人等
匠士侯 xx xxx
xxx
嘉庆x x 年



View onto Guanfang and down to the Jinshajiang.



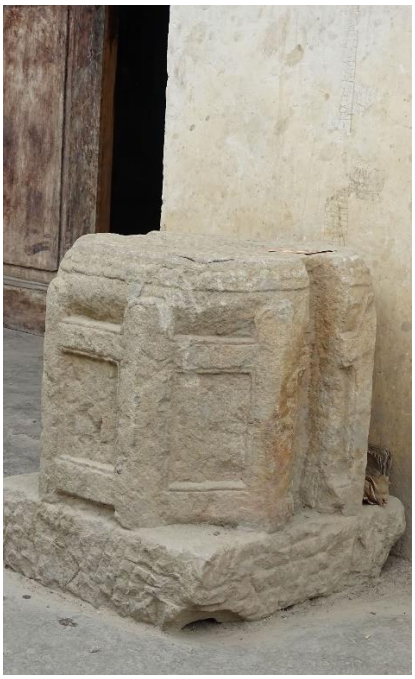


The Guanyin shrine above Guanfang and the foot of the former statur in the left coner. Nanny is trying to take photographs of the inscription in the rough frame next to the niche. Photos by Peifeng.



Mr. Song at the Guanyin shrine.

Back at Guanfang, Mr. Song took us to the house of Mr. Li Qinglong 李清龙 (aged 78), who has a crudely executed bas-relief of a god in his front room, which formerly belonged to the temple. Presumably the Heishen temple, which we were told was the largest temple that the old people had still seen. The stone was about 80 cm high and 50 wide. There were several pillar bases in the street, not large than the ones in Jinshachang village but better executed.





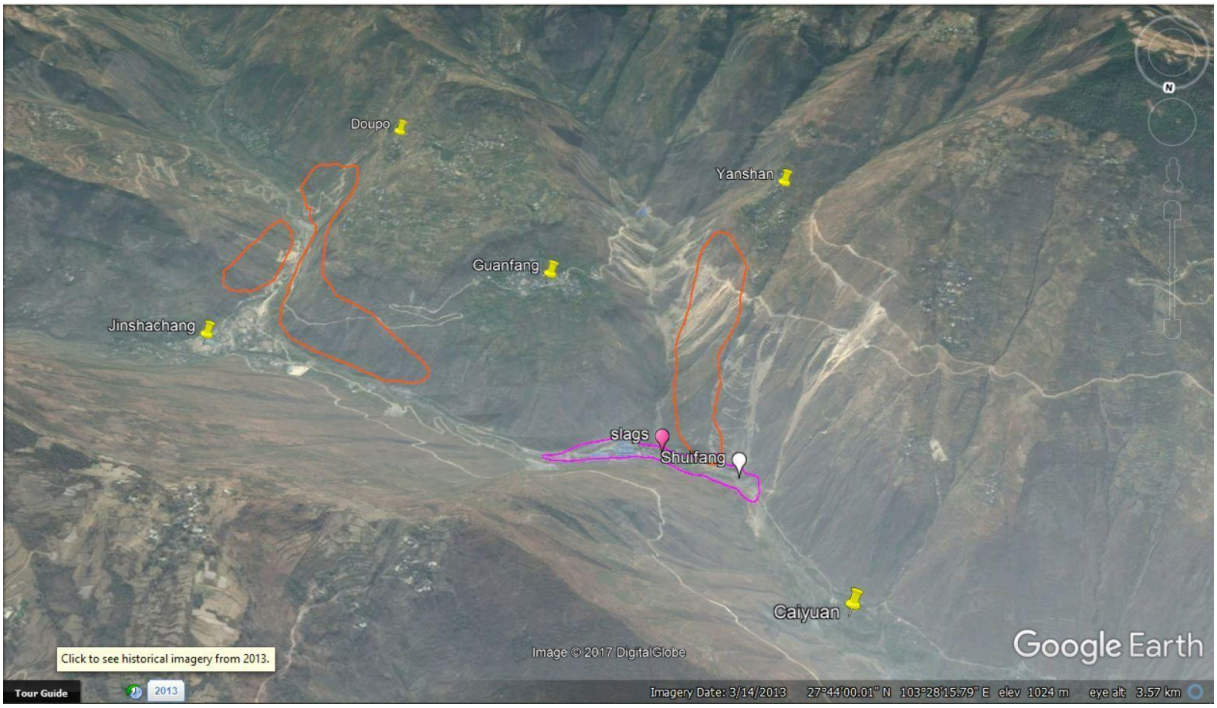


A pillar base in the main street of Guanfang and the bas-relief in the house of Mr. Li Qinglong.

We made a final stop at the house of a blacksmith in the new upper part of Jinshachang village, for Mr. Song remembered that he used to have an old bellow. The bellow was in fact still leaning against the wall right along the road. The blackmith explained that he had had it in use until some years back and that it was made from a wutong tree. The bellow was 140 cm in length and about 30 cm in diameter, with the piston some 25 cm in diameter and the feathers still in place. The wooden air channel was also still attached, but the two end pieces had come off. The handle was made from metal pipes.

The piston bellows. Photo by Peifeng.

We reached Jinshachang village at 5 pm and Lianfeng just after 6 pm.



The layout of the Jinshachang mines. Purple area: main slag dump: Red areas: areas of workings.

Results

Remains on site are relatively few, while past exploitation and oral histories are in part erased by the decades of operation by the forced labour camp. The large number of workings, with the uncertainty of differentiating between premodern and traditional remains, the layout of the valley with the villages linked to the mines indicate a considerable scale. The amount of slags cannot be established on account of the extreme gradients. Temple remains do not suggest great productivity. This might be due to the fact that surviving remains are from rebuilt structures that date after 1770 or after the bonanza decades. We forgot to inquire about the presence of Muslim Chinese in the mines.

The Dayinchang Mines (Great Silver Mines) 会东大银厂 (probably Mileshan in Huichuan 會川密勒山)

Records and questions

The Qianlong gazetteer of Dongchuan prefecture (乾隆东川府志) of 1761 lists the place names of Dayinchang 大银厂 and Xiaotongchang 小铜厂 in the recently added territory west of the Jinshajiang, without further comment. Historic records mention no mining here, while the addition of two strips of land that formerly were part of Sichuan to Dongchuan prefecture in Yunnan remain mysterious. The Mianhuadi silver mines were officially opened only in 1794 and therefore at least formally not linked to the change.[1] Recent maps show that Daqiao 大桥, formerly a small town on the road from Dongchuan (Huize) to Huili, had been renamed Qianxinzhen 铅锌镇, and also show extensive open-pit mining some 30 km southeast of at a village called Dayinchang.

Yang Yuda and Nanny Kim visited Daqiao on 18 November 2016 on the way to Mianhuadi. A quick exploration along the old main road near the historic bridge across the Daqiaohe revealed exceptionally large historic temples. Local informants remembered six large temples, two finely carved stone pillar bases at the Jiangxi guild Temple 江西庙 documenting pillars with a diameter of 60 cm, reflecting a huge building. The importance of this town was inexplicable to us at the time. Even if the Huili trade preferred this road into Sichuan to the Ningchang road, the town would have just been a stop along the way. The narrow valley appeared to have nothing to offer. The Mianhuadi Mines, which probably were important from the late 18th into the 19th century, would have contributed little to the economy of Daqiao because the transport route out of the mines into China led directly down to the Jinshajiang and to Menggu. Moreover, most daily needs of the mining town could be conveniently procured from the Menggu Plateau and the small terraces on the west bank of the river, rather than from the Daqiao valley.

In the absence of available information on Dayinchang, therefore, the fieldwork visit aimed to collect information on historic mining. Because we now believe that the importance of Daqiao is linked to the Dayinchang mines, we include the filed report on the town here.

Fieldwork by Yang Yuda and Nanny Kim at Daqiao 大桥镇（铅锌镇）, 2016.11.18.

Main informants: Mr. Chen 陈 and other inhabitants of the old street of Daqiao

When we reached Qianxinzhen from Huili, it was too late to continue towards Mianhuadi. Our driver from Huidong stated flatly that there was nowhere to stay beyond the town, which proved correct. So we wandered off to the only indicated site on the map, a Guangyin Temple that might be old. Beyond the end of the present main street, we got into an older street with traditional shops along the stream, with many old people enjoying the sun. It turned out that there were to Guanyin Temples, the old one by the river, and the new one at the top end of the old settlement, some 150 m from the last houses. The old temple was locked. It appeared to be a recent reconstruction on old foundations, probably considerably smaller than the original structures. The temple clearly formed the lowest end of the settlement, sitting on a small knob right above the small river, which from this point entered and increasingly narrow valley. A stele commemorating the reconstruction in the courtyard claimed a history of over 380 years. Along the walls of private homes to the east of the temple, we saw several large and elaborate

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relief carvings that presumably had been salvaged from this or an adjacent old temple. Two old Huanglian trees, one in the courtyard, and the other now in one of the private courtyards, as well as remains of walls and another old tree to the west suggest that the older temple compound had been larger.

Returning into the street, Yuda entered into conversation with the elderly people, who gradually warmed up to him. They recounted that this street used to be very busy, with caravan hostels, tea houses, and shops. There also used to be many temples, in addition to the Guanyin temple, there used to be a Temple of the God of Wealth 财神庙, a Huguang guild hall 湖广庙, a Jiangxi guild hall 江西庙, and a Heishen Temple [a Sichuan guild hall] 川楚庙. An old gentlemen by the name of Chen 陈 told us that there used to be three main caravan hostels, the largest run by the 祁家马店. Some parts of the present houses would still have been part of the hostels, but although we entered the courtyard between the two main hostels, we could not identify historic hostel structures with any certainty. An old grandfather who said that he was 83 years old stated that he was the son-in-law of the Qi family (祁家上门做女婿). He was unfortunately rather deaf. Mr Chen added that the Qi hostel had formerly been owned by the family Yang 杨, who later moved to Yunnan, whereupon the Qis 祁 took over. The hostel could stable 70-80 horses. The other two hostels were run by the family Zhou 周 and Kou 口(?).

Mr. Chen brought out his family documents. His elder brother died in Korea, Mr. Chen himself had begun as a soldier and later worked in the steel factory of Panzhihua, receiving a retirement pay of over 3000 Yuan now. His ancestors were from Kaifeng. He brought out his genealogy and was happy to have it photographed.

Returning to the group of old people, we were told that the town was called Daqiao because of the bridge that was right on this street. It used to be a stone bridge, and had opium dens, tea houses and stalls installed on it until a flood in the late Qing or the early Republican years washed all the buildings down, and the people in them as well, you could see the lights floating down the river and hear the screams, but nobody could be saved. One of the six stone pillars was destroyed sin this flood. The bridge was later repaired with iron chains and wooden planks. After liberation, these were changed to steel cables and concrete. In a flood in 1998 the bridge was again damaged and the local people had to raise money to have it repaired.

The bridge now consists of 5 pillars and buttresses on each bank, with the second pillar from the north bank missing. The section across the missing pillar shows signs of recent repair. A young man added that for the construction of the pillars, boilt cowhides were added to make the mortar, which therefore is particularly strong.

When we came back across the bridge, an old gentleman was just heading out to meet us by bike. He told us that his family was from Jiangxi, and had come when Huguang was filling up Sichuan [in the late 17th to mid-18th century]. His ancestors were from Jishui 江西吉水人. The temples of Daqiao were the Guanyin Temple 观音庙, the Caishen Temple 财神庙 (where people from Yunnan prayed), the Jiangxi Temple 江西庙, the Huguang Temple 湖广庙, The Sichuan Temple 川楚庙, the Huoshen Temple 火神庙, and the Heishen Temple 黑神庙. The Huoshen Temple was where the Xinhua bookstore is now, the Jiangxi Temple was west of the river, where the grain depot is now. We decided to have a look. With the help of an old lady we found the grain depot at the upper eastern end of the small settlement on the west bank. The granary is now disused, but a group of middle-aged men were preparing large fish for dinner. A gentlemen in his early 50s told us that the Jiangxi temple had been taken

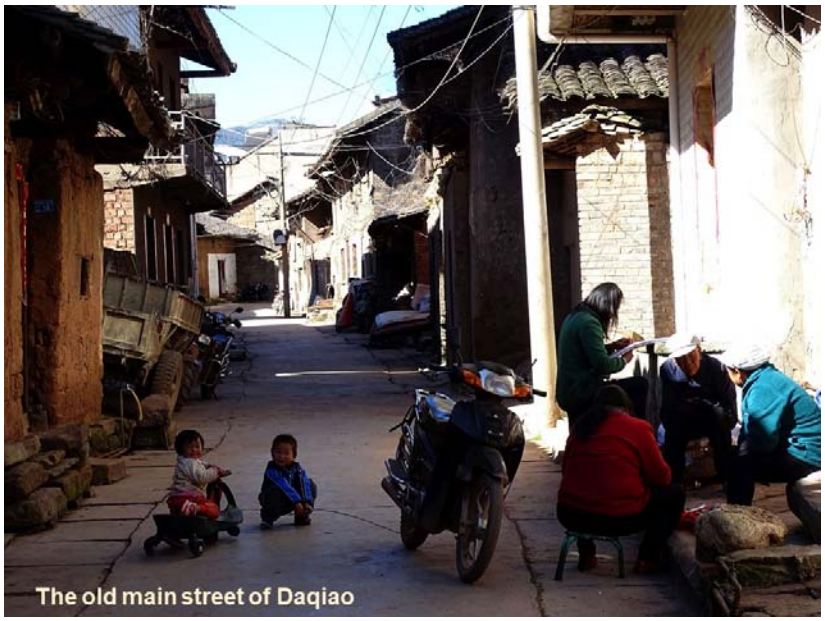
down when the granary was built, but the foundations were still there. Behind the present building a wall of about 1.4 m led up to the last terrace before the hillside became steep. A sandstone stele had been built into the wall that now was part of a chicken coop. The orchard that occupied the last terrace was narrow, not more than 10 m in width before a narrow road along the steeper mountain side. [Nanny considers it more probable that the present granary building in fact occupied the foundations of the former main hall]. Most of the stele inscription had become illegible. A date that probably referred to an event in the past read Jiaqing 3, 1798. Dimensions were 210 cm in length, 95 in height.

Near the eastern wall of the granary building were two stone pillar bases, octangular, 55 cm high, with a diameter of 60 cm, finely carved. The diameter of the pillars would indicate a huge building.

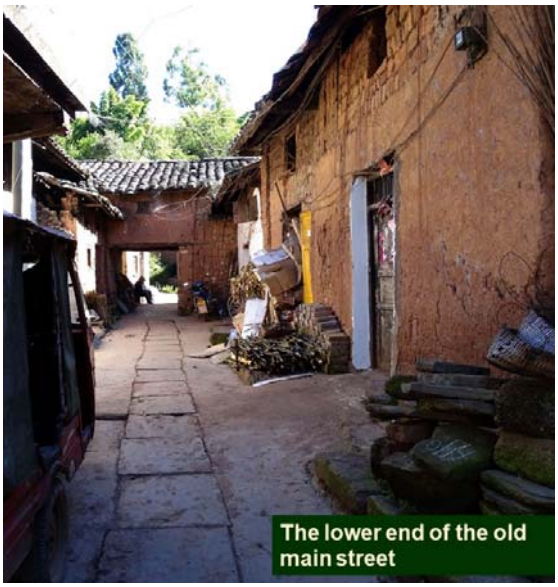
Upon asking, the gentlemen thought of another stele that had been used to cover a drain nearby. After cleaning out the rubble, much of this inscription turned out to be legible. It was about 190 cm m long and 96 cm wide. Unfortunately, it turned out to be the second part of a donation stele, recording names of donators only, and without a legible date. We declined an invitation for dinner (it was only about 4 pm), and forgot to ask the name of the helpful informant.

Back to the old main street, people confirmed that no remains of the other temples had survived. They thought that the Jiangxi and the Caishen temple would have been the largest. The Caishen temple had huge pillars, and used to have a copper bell, that reportedly contained gold, as well as a flat bell. Both were old. The primary school used the Caishen temple buildings, but had been moved out some time ago, and the new Guanyin temple had taken over the compound.

We went up to the New Guanyin Temple. The old gate facing the settlement is now closed, the new gate faces the country road above the town. We met a nun and eventually the abbot. The nun (from Yunnan) knew nothing of the former temple and the abbot (from Daqiao) was evidently not keen to talk about it. The New Guanyin temple is a large concrete structure, the former compound is erased. A stele records a foundation of a temple in the Tang period, and reconstruction in the Qianlong period. Upon insistence, the abbot remembered a stele of the former Caishen Temple that was integrated into the outside wall. Only a few metres from the gate, it had however vanished under a new coat of plaster and paint.



The old main street of Daqiao



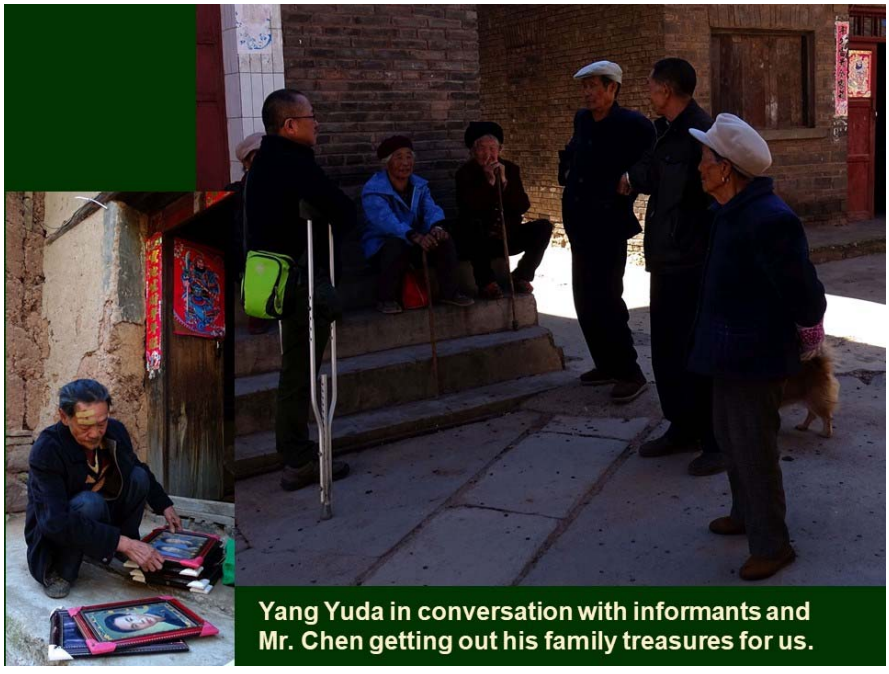
The lower end of the old main street



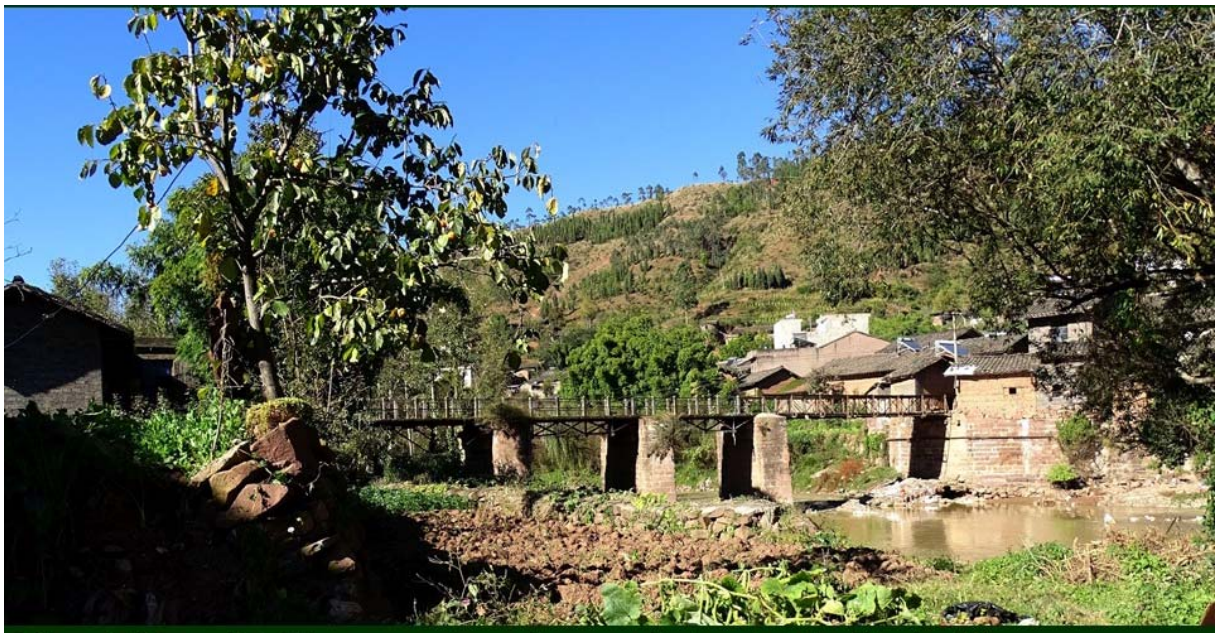
The recently rebuilt Guanyin Temple on the original site



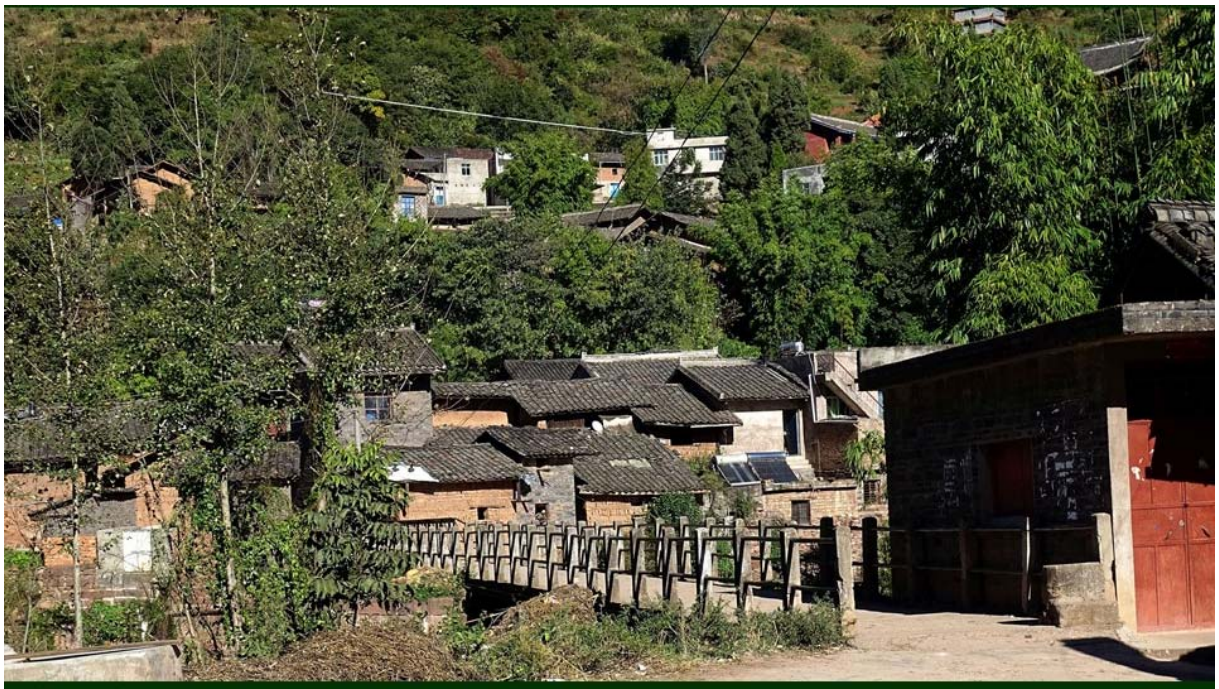
Part of a relief stone near the Guanyin Temple, ca 60 cm high, + 2 m long



Yang Yuda in conversation with informants and Mr. Chen getting out his family treasures for us.



The old Great Bridge seen from the south bank. The first pillar from the northern bulwark of the bridge is missing.



View from the southern bridgehead to the lower end of Daqiao. The red walls and the partly visible pagoda belong to the new Guanyin Temple.



Detail of the largely eroded sandstone stele in the wall.



Upper third of the largely illegible stele, showing rows of names of donators.



Helpful informants cleaning the stele that covers the sewer. One of the now abandoned



One of two octogonal pillar bases of the former Jiangxi Temple



View across the valley from behind the former Jiangxi Temple. The lower end of Daqiao town is behind the granary building, the red temple is the restores Guanyin temple on the old site. The ridge in the background rises to about 3200 m and separates the Daqiao valley from the Jinshajiang. The Daqiaohe winds southeastwards towards the Jinshajiang, it's valley visible in the dip in the right of the photo.

Results Daqiao:

The number and especially the size of the temples that formerly existed in Daqiao reflect an importance that exceeds that of a bridge and caravan stage on the road from Dongchuan to Huili. The prominent presence of people from Jiangxi, Huguang and Sichuan clearly indicates mining. The Mianhuadi Mines, which are about 1 day stage due east, cannot explain this importance. We therefore believe that other mines not far from Daqiao must have existed that founded importance of the town.

Additional information on Daqiao:

According to the gazetteer of Huili (同治《会理州志》) of 1874, Daqiao was the seat of Huili department from 1690 to 1728, when it was shifted to present-day Huili.[2] The administrative seat of Huichuan in the Ming period appears uncertain. Since Huili occupies the largest bazi in the department, while Daqiao is situated merely in a slightly widened valley at the confluence of two small rivers, it appears probable that the Huili Plateau had only a small Chinese presence in the late 17th century, while Daqiao was known and the area occupied by a sizeable Chinese population. This piece of information points to mining in this area in the Ming period.

[2] Huili zhouzhi, juan 1, 19 a-b.

Fieldwork by Nanny Kim and Liu Peifeng at Dayinchang, 2017.10.15. – 16.

Supported by: ---

Main informants: Mr. Geng Wuchang 耿武昌 (aged 48, of Fawo), teacher at the Fawo primary school, Mr. Guo Wanfa 郭万发 (aged 63, of Huogan near Fawo)

We departed from Qiaojia at 9 am and covered the ca. 110 km to Qianxinzhen (formerly Daqiao 大桥, which still is the locally used name) on a very good road, reaching the town at by 13:30. Vegetation, which had been better in Qiaojia than in any other part of Northeastern Yunnan that I have seen, was even better in Huidong, with the forests on the slope diversifying, several broadleaves, and the odd fir and very occasionally a cypress among the pine majority. Some of the pines appear to be 50 years.

Upon arriving in Daqiao we started inquiring about transport to Dayinchang. There were numerous mianbao-type mini-buses commuting on semi-fixed routes looking for customers. We were told that Dayinchang is not far from Manyingou 蛮银沟镇, which has recently become a township (*zhen* 镇). Although only some 30 km from Daqiao, the drivers had no interest in taking us there, claiming that the road was bad and it would take at least 2 hours. This was in fact the case. The road was not in a bad state, but much of it consisted of a very narrow, 1-lane concrete track in a gorge, hence the slow going.

We eventually found a driver and headed off. He followed the road towards Chahe for about 5 km, the turned south into a side valley. The valley opened up for a short section above the larger valley, but soon closed in and became a gorge. The young and sparse forest occasionally contained young cypresses. Climbing out of the gorge we reached Fawojie 发窝街, a rather large village. We got off at the upper end, which is in fact another village called Faqing 发箐乡, the two villages have been administratively joined as Manyingou township.



Manyingou. The larger town in the forground is Fawo, the village a bit higher up is Faqing.





Teacher Geng, and with Peifeng in front of his school.

On Sunday afternoon, there were a lot of people chatting on the street or playing in gamblings houses. Some asking around got us to talk to Mr. Geng Wuchang 耿武昌 (aged 48), a local primary school teacher with an interest in literature and local history. He had been teaching at the school for 27 years.

Teacher Geng told us that there were historic mines of an unknown age. It was also unknown, what they were worked for. There were slags, right around the school. The ground used to be covered in them. He himself used to play with them when he was a young child, they were like glass, very pretty, black and shiny. There used to be a Jiangxi Guild Hall, on the site of the primary school.

He took us to the school, which was nearby, right across the stream and in the middle of the Fawo village. There were some slags in the tiny vegetable plots between the school grounds and the stream.

A very old couple came along, in their 80s. As far as we understood, they knew about the old mines, but had no recollection of smelting or of what ores were worked. The old gentleman's family had moved in from Xuanwei. The whole area used to be covered in slags, it used to be below the main village and called 烧场地, markets were held there.

Teacher Geng explained that the village used to be a little way up the slope. When he was young, it was still there. [It appears that the village moved down following the construction of the motor road.]

He showed us the old main street, which was still in the original layout, although most houses had been recently rebuilt. The mining galleries used to be on the slope above, he indicated a general direction. They would now be blocked up.

Back towards the main street, we met a gentleman in his 90s, who said that his family was from Jiangxi and had come 7(?) generations ago. He also had no knowledge about the mines.

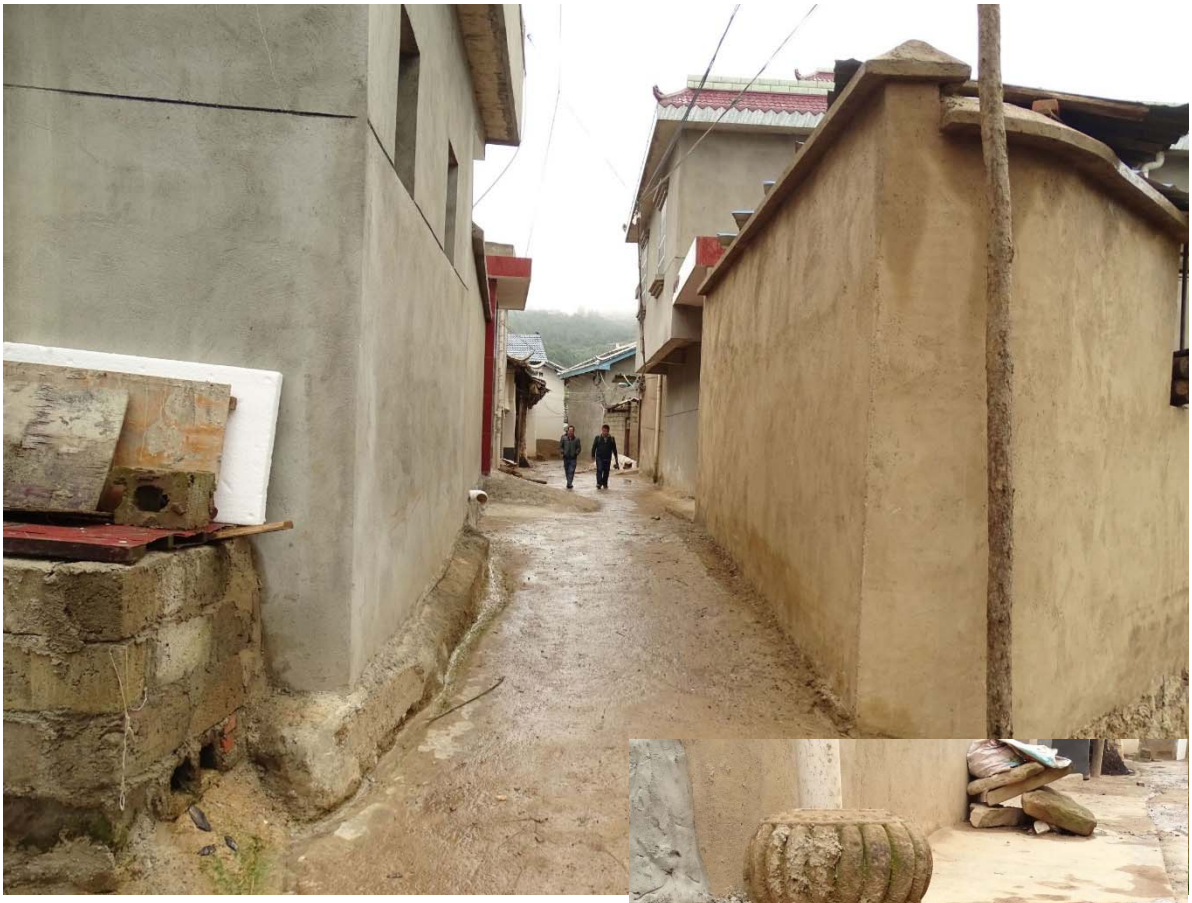
Teacher Geng took us to see a couple of pillar bases integrated in a wall and to the Guanyin Shrine in a small cliff on the stream just below the village. Seven schoolchildren followed and had fun observing us, kowtowing at the shrine and having their photos taken.



The plots with slags between the school and the stream.



The very old villagers.

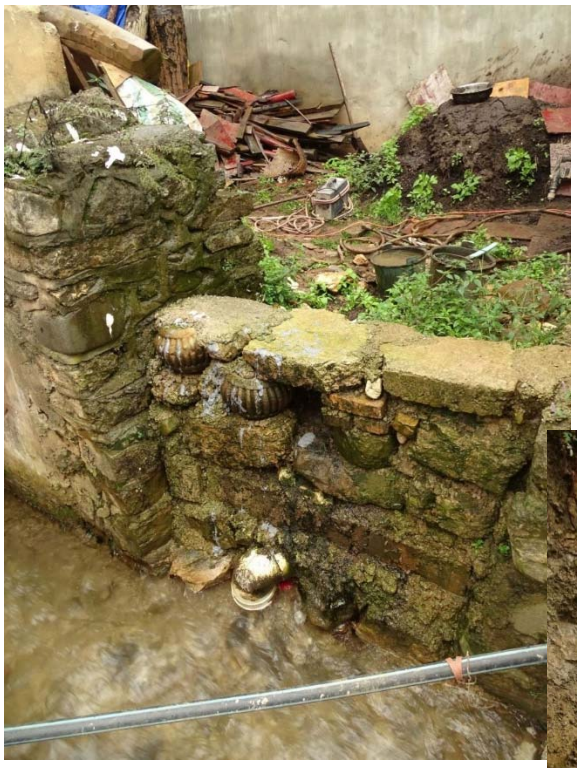




Above: In the old village main street. Insert: Pillar bases we noticed on the way down.



Left: Teacher Geng and Peifeng in conversation with informants near the school.



Left: Old pillar bases in a wall along the stream.

Below: Three of the boys who followed us to the shrine.

Below left: The Guanyin shrine below the village.





As it was only 4 pm, we decided to have a look at the slope above the village. We followed a largish trail in the general direction that teacher Geng had suggested. Heading around a corner perhaps 100 m above the village, we hit on an extremely disturbed slope, facing east, we stumbled along, increasingly mystified and into the evening dusk, until we eventually saw a man at an apparently operating mine below.

Mr. Guo Wanfa 郭万发 (aged 63) was from Huogan 火干, the next village above Fawo in the valley. Mr. Guo explained that the slope was indeed the area of the old workings and had been dug up for several decades because the soil contained lead oxide the formed visible layers on the rock surfaces. [In fact, we had seen orange oxidises layers on some rock]. He knew the old workings and had actually been inside, they were low and narrow and windy. They were all gone now. At present, the mines were worked for oxidized and sulphurized zinc ores. He showed us a large piece of ore that according to him was oxidized zinc with a content of 40%. The mineral was similar to the one the Zhu's had shown us in Zhujiaying,[3] consisting of crystallized cavities and light reddish grey material. The slope was called Laoshan 老山.

There used to be a Jiangxi Temple, a Huguang Temple, and a Temple of the God of Wealth.

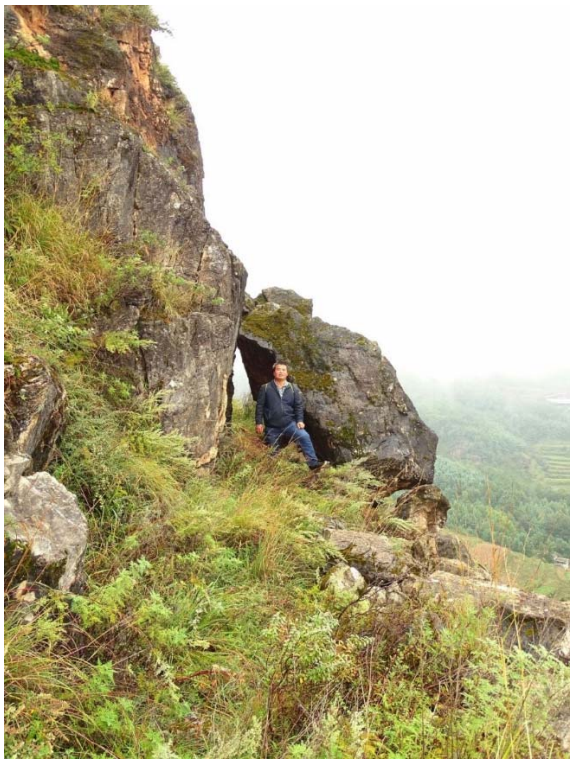
Oral tradition had it that there used to be many Muslim Chinese here, and they started fighting with the Han Chinese. Nowadays there is not a single Muslim family in the area. There is also a story about a mine the collapsed and apparently someone outside called out to buy fresh peaches, and those who believed there were peaches came out an were saved, while all others were buried and died.

Mr. Guo directed us the shortest way back to Fawo, a trail through the forest that came out at Huogan. We reached our hotel at 6 pm.



[3] See 20_huangmukuai.pdf





At the lower end of the disturbed slope, before we realized that this rockfall was not natural.



The disturbed slope.



Peifeng in the disturbed slope.



Mr. Guo Wanfa and Nanny.



The piece of oxidized ore.

2017.10.16 (Mon): Dayinchang in Qianxinzhen (Daqiao), Huidong District 会东县铅锌镇大银厂, return to Kunming

The weather was still wet. We found a young driver of a small car to take us up to Dayinchang, some 15 km from Faqing and at about 2800 m. The ascent was up the slope facing west above the village, reaching the ridge at Tiechang, iron mines that may be old and are still worked. The ascent continued on the southern slope of the main massif. The iron mines are at roughly 300 height m below, on a ridge between to streams descending towards the Jinshajiang. Dayinchang is in the valley of another parallel but much higher stream. The height was mostly in the clouds in the morning.

The mine is under exploitation and Dayinchang village has been re-settled. With little

orientation due to the mist, we first drove on along a large pit, following the valley down to where Saopo 扫坡 might indicate a slope covered in slags (Shaopo 烧坡). We ended up at the abandoned village, with the clouds thankfully rising. We met a gentleman about 70 year of age who was not from the area but was looking after some old buildings of former facilities in the old village. There were in fact slags there, though iron appeared possible as well as lead.

Some way above the abandoned village a massive dam blocked off the village, presumably to capture run-off from mining and ore washing above. The buildings around were traditional in appearance but dated to the 1990s, with mining by still relatively traditional means obviously busy by then. There were also several driving tracks and roads, partly overlying each other.

We returned to the upper end of the pit. Workings evidently extended considerably further up the valley. We drove in a short way and went exploring a bit at a tiny brook that appeared to cut into the layers the predated recent gangue dumps. We actually found a clear layer of slags some 20 cm thick.

We returned to Faqing and asked around a bit more, hoping to find former inhabitatns of Dayinchang village. We had no luck, but inquired about Laoshan 老山 (Old mountain) and the corresponding Xinshan 新山 (New Mountain). Googlemaps shows a village called Xinshan about 1 km north of Fawo. All informants however stated that the ridge above towards Dayinchang was called Xinshan.





Local informant and our driver at the slag dump in the abandoned village and detail of slags.



View eastwards down the valley.



View up the slope of the abandoned village. The open pit mines are further up.







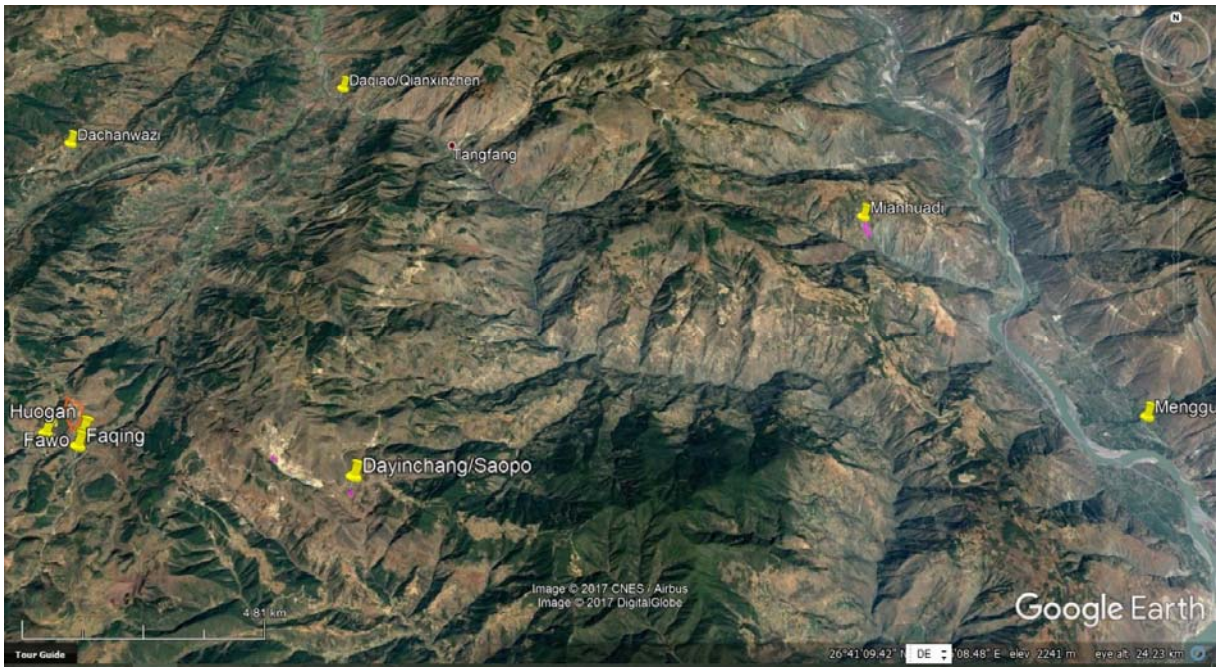
Recent gangue heaps along the brook above the pit/dam and looking for slags.



Slag layer in the banks of the brook.

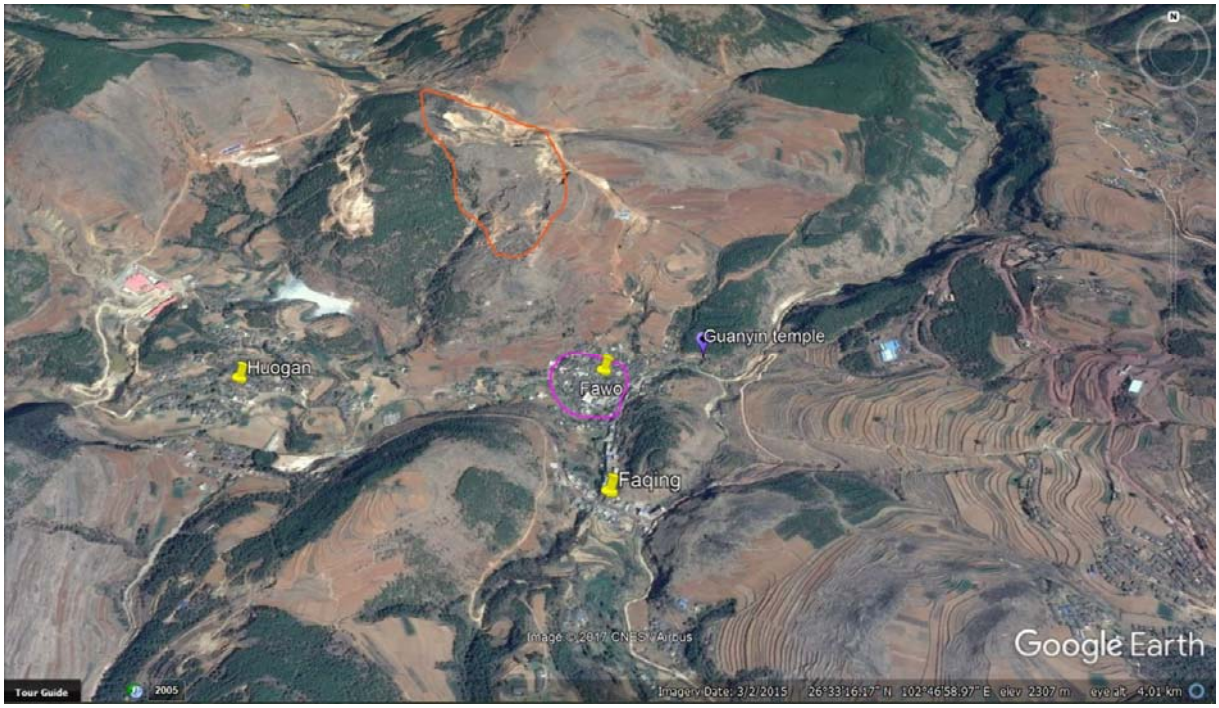


View up the gorge below Fawo and the mixed young forest.



The area of Qianxinzhen (Daqiao), with the Jinshajiang in the east, the Mianhuadi Mines, the Fawo and the Dayinchang sites, and the probable site of Xiaotongchang at Dachan wazi.

Fawo and the Laoshan mining area. Purple area: Slags, Red area: Mines.





The Dayinchang mines at the mountain of 3100 m, with the upper portion of the iron mining slope below.

Results

The absence of oral histories reflects that mining ended certainly over two centuries ago and probably considerably earlier. Remains are extensive and point to a major mine, certainly larger than Mianhuadi. Several late Ming sources mention mines at the Mileshan in Huichuan 會川密勒山, Qing records locate this mountain 300 li (roughly 150 km) east of Huili.[4] *The site can therefore be identified as the Mile Mines, while dating of the duration of the exploitation as well as its scale remain uncertain. Nevertheless, fieldwork and the tentative mapping of remains in this case constitute the first concrete information on the site. We conclude that the mining site at Laoshan (the "Old mountain" south of Fawo and the smelting site below the historic village were the earlier site of intensive silver mining, and the site at Dayinchang the later and probably more important site. By the early 18th century, the mines had become forgotten, and with the redrawing of the boundaries of Dongchuan and Huili, Fawo, now merely a village ended up in Huili, while Dayinchang and Xiaotongchang were added to Dongchuan. Iron mining apparently continued, with some copper exploitation probable as well, while silver mining most probably was not revived.*

Additional information:

The 1:100,000 maps of the Republican period (ca. 1930) show the place names Dayinchang, Xiaotongchang, and Tiechang within the territory of Qiaojia.

The Huili gazetteer of 1874 records Fawochang 發窩厰 at 300 li east of Huili as a village that held no market.[5] The fact that the place was still known as a "mine" (chang) but had shrunk to an unimportant village confirms that mining had long ended.

The same source records the Mile Mountain 彌勒山 as 200 li to the east as a silver site where a mine with a mine official was set up in the Xuande period (1399－1435), with soldiers of Yunnan being

[4] Gu Yanwu, *Tianxia junguo libingshu* 天下郡國利病書, Fang Yizhi 方以智, *Wuli xiaoshi* 物理小識 (1643), Tongzhi Huili zhouzhi 同治《会理州志》, *juan* 9.

[5] Tongzhi Huili zhouzhi 同治《会理州志》, *juan* 9, 1b.

pressed into serving as miners. The mine is stated to have been abandoned at an unspecified time (産銀礦，明宣德間置銀場遣官，開採以雲南官兵充礦夫，尋罷。) The localization of the mountain is vague and no connection with Fawochang is drawn. The mountain is not localized in the recent local gazetteers of Huili and Huidong.

The Huidong gazetteer of 1996 records on the beginnings of the zinc and lead mine at Daqiao/Qianxinzhen that a local magnate started the exploitation of zinc ores, presumably in the Republican period. The enterprise became as state company in 1955 and a forced labour camp in 1958. traditional mining and smelting technologies were employed certainly into the 1960s, with modernization in the 1980s and from 1990.[6]

Audemard Leclère, who travelled from Huize to Huili in 1899, heard about a small copper mine not far from Daqiao.[7] As Leclère's mission was mineral resources, his observation confirms that silver mining had long ended and large scale zinc mining not yet begun.

The Huidong gazetteer of place names of 1986 (会东县地名志) records a mixture of useful and erroneous information:
The Manyingou Iron Mine 满银沟铁矿 was founded at and unspecified time after 1949

Tiechang in Tiechanggou; a Qing period iron mine
Dayinchang: a silver mine exploited at an unknown time in the past
Saopo 扫坡, a slope covered in iron smelting slags
Dalu liangzi 大路梁子: a site where high furnaces for iron smelting used to be standing.[8]
Daqiao: the name going back to a bridge with five [sic!] pillars built during the Hongwu period (洪武年间, 1368－1398), which remained in use.[9]
Fawo 发窝: as a village enclosed by mountains where a landlord got rich on growing opium.
Manyingou 满银沟 a valley where rich iron ore was found, which the locals called silver.[10]

[6] Huidong xianzhi 1996, 515. When we visited Daqiao in 2016, the smelting plant appeared to be no longer operating.
[7] Leclère 1900, 98. Garnier, who travelled the same route in early 1868, does not mention Daqiao or any mining.
[8] 会东县地名领导小组，1986, 107.
[9] 91.
[10] 105. Informants at Faqing incidentally told us that Manyingou originally was a tiny village near the iron mines. While the connection of the place name and the modern iron mines is thus correct, the notion that locals used to mistake iron ore for silver ore or used a misleading name is obviously erroneous.

The Bán Thi mines in Chợ Đồn County, Bác Kạn province

Nanny Kim, 2017.5.11.

Records and questions

The Ban-thi zinc mines were opened as a colonial concession in 1908 and became the most productive zinc mine of the region. A handbook on the mineral industry of French Indochina of 1933 records:

> The most important of the [zinc] mines in Indochina and the only ones to remain in operation today is the mine of the Compagnie minière et métallurgique de l'Indochine that exploits the concession Rubis to the south-west of the village of Cho-diên, in Bac-kan province (Tonkin). Data are available only to 1930, according to which it produced, since 1914, roughly 360,000 tons of ore. The extracted calamine is transported down the mountain by cable into the valley of Ban-thi, where it is calcinated. From Ban-thi, the marketable mineral is shipped by a railway line of 33 km to Song Gam, a tributary on the left bank of the Rivière Claire, where it is loaded on metal sampans of 15 tonnes. At Tuyên-quang, on the Rivière Claire, a northern tributary of the Red River, it is transhipped to boats that transport it either to Haiphong, from where it is exported, or to the plant at Quang-yên (see page 216) where it is smelted.[1]

Not far from this mine, possibly at the county town Chợ Đồn, were other old mines. According of explorations of the 1925, there were at Cho-don, 12 km SW of station of Ban-thi. The deposit was similar to Ban-Thi, and "riddled with old Chinese galleries, who presumably targeted silver." Es a result of the explorations, exploitation for zinc was not undertaken on account of the low zinc prices at the period.[2]

The two sites were evidently historic silver mines, but we have no information that would allow the identification of their historic names or of their importance.

Fieldwork by Nanny Kim 金兰中, Yang Yuda 杨煜达 and Vũ Đường Luân 武堂伦, 6 – 7 November 2017

Supported by: The provincial Culture Office of Bác Kạn, who provided the fieldwork permission

Main informants: declined providing their names.

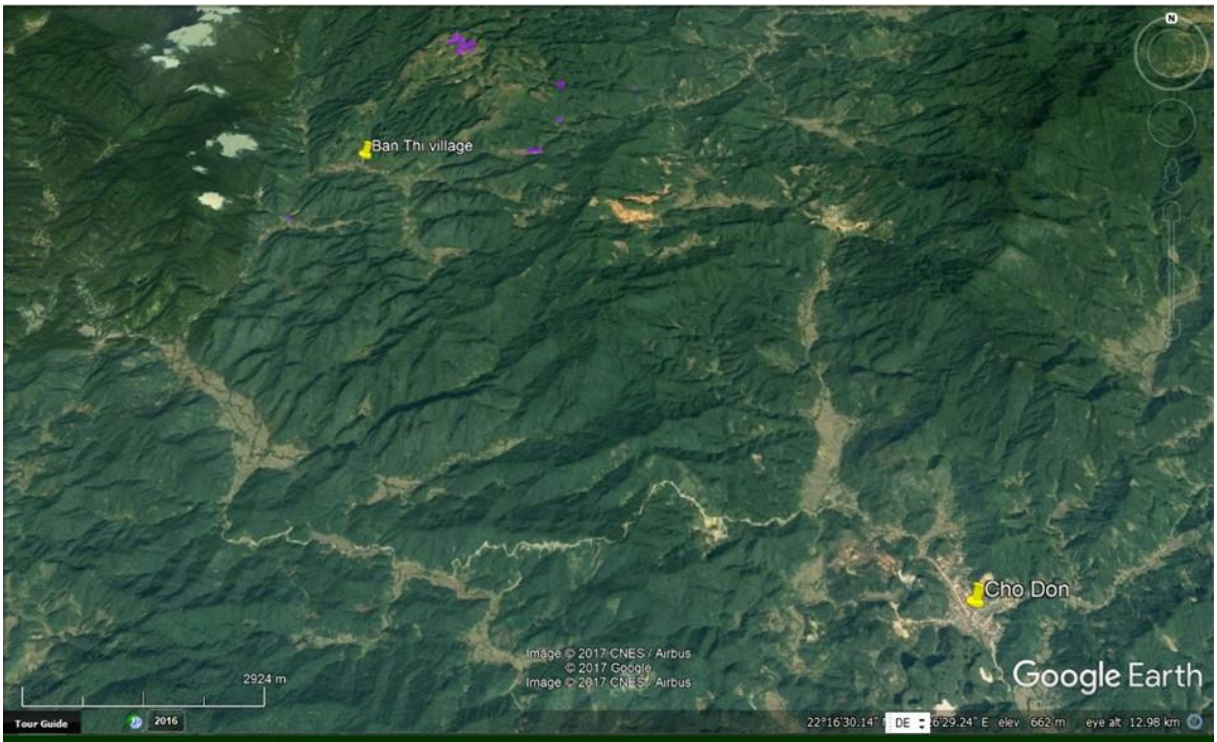
2017.11.06. (Mon) Bác Kạn -> Bán Thi -> Chợ Đồn

The country consists of forested limestone cones and ranges, interspersed with winding valleys mostly filled by rice paddies. The vegetation becomes more lush as the terrain get more mountainous. The forest is not very dense, some quite large trees (probably most no older than 30 years), palms, wild banana, ficus and other large-leaved evergreens, occasionally lighter green deciduous or partly deciduous trees. Creepers abound, in places covering the forest.

We headed out from Bác Kạn with only vague directions, deciding to inquire from Chợ Đồn. With no sign of mining at this small town, we continued westwards, eventually on a very small but still asphalted road past abandoned mining facilities (skeletons of factory halls). We found ourselves in a small village with a single eating place and a small market street, which turned out to be Bán Thi. A friendly butcher soon confirmed that there was a site not far away that "the Chinese" had exploited. There were slags on the street, which looked mixed and crumbly, much like zinc smelting slags.

While having lunch and tea with some truck drivers, Đường Luân kept inquiring. A driver, who was wearing a heavy silver chain, was from the area, and quite specific about slag dumps some

[1] *L'industrie minérale indochinoise* 1933, 209. Translation by the author.
[2] *Indochine du Nord*, 1925, 136, 219.



Chợ Đồn and Bán Thi in Bác Kạn province

way up the mountain.

We followed a narrow track up the mountain ridge for some 8 km. The track kept climbing to about 900 m, with the top cones now only about 50 m higher. There was a small operating mine, and dorms a little way on where the gradient lessened. Just past these buildings, we reached the wide ridge with karst cones. Nobody was in sight, and the relatively level areas were sued for grazing and therefore easily accessible. There were evident traces of recent earth-movements by heavy machinery in the basins between the cones. We headed out separately and found 3 pans, with partly dug-up slags and poor vegetation. Slags and debris, much dug up in the larges basin that was a bit off the track and not directly visible, the two most reachable one least dug up, the northern one especially disturbed, hard to make out. Yuda found a similar situation on the slope to the east of the track, which heavily disturbed by recent mining on the slope below.

Area 1 (Bán Thi 1 in the map), the pan at the western end of the area, is the largest. Remaining slags are relatively uniform and greyish, the area has been dug up recently to the clay layer. Took a sample of charcoal from this layer. Area Ban Thi 2, the next to the east just below the tallest cone is similar, but the evident smelting area is smaller and slags become reddish (zinc smelting?) towards the driving track. Ban Thi 3 is disturbed by deep holes recently excavated in several parts. A thin layer of undefined slags was visible on the rim of the larger holes, a recently operated mine or trial excavation, fenced-off grazing ground in the higher part of the basin, reddish remains in the lower towards the track, presumably furnace remains.

Ban Thi 4 is very steep, descending to the lower end of the operating mines. The top layers, where still in site, are covered in slags, 20 to 30 cm thickness could be established in an undisturbed layer near the top. The disturbed debris is mostly reddish.

Ban Thi 5 is a small area above and behind the first house of the recent village, possibly extends under the grazing ground. Reddish slags, possibly from zinc smelting.

A tiny village of 4 to 5 families is just to the north of this area. A woman coming home with her buffaloes said they had move up recently, but she had heard about a French furnace up on the cone over there. Directions were too vague and the afternoon was getting on.

We drove down and out of the valley to another site where people in the larger village had mentioned slags. Found the site but could not establish the extent of the still visible slag dump under recently built houses and tiny vegetable gardens on the banks of a small stream. According to locals most of the slags had been dug up and sold. The administrative village is called Bán Thi.



Village street at Bán Thi

Headed back to Chợ Đồn (about 20 km on a decent but of course windy road) and found the only hotel that boasts a car port and therefore calls itself motel.

Đường Luân asked the hotel owner whether he knew anything about mines in the vicinity of the town. He turned out to be from Bán Thi and was definite that Bàn Thi is the largest old mining area, according to him exploited by the French. He specified that there were also large French workings further along the ridge past the tiny village, with a cable-car that used to transport the ore down into the valley. He also stated that old French mines existed in the mountains south of the stream.



Vũ Đường Luân in conversation with informants at Bán Thi



View across the pan Bán Thi 1



View south across pan Bán Thi 2 to Bán Thi 4 and the mining slope



Vũ Đường Luân at a cut through top layers at the western end of Bán Thi 1, showing yellowish soil, a layer of gangue, and a layer of slags and furnace debris above rock and soil.

Detail with a piece of furnace wall burnt red







Mix of probably historic slags and chunks of oxidized iron or lead ore



View from Bán Thi 4 towards the tiny new village



View across the mining slope Bán Thi 4



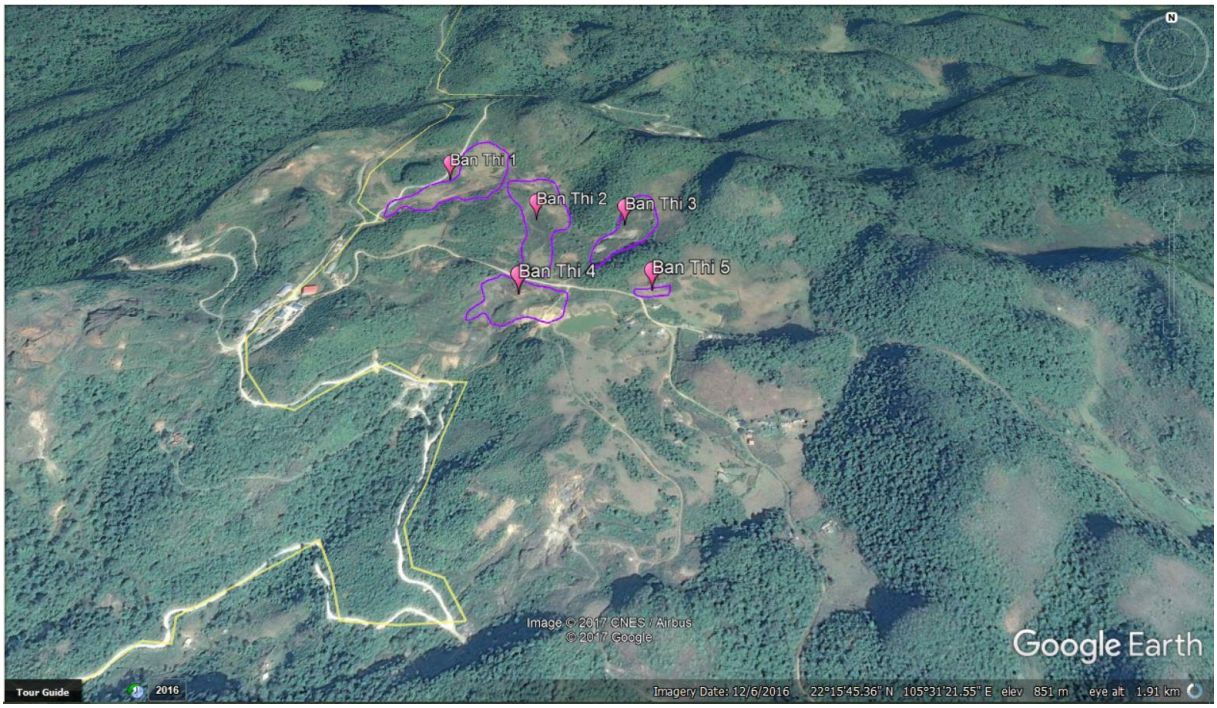
Smelting debris at Bán Thi 5, perhaps from traditional zinc smelting



Stream below the lower end of Bán Thi, and Yang Yuda at the embankment with the slag layer of Bán Thi 6







The slag dumps on the mountain top above Bán Thi.

2017.11.07. (Tue) Chợ Đồn -> Bán Thi -> Bác Kạn -> Ngân Sơn

We drove into the Bán Thi area by a more northern route, first heading towards Ba Be by a small road in a pretty valley. We passed by a mining plant that appeared not to be operating. At Bó Phia, we turned into a dirt track that we expected to be the back road to Bán Thi. After a

seemingly long time of very slow progress, the track reached a watershed between karst cones and turned down a short steep descent into the valley above Bán Thi. At the end of the descent Yuda stopped the car to look at what seemed to be slags. There were indeed slags to both sides of the tracks and long the edge of the first field planted in maize to the small stream. Instead of the usual shape and colour, however, these were very dark, near black, and very large, some over 50 cm across. We found these slags for about 150 to 200 m along the track. They appeard to have been washed down from the extremely steep, forested slope.

In a small erosion gully that was washed clean to about 7 m above the track, a layer of slags and large chunks was embedded.

As the slope was too steep and vegetation to dense to tray climbing, we continued a little way further down to see whether there might be a track or path. We met two men tending to their fields just below the lower end of the slag area. They could not provide information on the origin of the slags but agreed to take us up as far they could go by motorbike.

Đường Luân and me went, and they took us back along the track to the first tiny village beyond the watershed (under 1 km). Here they showed again another slag dump right behind their house. The slags were packed in a thick layer and had the usual appearance. I walked up a well-worn track for some 1.5 km that headed up above the valley. I found dense and thick slags covering the lower, less steep slope, as well as some smelting remains on and along the path through the forest further up. Although I passed the slope above the cones and the site of the large slag lumps, all sight was blocked by dense, young forest.

Back to the car, we drove on to Bán Thi, which was not much further on. We continued back to Chợ Đồn for lunch and drove right back to Bó Phia to visit another site further up the mountains. The turn-off northwards was only a short way into the dirt track and turned out to be not negotiable by car. We drove back to Bó Phia to see whether we could find people who would take us up by motorbike. The first house was a timber workshop. Three young guys quickly made themselves available. It turned out that they had tried to exploit the old mining sites and knew precisely where they were. They showed us three sites. The first in an open spot along the track, on an unclear extent but probably small. The second was on a small saddle in the forest, the extent again unclear due to the vegetation. Thick layer appeared to be over 0.5 m thick. The third was some way up on a track that was not passable by bike. Our informants initially claimed that it was 3 km, but we reached the site under half an hour’s walk through the forest, largely heading straight up the valley SW on the northern slope. A track suitable for motorcyles was under construction, built by breaking up limestone by firesetting, the rough track filled out with earth, and with concrete on the steepest sections.

The reason for this effort became clear when we reached a basin between cones that is almost flat, and covered in tall bamboo forest. The slag area is about 100-150 m across, and probably extends 100 m length downhill. It ends in a small gully. At its lower end is a mining shaft that has been recently worked for oxidised lead. Our informants knew of several mines around here, apparently all perpendicular shafts. Their mine followed old workings. For the time being, they abandoned this working because of the low price of lead ore, but were working sulphur (?) nearby.

We returned to Bác Kạn, met the official of the culture office, who had prepared the introduction to the culture office of Ngân Sơn and drove straight on to Ngân Sơn, reaching this town about 8:30 pm.



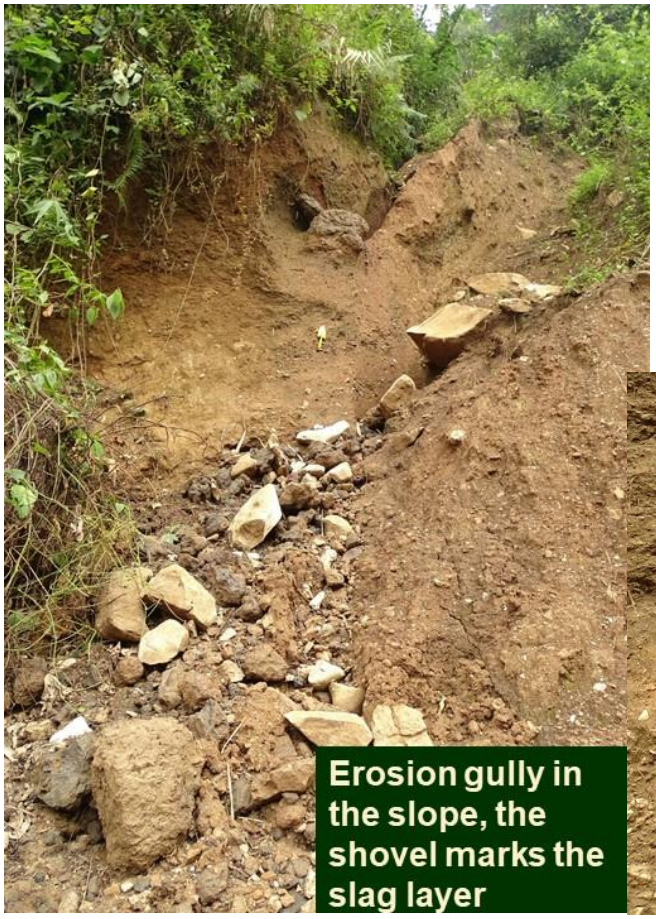
The slag dumps 7s to 10 east of Bán Thi







View down the Bán Thi valley from near the top, upper end of Bán Thi 7



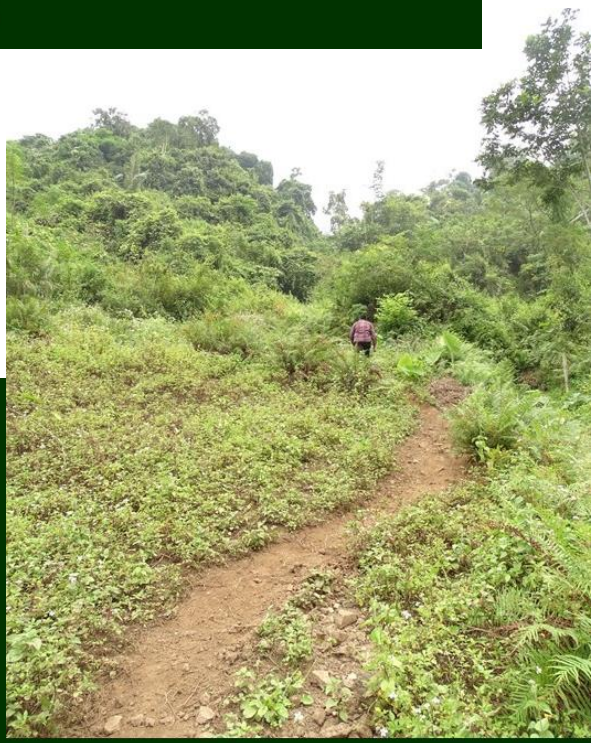
Erosion gully in the slope, the shovel marks the slag layer



Slag layer in the mud slope



View down to the tiny village at Bán Thi 8



Track through the slag dump Bán Thi 8



Slag layer at the track, Bán Thi 8



Vegetation on the way to Bán Thi 9



Our informants at Bán Thi 9s



Partly dug up slag layer at Bán Thi 9



Bamboo forest at Bán Thi 10


Our informants at their mine


Lead ore


Part of the pan Bán Thi 10



Historic slags on the path at Bán Thi 10





Building a motocycle path by firesetting

Results

The historic mines at Bán Thi were clearly extensive. As the French exploitation relied initially on shipping the ores to the home country, smelting on site during the colonial period is highly improbable. Some continuation by traditional technologies is possible, but would have ended with the beginnings of French operations in 1908. The fact that oral traditions usually attribute all historic exploitation to "the French" also suggests that the colonial exploitation replaced and overlaid earlier mining, in the landscape as well as in local memory. We have no explanation for the unusual slags at Bán Thi 7. They may have been left by calcination, but the distance of nearly 2 km from the site of colonial industrial plants appears too far. I expect all other dumps to be remains of smelting sites dating before the mid-19th century. The historic name of the site could not be established. Some, presumably late exploitation for zinc is possible, but silver can be established to have been the main target of historic mining.

Further information

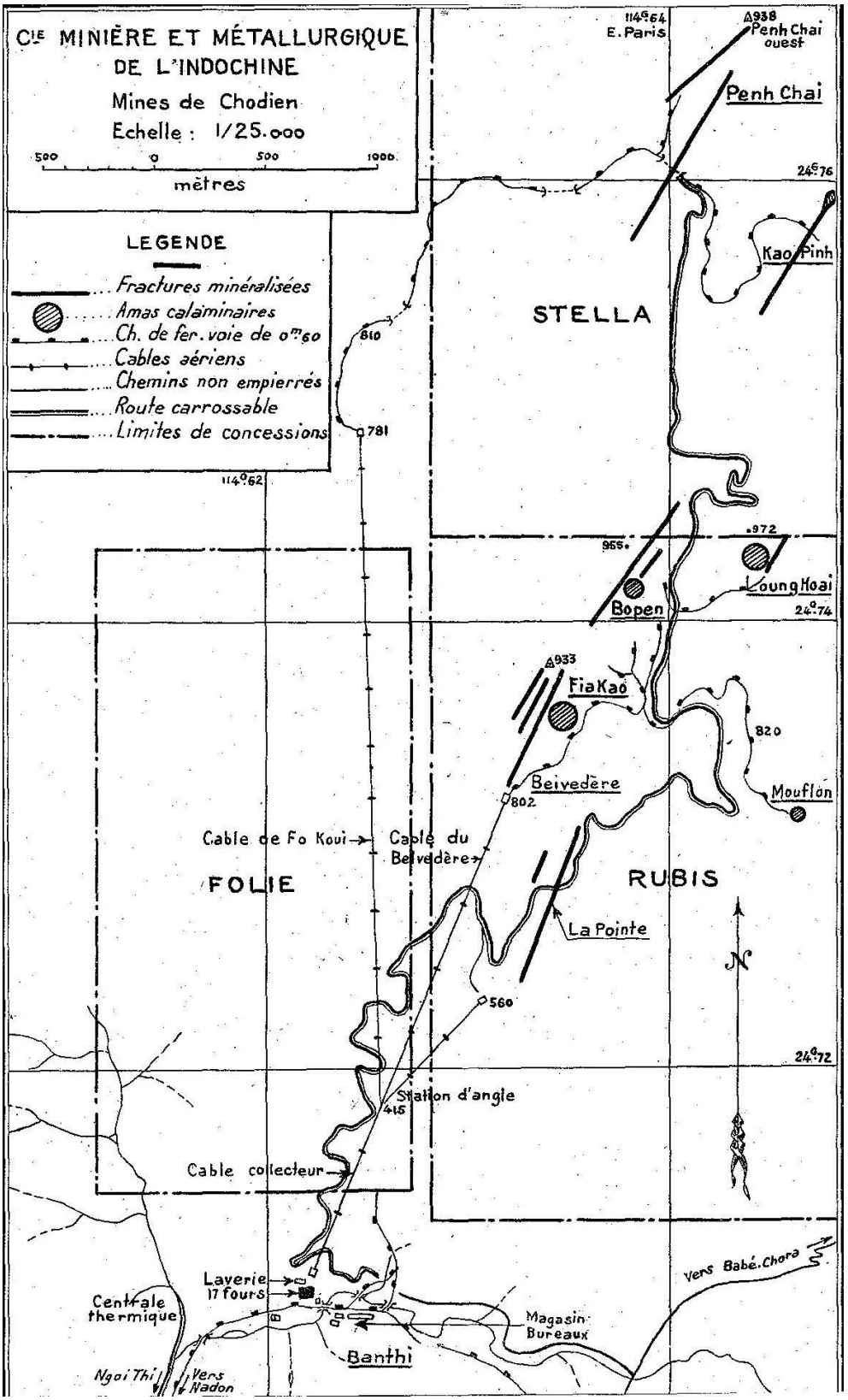
The handbook *L'industrie minérale indochinoise* contains a description of the geology:

> The known calamine deposits in the region of Cho-diên are localized in cristallized limestone resting on lustrous schist. They might all belong to the same limestone layer, that has a thickness of at least 200 m. The formation has been laminated by tangential forces, the effects of which are most visible near the contact of the limestone and schist layers, contact perhaps not corresponding to normal stratigraphy but of tectonic origin. It has also been affected, after the horizontal movements, to almost vertical fractures, which have caused considerably different levels between the compartments deliminated by these fractures.
>
> The most recent fracture system, that has a north-western direction, i.e. runs parallel to the Red River, is generally sterile. The metallization appears linked with a second system oriented between NNE and NE, i.e. roughly perpendicular to the first, and recognizable over more than 10 km.
>
> The mineralization, of which the original sulfurized form is rarely found, is visible throughout, especially along the schist base and presents itself in various forms, attached to three types: carbonated or silicated fillings of fractures and their irregular expansions; inter-stratification from these fracture into the limestone, usually in the limestone-schist contact zone, and enrichment in deep soil layer by decalcification filling cavities formed by erosion in the limestone.[3]

According to this description, lead-silver ores would have been found in veins of secondary enrichment, most typically in the contact zone of limestone and schist, and often below the zinc ore. This structure of the orebody explains how modern mining for zinc exploited mostly the same sites as historic mining for silver.

The map of the colonial mine shows the industrial building, the ruins of which were still on site in 2017, the cable cars and the main sites of exploitation that correspond with the most visibly disturbed slopes.[4] The map does not include area of the slag dumps Ban Thi 7-10, suggesting that these were historic mining sites that were not subsequently exploited for zinc.

[3] *L'industrie minérale indochinoise* 1933, 214-5. Translation by the author.
[4] *L'industrie minérale indochinoise* 1933, map following p. 214


Cie MINIÈRE ET MÉTALLURGIQUE DE L'INDOCHINE
Mines de Chodien
Echelle : 1/25.000
500 0 500 1000
mètres
LEGENDE
Fractures minéralisées
Amas calaminaires
Ch. de fer. voie de 0m60
Cables aériens
Chemins non empierrés
Route carrossable
Limites de concessions
1140.64
E. Paris
Δ938
Penh Chai ouest
Penh Chai
24°.76
Kao Pinh
STELLA
810
781
1140.62
955
.972
Loung Koai
Bopen
24°.74
Δ933
FiaKao
820
Belvedère
802
Mouflon
Cable de Fo Koui
Cable du Belvedère
FOLIE
RUBIS
La Pointe
N
560
24°.72
Station d'angle
415
Cable collecteur
Laverie
17 fours
Centrale thermique
Magasin
Bureaux
Banthi
Ngoi Thi
Vers Nadon
Vers Babé. Chora

Ngân Sơn 銀山 in Bác Kạn province

Nanny Kim, draft May 2018

Records and questions

Ngân Sơn probably was the most productive mining area in early modern Vietnam. Tax records dating from 1802 to 1851 report a reported revenue of 400 *liang*, that only fell to 370 *liang* in 1851.[1] The recorded revenue made this mine the most remunerative to the king. Since the area was ruled by a local lord, however, we have reasons to expect that both the output and the taxes levied locally were far above the officially reported sum.

According to early 20th century records, "very old mines of argentiferous galena" were found in the surroundings of the town. A tour guide of 1925 adds, that the place used to be "the fiefdom of a Thai lord, who was invested with the name of Cam-hoa before the Tràn, and changed to Ngan-so'n in 1900.[2]

The handbook of the mining industry of 1933 also states that Ngan-son and Tong-tinh were the most important ancient exploitations. It records on the geology of Ngân Sơn:

> The area of Ngan Son is formed by primary schists within which islands of crystallized limestone are found. On an area extending over a length of 6 km from north-east to south-west and 2 km wide, this formation is affected by numerous mineralized fractures, the fillings of galena, blende, calamine, iron pyrite and accompanied by chalcopyrite are remarkable for their high silver content.
>
> The veins have been exploited by the Chinese to a depth where it became impossible for them to prevent water infiltration. In their old workings, one often finds blende (sphalerite (Zn,Fe)S) that they left behind, even though it contained 3 kg and more of silver per tonne.[3]

The record concludes that exploitation was not attempted, due to the low silver prices.

The analysis of discarded zinc ores documents elevated silver contents. Historic miners clearly targeted silver-lead ores. It appears that the exploitation predated the technology of zinc distillation, or – more probably – that galena was available in sufficient quantities and the costly and difficult treatment of zinc ores therefore avoided.

Fieldwork by Nanny Kim, Yang Yuda 杨煜达 and Vũ Đường Luân 武堂伦, 8, 9, and 11 November 2017

Supported by: The provincial Culture Office of Bác Kạn and the village culture office of Đực Vân.

Main informants: Nuong Vân Mac (aged ca. 55) of Đực Vân, Di Phù Sáng (aged 63) of Ngân Sơn, Phan Thi Huến (aged 55) of Cốc Lùng.

The area of Ngân Sơn is in the uplands of northern Vietnam, the basin is at about 500 m, the surrounding karst ranges at up to 900 m. The mountains are mostly recently re-afforested in pine. The trees grow quickly, approaching 20 m in height and over 30 cm in diameter in 15-20 years. Occasionally, some large-leaved broadleaves and a tropical fir is mixed in, the fir looking aggressive, with long spikes all around the branches. The landscape appears far less tropical than in Chơ Đôn, where forest trees are mixed with tall bamboo, and creepers often give the vegetation a slightly eerie appearance.

The county culture office supported our visit by taking us to the Đực Vân, the next village north

[1] Data provided by Vũ Đường Luân.
[2] *Indochine du Nord*, 1925, 133. The place name Ngân Sơn however was certainly older and also appears in earlier Western records.
[3] *L'industrie minérale indochinoise* 1933, 222. Translation by the author.

of the town along the main road. The village government in turn organized three locals who took us to the sites by motorcycle. Nuong Vân Mac, in his 50s, had been involved in mining and was our main guide.

Our informants first took us to the site that they reckon is the largest and which is relatively nearby (Duc Van 1). The slag area extends over about 5 rice paddies on a saddle above the Ngân Sơn basin and up the slope across dry fields and a grazing area. Our informants also showed us numerous shaft mines on the slope, beginning in the meadow just above the fields and extending into a young pine forest along the increasingly steep slope. The slope becomes a spur above a small valley that descends towards the reservoir that froms the center of the Đực Vân pan. We saw cluster of at least 10 shafts, many at a distance of only 4 to 5 m from each other.

In the afternoon, our guides took us to three more sites in the recently reforested mountains to the west of the lake, at a distance of 7 to 8 km from the central village. It was a long ride for the unaccustomed, and especially for Yang Yuda, who has to keep balance as well as hold onto his crutches.

The first site (Duc Van 2) was on the main western ridge near the highest cones. It occupies a dell below a low cliff and is mostly within a recently re-afforested area that is surrounded by dry ditches some 2 m deep, which serve to keep the cattle out. The area of still visible slag remains is about 100 m across. According to our Mr. Nuong, the slags had been dug up recently and re-smelted for gold [re-smelting more probably was for lead than gold, but the selling of the slags was evident]. They also showed us 4 mining shafts the southeastern corner of the area, with at least another one in the adjacent ditch.

Turning back, our guides stopped in the first valley between the main ridge and the mountain to the SE that has a cleavage and is about the same height (around 900 m). Grazing land and some maize; a small grotto at the top end of the fields in a small limestone cliff, and very recent mining of oxidized iron, with remains of a furnace. Mr. Nuong showed us ore that is similar to the minerals he had shown us from or near the old workings at the southeastern corner of Duc Van 2. He stated that old working had existed around here as well and that there was a slag dump somewhere in the nearby forest. Walking down the track we noticed a small grave with a partially legible inscription. According to our guides, there were numerous Yao graves in the area that had Chinese inscriptions.

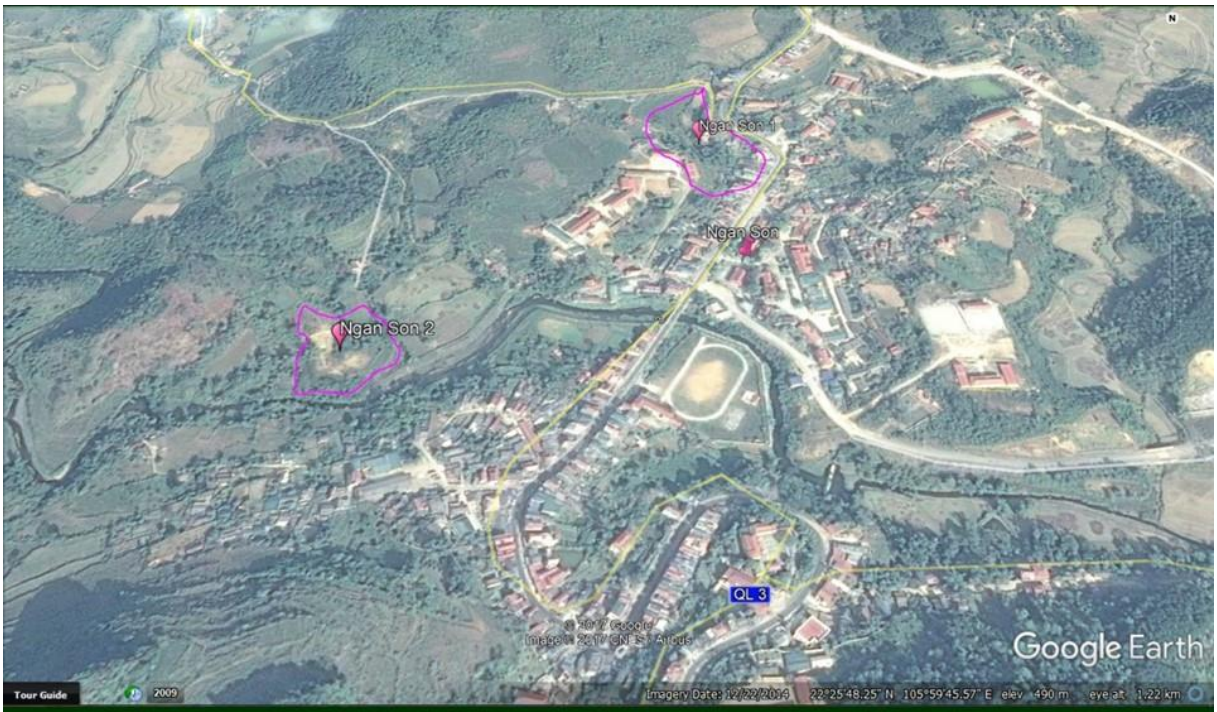
The next site was along the way back but heading south into the forest. The location of the site slags on the forest floor is somewhat uncertain, it was located on a slope facing SE and just above two small ponds. The slags well visible, their extent and the thickness of layer could not be established. (Duc Van 4)

Our guides took us back to Đực Vân village by circling the lake to the south and hitting the main road below the site we had visited in the morning.

According to our informants, the pine forests were planted about 20 years ago. They remembered the mountains as bare, explaining that people used to burn them off regularly. [The map of ca. 1940 in fact shows the surroundings of Ngân Sơn as completely deforested]

Back at the village, they stated that altogether some 10 slag dumps existed in their village area.

We were back at Ngân Sơn at about 5 pm.



Ngân Sơn town and the established extent of the slag areas Ngan Son 1 and 2.



Duc Van 1, with the main road in the foregound, the slag dum is marked purple, the area of the dense mine shafts red.



Slag dumps Duc Van 2, 3, and 4 in the hills west of the lake.



View from the hotel across the suburb on the historic slag dump



View westwards from the Đực Vân village government across the pan and the lake.



The hotel garden, soil mixed with slags



The upper end of Ngan Son 1, photo by Yang Yuda



Đường Luân and Yuda with a county and a village official



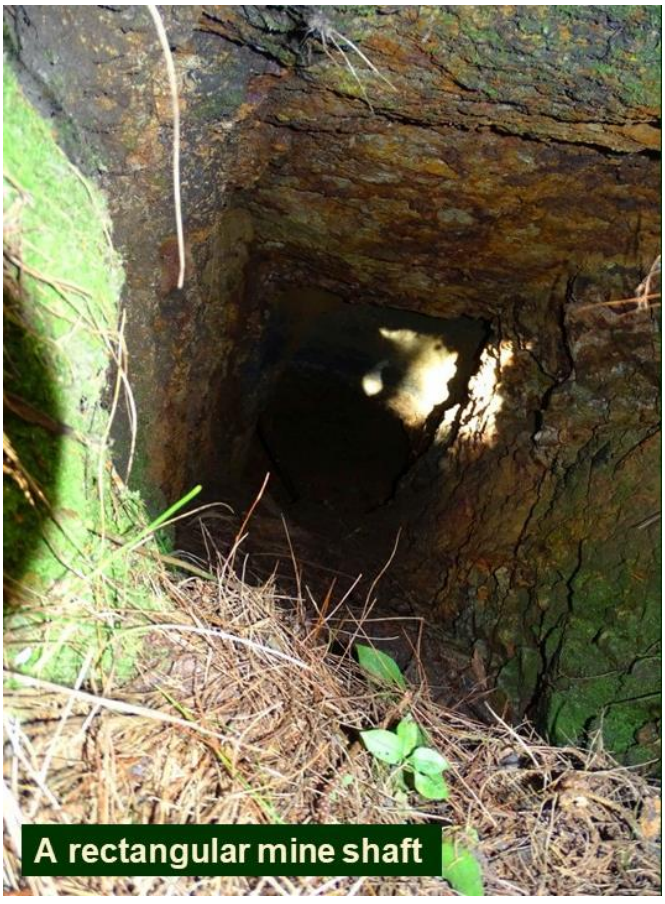
View down the slag area Duc Van 1 towards the paddy fields on the saddle and Ngân Sơn out of view below.



At the top of the slag dump Duc Van 1



Mr. Nuong and another informat at wo mine shafts



A rectangular mine shaft



View north from the end of the saddle to the meadow area dn the pine forest with the mines.



The slag area Duc Van 2.



Mine shaft at Duc Van 2



View down the slope between Duc Van 2 and 3, across the Đực Vân pan to the ridges NE.



Grave with shaky Chinese characters at Duc Van 3


Duc Van 4 in the young forest


Đực Vân village

2017.11.09. (Tue) Ngân Sơn to Thính Túc

The weather had changed overnight, due to another late tayphoon that hit southern Vietnam. In heavy rain without any prospect for letting up, Đường Luân and me went into town to look at the extent of the slags and to interview more people. Our hotel owner was very specific about the slag dump under and around his house. He indicated a depth of around 1 m for his house, which had been built fairly recently, presumably less than 10 years ago. He pointed out the area as reaching into the fields behind and to the houses along the main road, specifying that the dump reached a thickness of several metres deep under a recently built larger building on that road.

Đường Luân had heard that another slag dump was near the vegetable market. This appears to be the old part of the town, to the south of the stream und right under the "horse ears" mountain, two narrow karst cones. We walked down a narrow street, that appeared old in its layout but without any older buildings along it. At the last house, Đường Luân asked an elderly man about the slag dump. Di Phù Sáng (aged 63), almost immediately agreed to take us and came back with his gumboots on. We followed him down a small path to the stream, crossed some overflooded stepping stones and reached the dump where the ground gets slightly higher again. The major part of the dump had been dug up and sold. The lower end would have had a thickness of about 5 m. The overall width reaching into the next field to the north and into bushes towards the stream was 150-200 m, the length from the visible upper end to the bush area above the first fields along the stream about 70-100 m. Mr. Di had seen objects in the shape of *shatiao*, he reckoned they were cores left by prospectors.

We parted at the stepping stones but quickly realized that we had forgotten to specify whether the *shatiao*-shaped objects Mr. Di had seen were made from clay.

We returned to his house by the road and found Di and his wife together with Mr Hứa A Lầm, 79 years-old, and his wife, as well as his son or younger relative aged about 50. Đường Luân explained our interest in the local history, and the group soon warmed up to the topic. They told us that this part of town is still mainly Chinese, Mr. Di's ancestors had come 6 generations ago, those of Mr. Hứa three generations ago, Nong from Guangxi, probably in the 1920s, when his grandfather was a young man. They speak some Chinese but most of the conversation was in Vietnamese.

There used to be two temples on this street, both sites still known but no remains of old buildings.

Mr. Di specified that the objects he had seen were in fact drill cores. None of the informants had seen ceramic objects of this shape.

They told us about an even larger slag dump that is some 3 km away and gradually came up with more locations:

Based on Đường Luân's notes, these were:

1 Toi Men (对门) [Ngan Son 2], behind the old market, approximately 15.000 m^2

2 Nà Đeng – Đồng Cân, in Vân Tùng commune, 3 km from Ngân Sơn town. That area is also called "Núi Bạc", which means "silver mountain".

3 Cốc Lùng, in Vân Tùng commune, near Ngân Sơn town [Coc Lung]

4 Lũng Viềng in Cốc Đán commune to Nà Pán in Trung Hòa commune, both in Ngân Sơn county, at around 10 km from Ngân Sơn town. After some discussion, they decided that this was the biggest slag dump.

5 Núi Tai Ngựa in Vân Tùng commune, near Ngân Sơn town. This site was exploited during the French colonial era and remained the main exploited mine (矿洞), the gallery being large enough for a big car to enter.

When we asked about the slag dumps of Đực Vân, our informants were vaguely aware of these sites but stated that they were small compared to the ones they had enumerated.

They did not know which ores had been exploited, but differentiated between Chinese and French mines.

We returned to the hotel, exchanged the information, and decided to drive on to Tính Túc in the hope of better weather there, departing towards 11 am.



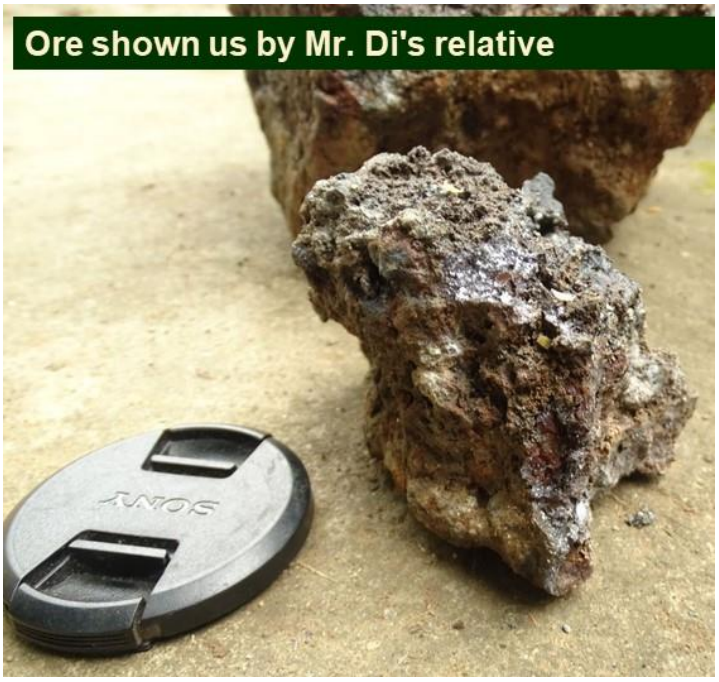
Mr. Di and Đường Luân on the remains of that slag dump Ngan Son 2



Stepping stones across the Ngân Sơn stream



The end of the old vegetable market street with the restored temple



Ore shown us by Mr. Di's relative

2017.11.11. (Sat): Ngân Sơn, return to Hà Nọi

We left Cao Bằng for Ngân Sơn and Hà Nọi just after 7 am. It was still heavily overcast and foggy, but had cleared up by the time we reached Ngân Sơn at 8:20. We stopped at the hotel on the edge of town that we had been staying at before.

Đường Luân deliberated with the landlady and two gentlemen who came down the track on their motorbikes. In the event, Yuda was left behind on account of the wet ground, and the two men took Đường Luân and me without further explanation. We passed through the town and followed the main road heading south to the first ridge, where my driver took a turn to the left descended due south for a short distance and stopped at the first house.

The only person present was an elderly lady with a bad back, Phan Thi Huến (55 years old),

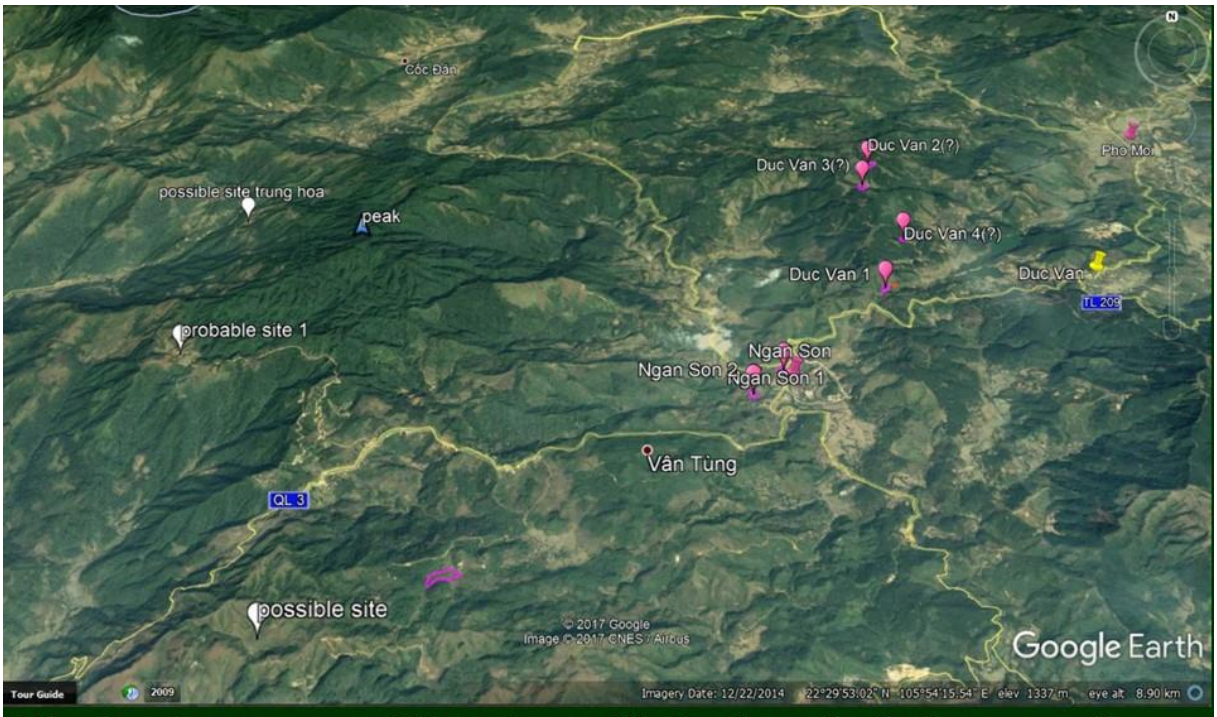
who considered our strange request for a while but then agreed to show us the site. We found ourselves trudging off behind her, while the cyclists turned back. Mrs. Phan told us that she is Nong and that her grandfather was still was involved in smelting. He had died when she was only a small child, therefore had no further knowledge on the metals that he had worked or about the history of the mines.

We first headed down the motorcycle track, but instead of following it bending left into the main village, we turned right into another track and shortly afterwards left this track to follow a path that overall continued southward, heading gently up for a while, until we came out at pan of fields, sloping to the southeast. These were her fields and she stated that there were slags throughout. These were easily visible on the track, as well as along the upper edge of the fields bordered by limestone. The thickness of the layer could not be established. At the southern end of the pan slags had been heaped up presumably after sieving and in order to sell them. Mrs. Phan confirmed that they had sold them for a while.

Slags visible in the path thinned out on the track above the fields. A man coming down on his motorcycle told us that there were more further up. I followed the track for about 1 km, but did not come upon any slags to the top of the ridge between karst cones.

We walked back on the motorcycle track, circling a karst cone along its western base instead of the lower and more direct route along its eastern base that the path took. On the track, we met the same informant who had mentioned the further dump because his bike had a hitch. He specified that further on was in fact a distance of a few km.

For reasons of time, we passed by Mrs. Phan's house and headed straight back up to the main road, where our driver and Yuda picked us up to continue straight to Hà Nọi.



The slag dumps around Ngân Sơn, with Coc Lung in the foreground.



At Mrs. Phan's house

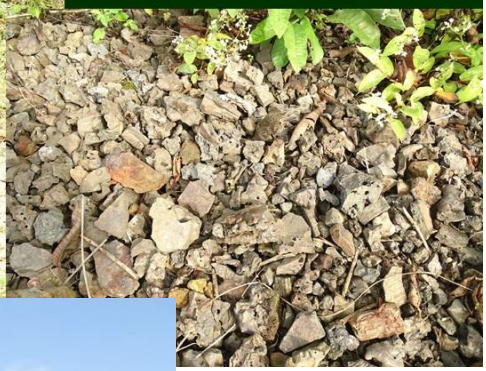


Motocycle track below Mrs. Phan's house



Mrs. Phan's fields, named slag dump Coc Lung for identification.





Mrs. Phan and sieved slag heaps at the upper end of the fields



View across Cốc Lùng, facing east.

Results

The considerable number of slag dumps near and around Ngân Sơn is clear evidence of longstanding and important mining. Time was insufficient to begin establishing the extent of the mining area by surveying at least all larger slag dumps. Because our informants at Đực Vân were not familiar with the slag dumps of Ngân Sơn and vice versa, relative comparison is uncertain. By preliminary estimate of the visited, it would seem that the dumps Ngân Sơn 1 and 2, Coc Lung and *Duc Van 1 were roughly comparable in scale, while the other sites were probably smaller.*

Based on government records that stated that the Phuc Sơn Mines were near Ngân Sơn, Đường Luân identified the Coc Lung dump as belonging to these mines.

Further fieldwork on the other sites to the west and southwest of Ngân Sơn would be highly desirable.



The "horse ear" cones of Ngân Sơn, with only a small part of the town visible for the lush trees



US military maps, ca. 1940. Detail of Ngân Sơn and surroundings, showing the deforested area.

The Thông Thinh Mines near Tính Túc, Cao Bằng province

Nanny Kim, draft May 2018

Records and questions

In 1976, Quan Hansheng noted two highly productive borderland mines, one located in Burma, the other identified as the Songxing (宋星) Mines in Vietnam, from which about 64 tons, or a recorded 2 million *liang* or 72 tons of silver were annually imported, probably in the 1830s and possibly earlier. Quan thus indicated that the reconstruction based on tax record were incomplete. In addition to the obvious absence of mines outside the Qing territory, the output figures would suggest that the majority of Chinese miners worked outside China.[1] The sherd of information documents existence of a mines that was extremely productive in the early 19th century.

The site appears as Thông Thinh 送興 in the Vietnamese tax records from 1804 to 1851, with quite modest reported annual taxes of 100 to 165 *liang*.

The probable location is at or near the Tính Túc that were exploited from 1905 for tin and tungstene and are still worked today.

The industrial handbook of 1933 describes the deposit at Tính Túc :

The alluvial deposit that is exploited fills the bottom of the Ting-tuc valley, resting on a very irregular bedrock of limestone, and found to have a depth of some 60 m in places. It consists of loam-sand mass mineralized almost exclusively with cassiterite (at a content of 1 kg of tin per tonne of material). There are sterile blocs of all dimensions mixed in; and the material has a slight gold content (20 to 25 g of gold per ton of tin).[2]

The map in the same handbook following p. 164 indicates 3 villages surrounding the valley and the pit of the Adèle concession that were in existence prior to the modern open-pit exploitation of cassiterite.

A map "Règion du Pia Ouac: Concessions minières" of 1908 indicates "old Chinese workings" on several slopes of the southwestern spurs of the mountain, as well as the place name "Tong Tinh".[3]

Based on the materials, we expected historic silver exploitation to be concentrated around Thông Thinh, with a possibility of historic tin exploitation at Tính Túc.

Fieldwork by Nanny Kim, Yang Yuda 杨煜达 and Vũ Đường Luân 武堂伦, 10 November 2017

Supported by: --

Main informants: Mr. Lý Pao Phúc (ca 30 years old) of Bình Đường.

2017.11.10. (Fri): Tinh Tuc/Thông Thinh, around Pia Ouác

Two successive days of rain and mist affected fieldwork at the site. People at Tính Túc town told us that the economy was quite depressed since mining had practically ceased a few years ago.

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[1] Quan Hansheng (Chuan Han-sheng) 全漢昇. 1976. "Ming-Qing shidai Yunnan de yinke yu yinchan'e "明清時代雲南的銀課與銀產額" (Silver taxes and silver output of Yunnan in the Ming and Qing periods). *Xinya xuebao* 新亞學報, 11.1: 61-88. His sources for the two borderland mines are Zhao Yi 赵翼, *Yanbao zaji* 簷曝杂记 (Scattered notes), reprint (Beijing: Zhonghua shuju, 1982) and the *Veritable Records of the Nguyễn Dynasty*. T9he latter reference is slightly vague.

[2] *L'industrie minérale indochinoise* 1933, 173.

[3] The map is held at the BNF : btv1b530636670

We had to stay over 10 km from Tính Túc. In the early morning, we drove passed through the town and the mining area to Bình Đường, the village that Đường Luân expected to be former Thông Thinh. The road circled the northern rim of the open pit mine, climbing up before heading south into a valley between the Pia Oác massif and a relatively low but sharp crest running north-south.

Đường Luân started inquiring as we got into scattered houses. People readily confirmed that there were old Chinese workings around, pointing to the nearby slopes in the mist. Lý Pao Phúc (ca 30 years old) acted as our guide. He got his motorbike out and led us along the driving track up the lower spurs of the Pia Oác massif. It was hard to tell where we were in the mist and passing mostly though young, re-afforested in pine forest. We stopped at a bamboo timbering station, where Mr. Ly told us that our goal was 1 km walk from here. The rain had become a drizzle by now, but it was still very misty. The upper end of the track was rather slippery, so Yuda and Đường Luân stayed behind. I trudged behind Mr. Ly, who soon took off his plastic sandals and continued barefoot, down a short descent in the forest and int a cultivated side valley, with a few houses here and there. About 1 km down the gently descending valley was a small cluster of houses, just below we reached the widest part of the upper valley, crossed a small brook and reached a large pile of slags next to another small brook and approaching the northern slope. The valley slopes down steeper from this point, especially to the south. The further descent was still in the mist.

We had encountered slags in the track all the way from the lower edge of the forest. Due to the shortage of time, I could not establish whether these were left on site or distributed on the track. For better grip. Mr. Lý actually speaks a little Chinese, so we found a way of communicating slightly beyond gestures. He pointed out that there were some slags (or had been) just below the village, and that the main slag area was the bottom of the basin and the northern slopes. He also indicated that the mines were on the northern slope, while being definite that none were on the southern slope. The height of the slopes and their precise direction remained veiled in the mist. In the fields below the houses, slag lumps in the walls dividing the paddy fields and in the ground were evidence that we had entered the slag area.

The pile of slags was left from selling slags, a couple of years ago, if I understood correctly. Next to the pile was a small facility presumably for loading small tractors or mini trucks. I looked for *shatio* but found none, possibly because the material on the pile and around had been pre-sorted.

When we headed back up the way we had come, the cloud began to rise, with brief moments of sunshine as we were back up and joining the others.

Back at the timber station, Đường Luân had collected more information about the Chinese company that had dug up and smelted the slags for two years. It had to stop recently because the permit had run out.

All informants confirmed that this was the one major slag dump in the area. And that there used to be numerous workings, up to 40 m deep, presumably shafts, very densely set. Unfortunately it was too wet and slippery to go to the mines.

The fellow in the timbering station, around 50 years old, stated that he had seen *shatiao* and again confirmed that they were similar to the specimen from that I had brought from Yiliang.

They knew about a temple in the village, we had walked right past but lacking communication I hadn’t noticed.

The local pronunciation of the village name is Thông Xinh, the old official name Thông Thinh, the new name Bình Đường.

The pine forest, with trees about 20 m high and up to 50 cm trunks, has been planted about 20

years ago.

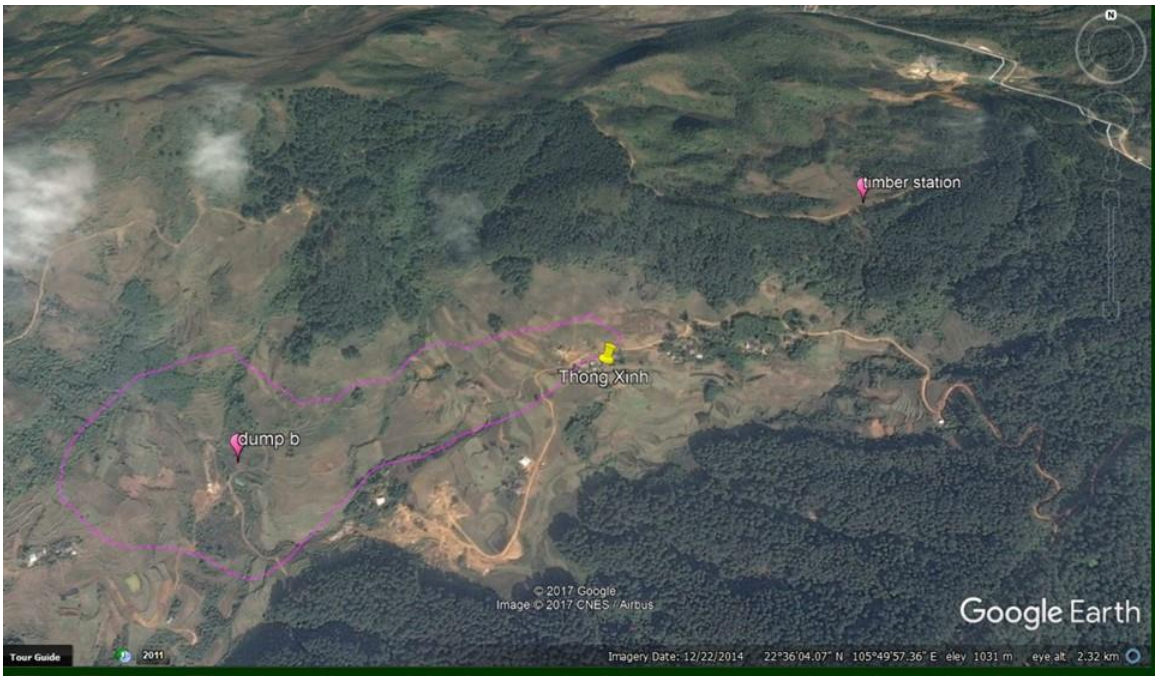
Mr Lý set us on the small road that circles the Pia Ouác to the south. We got a brief view of the mountain peak near the juncture and near the watershed of the southern spur. As soon as we had crossed the watershed the forest changed back to mixed broadleaf. The eastern flank was still largely in the clouds.

We left for Cao Bằng, reaching the city past 2 pm.

Đường Luân took us to the Guandi temple. It is a new structure presumably on part of the old grounds. There are 4 or 5 some donation stele still in existence (Đường Luân has rubbings), and two cast iron bells, dated 1757 (QL 22) and 1799 (JQ 4), the Jiaqing bell inscription specifies that the bellmakers were from Foshan. The temple testifies to the historic Guangdong presence in the city. With the routes out of Ngân Sơn and Thông Thinh into Guangdong passing through Cao Bằng, the importance of the city as a commercial centre indirectly reflects the productivity of the mines.



The Pia Oác Massif with the Thông Thinh valley and the Tin Tuc mines



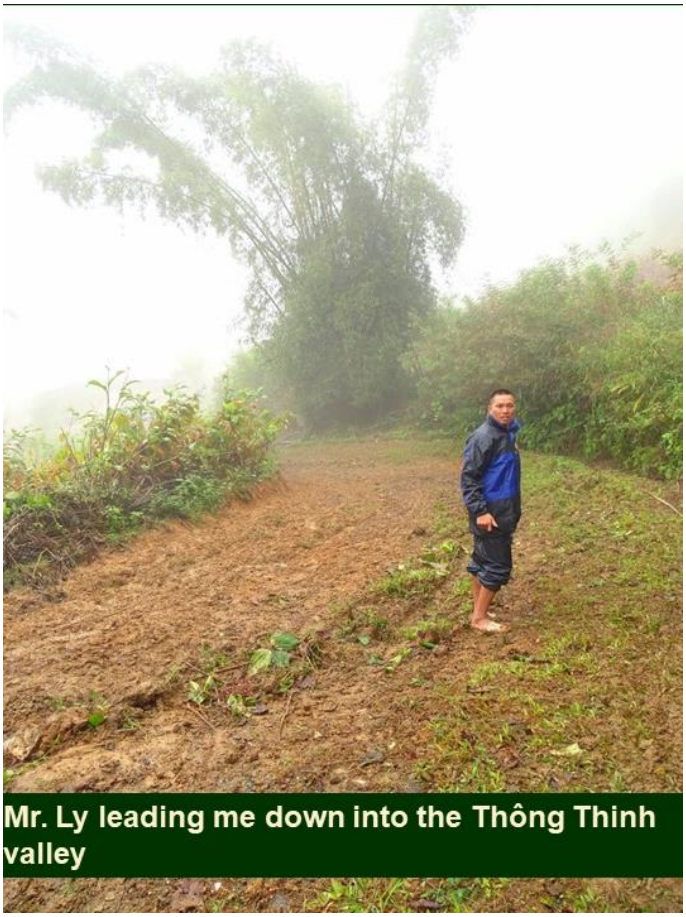
The Thông Thinh valley with the probable extent of the historic slag dump



Đường Luân at a village shop in Binh Duong



In the mist at the timbering station above the Thông Thinh valley



Mr. Ly leading me down into the Thông Thinh valley



Small brook crossing the path above the slag pile and below the main village



Slag layes in the bank above the brook and under the path and the brook



A large slag lump in a wall between two fields

Mr. Ly on the slag pile





Slags



The village kindergarten on the track



Forest between Tong Tinh valley and the timbering station



The view from the timbering station to the karst cones that border Thông Thinh valley beyond.



The Pia Oác peaks (1900 m) almost revealed



Karst ranges between Tinh Tuc and Cao Bằng



The Guandi Temple in Cao Bằng that still holds two bells cast by bellmakers of Foshan and dated Qianlong 22 and Jiaqing 4.



Results

The information obtained from local informants confirms the locations of mines indicated on the map of 1908 and allowed the rough identification of the historic slag dump. The dump identifies the Thông Thinh valley as the center of historic silver mining. We could not find further information on historic tin mining at the site of the open pit of Tính Túc. The probable extent of the Thông Thinh dump is considerable, reflecting a very important site that probably was exploited for a relatively concentrated period of time under conditions of similar organizational structures.

Qianchang 铅厂 in Nanhua District 南华县雨露乡铅厂村

Nanny Kim, draft May 2018

Records and questions

The site is not recorded in the written sources. The fact that a major mine is recorded to have been located 40 li south of Chuxiong or Nanhua suggested that this site - the name meaning “lead mine” - might have been a silver mine.

Fieldwork by Nanny Kim and Yang Yuda 杨煜达, with Li Qiang 李强, our driver (born 1962, with 9 years experience in the mining industry), 2018.1.27.

Supported by: --

Main informant: Ms He 何 (Yi nationality 彝族, 32 years old) of the vicinity of Qianchang

We departed from Kunming at 6 am and got to Nanhua at lunchtime. Continued on a good country road SE to for about 20 km to Yuluxiang 雨露乡, and some further 20 km south to Qianchang 铅厂村. The country we crossed is the hardly perceptible watershed between the Jinshajiang and the Yuanjiang/Honghe/Red River, consisting of ranges that rise from the plateau oat almost 2000 m to about 2300. After a second gradual ascent from Yulu, the road began descending towards the valley of the Malonghe 马龙河. Qianchang is on the western slope of a basin-shaped valley. We started asking at one of the first houses, a shop combined with a motorbike repair workshop. The young owner, who was working on some motorbikes caught on quickly and told us that there were mines further on and at Longtan 龙潭 across the basin to the north. The population is mostly Yizu. He was not sure what metal the mines exploited and at which time they might have been in operation. An entrepreneur had planned to open mines down in the valley, but had been drive away by locals.

Ms He (何, 彝族, 32 years old), a relative of the shop owner agreed to take us to the sites. We passed through Qianchang village southwards, over a minor spur with another smaller village into a valley that descends southwards. The brook that drains this valley is a tributary to a northern tributary of the Malonghe. Ms He directed us down a narrow dirt track that reached the valley bottom and ascended towards an industrial shed on the eastern mountain shoulder, above the main descent into the valley of the tributary river. She told us that two mines by the above-mentioned entrepreneur were just above the track in the valley bottom, and the shed was also his facility. We realized that the track was built for the abandoned mining project. Looking for a place to turn the car around, we ran into relatives of Ms He who were harvesting eucalypt branches. They understood quickly that we were not looking for ore but for remains of historic mining and told us that there used to be slags in the fields above the power line tower on the opposite slope. The inhabitants of the village further up on the slope had sold slags for some years.

We turned back and re-crossed the valley bottom. Ms He and me went down to look for the slags. They were soon well visible in the fields, and Ms He had keen eyes and pointed them out. Not far above the power line tower we hit on a tiny brook, there were slags not forming a coherent layer about 1 m below the present surface in the washed out bank. A short way below a guy was burning off the dry grass and stubble on the slope, so we backtracked and headed up the slope. Slags continued to be well visible. Heading towards the northern end of the village we re-crossed the tiny brook and hit on a cavity that descends steeply into the mountain in the rill but just above the brook. Possibly an old mine. The slage petered out a short way, probably less than 50 m in height) below the village.

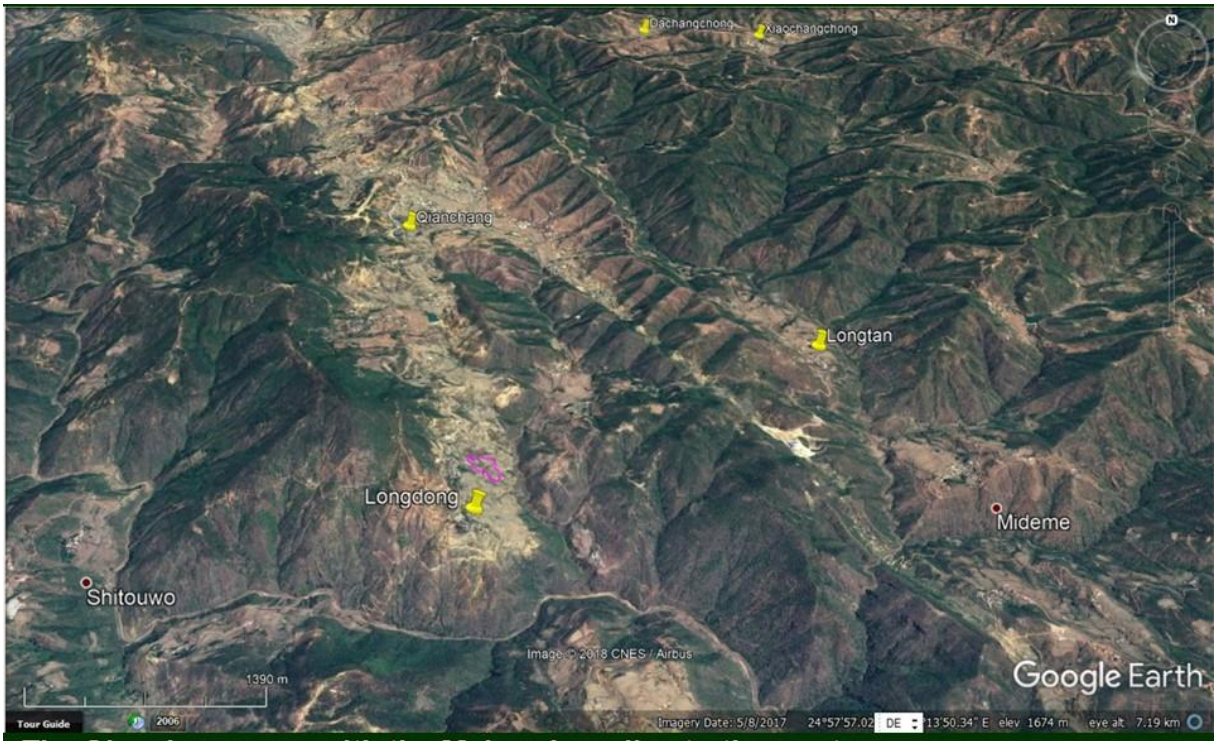
We re-joined the others and proceeded along the track to inquire in the village. Ms He became highly reluctant, there appears to be some tension between villages or clans. She told us that this village, which in fact looks like two, has two family names, the northern part is inhabited by the Hes, the southern by the Zhous. We asked a middle-aged Mr. He and he asked us in. He didn’t know much but

confirmed that there were old slags, mentioned a temple, and stated that the name of the village was now Longdong 龙洞, and was formerly 老洞. He said his father knew more, but when the latter arrived he was unwilling to talk to us. When Yuda asked him which gods the temple was consecrated for, he answered that this was of no concern to them as Yi (彝家), indirectly confirming that the temple site was in existence when their ancestors moved in.

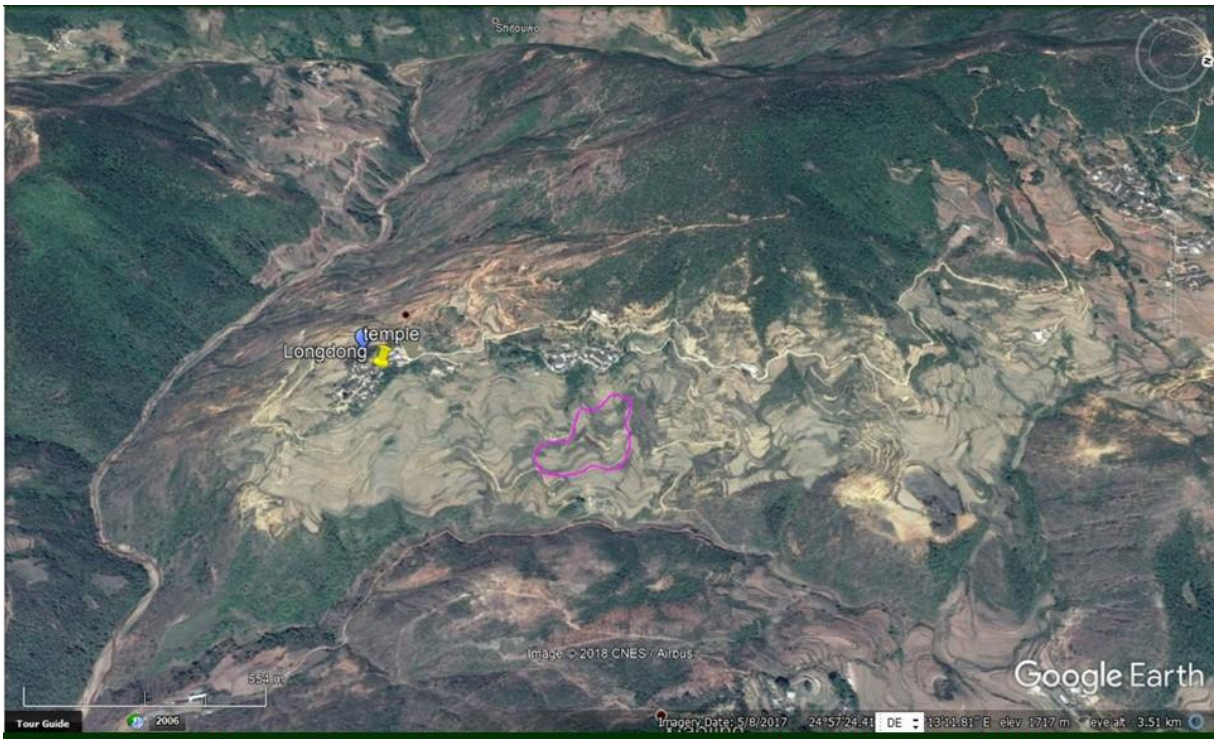
We had a look at the temple, perched on the mountain shoulder above a massive descent into the valley of the tributary river, the confluence with the Malonghe being visible WSW. The temple had been recently restored, the contribution inscription listed numerous persons by the names of He and Zhou.

We returned to Qianchang and dropped Ms He off.

Longtan in is a northern side-valley of the basin, perhaps 5 km as the crow flies, but over 15 by the road, which ascends along the ridge NWN crosses it and then re-descends. The navigation system guided us through a small village and to the gate of an industrial dump. Back in the village we asked a gentleman of about 60, who told us that there used to be a mine (or quarry) down the road but no historic mining.



The Qianchang pan, with the Malonghe valley to the west



The double village of Longdong, the slope with the slag dump, and with the Malonghe in the background



View across the Qianchang pan



View up the valley towards Qianchang, with the corner of Longdong just visible. In the foreground Ms He and her relative at work harvesting eucalypts.



Yuda with informants at the eucalypt pantation



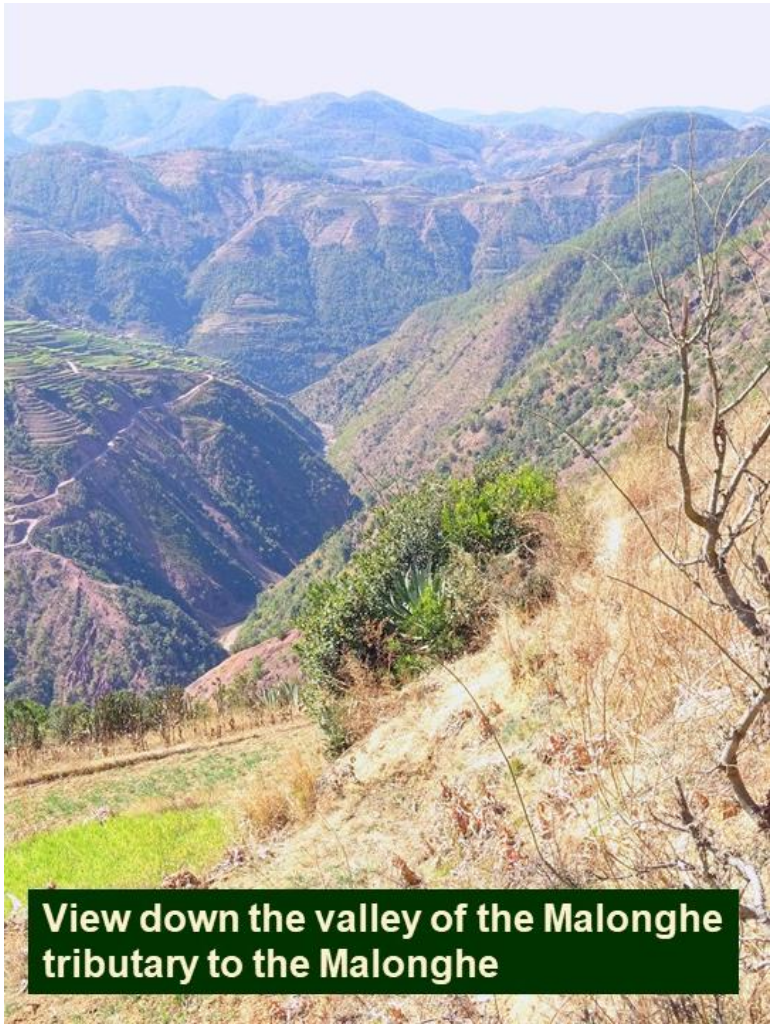
The terrassed slope below the upper end of Longdong

Ms He looking for slags in a small erosion gully and on our path through the fields.





Workings entering a natural crack.



View down the valley of the Malonghe tributary to the Malonghe



The recently restored temple above Longdong; slags in the mud walls, and the list of donators.



Fig tree on the temple grounds



Results

With high probability, Qianchang is a historic silver mine that was exploited a relatively long time ago. The absence of oral histories concerning the mine shows that the present inhabitants are not descendants of the miners.

Further research has to rely on archaeology.

The Old Silver Mines 老银厂 near Duogu (Duohu) 朵姑村 in Midu District 弥渡县朵姑村老银厂

Records and questions

No historic mine appears in the records that might be located at Duogu. The site came to the knowledge of the Cultural Relics Office of Midu, apparently fairly recently.

Fieldwork by Nanny Kim 金兰中 and Yang Yuda 杨煜达, with Li Qiang 李强, our driver (born 1962, with 9 years experience in the mining industry), 30 January 2018

Supported by: Prof. Li Xuelong 李学龙 of the Institute for ethnic Studies, Dali University, Mr. Bi Chaoyi 毕朝义, director of the Midu Museum, Ms. Li Xiaoling 李晓玲 of the County Museum of Midu, Ms. Du Xinyan 杜新燕 of the Yinjie Culture Office

Main informants: Mr. Li (ca. 55) of Duogu, Mr. Li Jinghong 李敬红, mayor of Duogu

Yuda was invited for a ceremony as associated scholar to the newly founded Center for Ethnic Studies at Dali University and had mentioned that we were on a fieldwork trip. Li Xuelong 李学龙, formerly at the District Museum at Xiaguan, came down from Dali to join us for the sites in the region. He brought his niece and we met around 9:30 to proceed to the Midu Cultural Relics office together. We met the Museum Director Bi Chaoyi 毕朝义, and had a look at the exhibition. They have a number of stone age and bronze objects, and also a small pile of ore or slag and two ceramic pipes of identified as objects found at the Huangkuanchang Mines. The ceramic objects had the dimensions of *shatiao* 沙条, but appeared to possess a narrow central hole. Director Bi told us that these objects dated to before his time and that he had no further knowledge about them. There are two sites in Midu, the knwon Ming period Huangkuang Mines, and the otherwise unrecorded mines at Duogu. We decided to go to Duogu village first, and use the full next day for the Huangkuang Mines.

Ms Li Xiaoling 李晓玲 joined us. She is in her late twenties, a graduate in literature who worked as a middle school teacher for five years before joining the Cultural Relics Office not quite 2 years ago. Duogu is not far from the southern end of the Midu Plateau and near the top of the range that separates this plateau from that of Weishan to the west. We took the main road to Yinjiexiang 寅街, where we picked up Ms Du Xinyan 杜新燕 of the local Culture Office. She is in her late twenties, quite interested in her work, and had been to the site before. T avoid bothering the village government, we had lunch at Yinjie at about 10:30 am. The road to Duogu is windy good asphalted into the village.

Duogu is the last of a small cluster of villages in the higher part of a valley with many bifurcations, sitting on a small protrusion on the south slope. The top of the range is planted with rotors. It seems that the mines have recently come to the attention of the local Cultural Office, perhaps in connection with roadworks for transporting the rotors.

Duogu is an Yi village. The mayor Li Jinghong 李敬红 told us that the name is pronounced Duohu in Yi and means “plenty.” He arranged for Mr. Li to be our guide. We crossed the stream and headed up a winding track southwards and westwards, ending up in the narrow valley of a side-stream. A about 2300 m Mr Li stopped the car in a bend of a rill. There are two mine entrances and a recent stele erected by the Relics Office. Both workings had rounded roofs in the entrance area and had been blocked up a short way in.

Ms Du and Mr Li both stated that the largest mine that had a considerably large opening and reached deep into the mountain was only a short way below the driving track. The track is relatively wide and appeared to have been built or widened very recently (it is in facto not on the satellite image) and Ms Du later inquired for me that it was at most 3 months old. The descent is rather steep and was covered in loose debris. Nevertheless, eventually all of us except for Yuda and our diver clambered down and

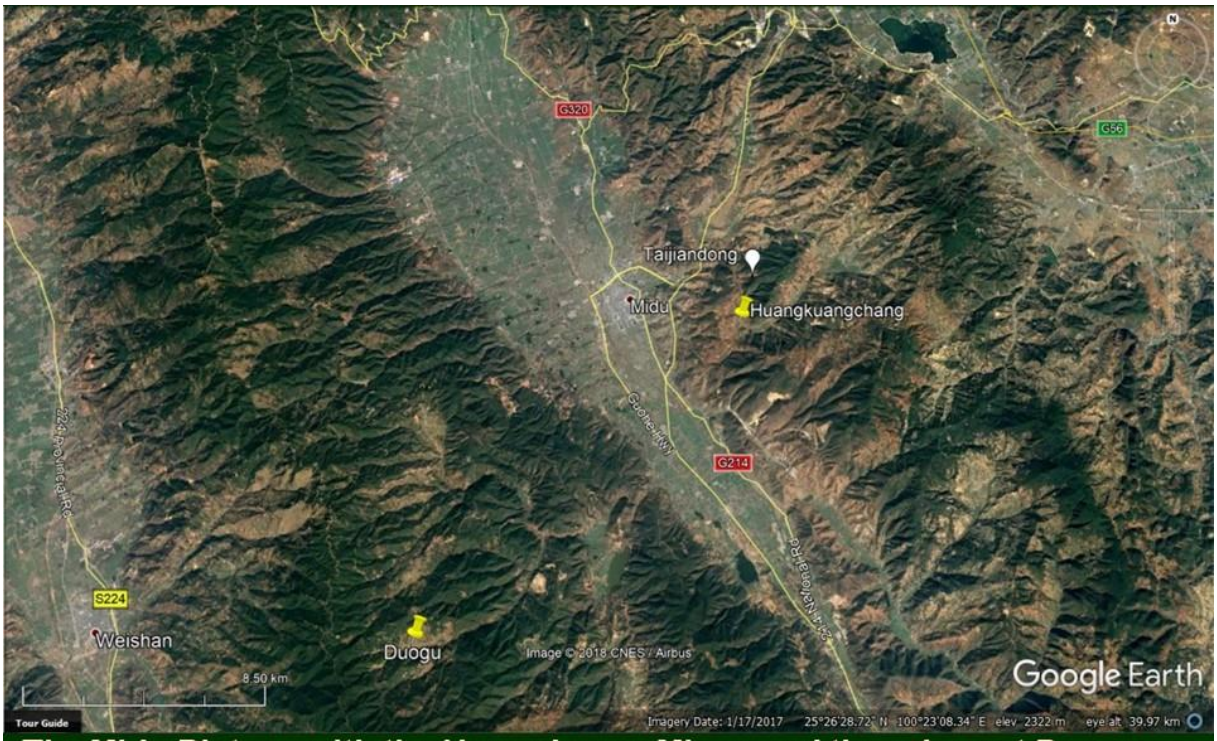
followed Mr Li though the dense bush. Without finding the mine entrance, however. Mr Li and me ended up on a narrow grassy strip at the brook. Upon asking about slags (by that time I had begun to get used to his dialect), Mr Li confirmed that there were some slags down here, pointing up and down the valley bottom, but more further up. I had a look in the shallow stream but found nothing there. We found some slags and walked a little way up nearly to the point where the track came down to cross to the other side of the valley.

We re-joined the others and turned back. Mr Li stopped the car again under 1 km on at a eucalypt plantation (apparently only 2-4 years old) at a point where the ridge widens and the track reaches a saddle and descends into another side valley. There were large clumps of slag piled up on the bank of the track, and they were distributed throughout the easily accessible area of the eucalypts to both sides of the track. Yuda and Li Yunlong explored the lower area, finding bits and pieces sparsely throughout. I walked back along the track to look as the cuts of the track into the soil, which are between 1 and 4 m. There is a whitish soft bedrock, with well visible slag and debris layers where it lowers, and the forest soil layer above. Near the saddle the cut was clearest, with a layer of slags and furnace debris reaching below the level of the track. Took some charcoal samples. The dug-up material contains much slag, also bits of ceramic rods (lutiao or shatiao) and sherds of vessels of daily use.

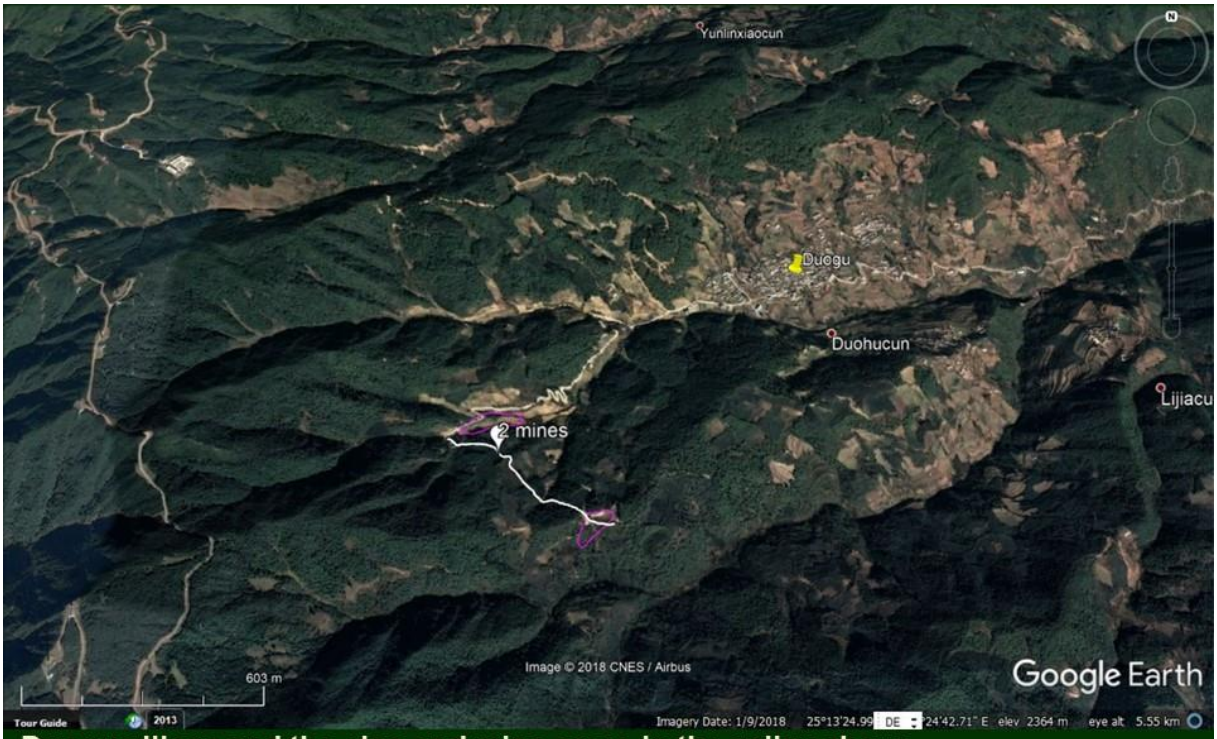
Mr Li said they had always known that this was and old silver mine, though they had no knowledge on when it had been active. There were no stories related to the mine and or to their ancestors having anything to do with it. He had heard that it dated to the Ming.

We returned to the village and mayor Li Jinghong 李敬红 warmed up to presenting us the local history and culture. He told us that they had collected stories and traditions and embellished all houses with “traditional” emblems and sayings, as well as some walls with murals. He took us up the a recently built activity center, the front wall with a huge painted cabbage. He explained that the village used to be on the road from Midu to Weishan and there was a story of its founding after particularly tasty cabbage was grown here. The old road started right at the building and was still well visible, heading up along the south slope. I went up a little way.

Li Jinghong also told us that his family moved here 9 generations ago, and that the village was uninhabited then. His family was classified as landowners after 1949 for they possessed most of the fields. The mine was known as the “old silver mine” 老银厂. There was a story about two large and one small elephants who came here, the small elephant fell into a pond (?) and eventually turned into silver, with a leg(?) eventually being exploited. It was also said that the people of the silver mine late moved to Yinjie 寅街 (second Market), so that the original meaning would be “silver market.” There was a large well, which used to be the only source of water before tap water.



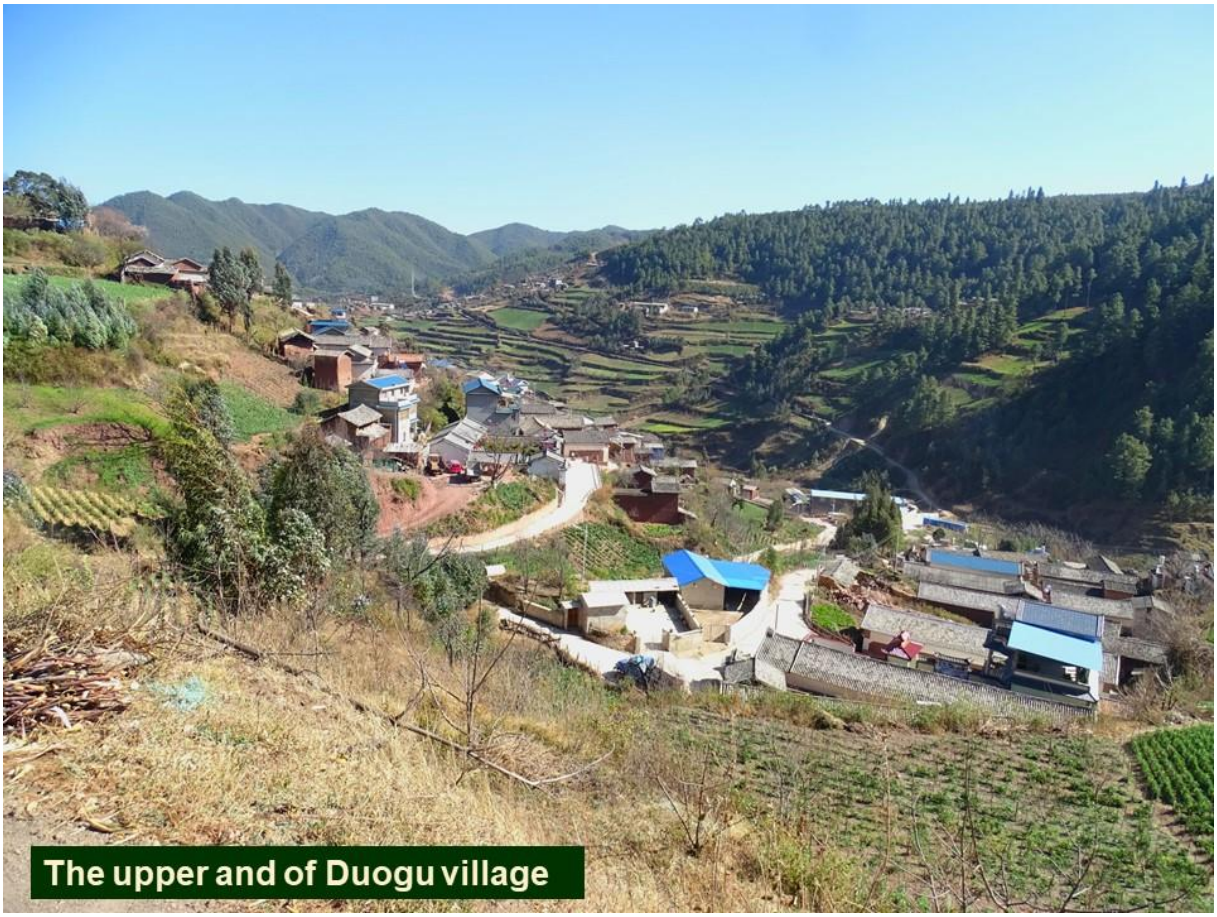
The Midu Plateau with the Huangkuang Mines and the mines at Duogu



Duogu village and the slag and mine areas in the valley above.
The white line marks the driving track.



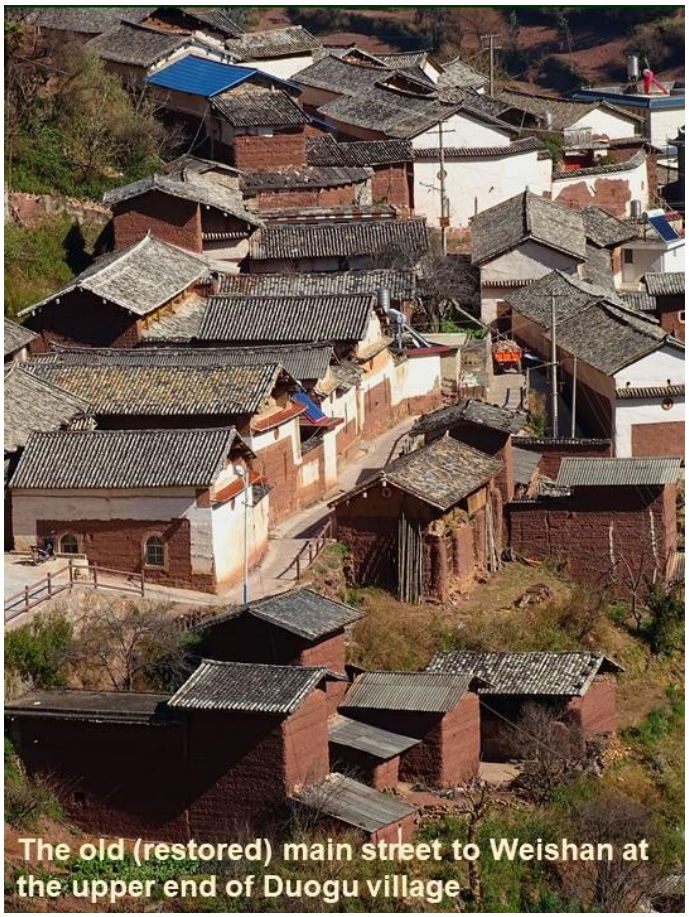
The slag and mine areas in the valley above Duogu.



The upper and of Duogu village



Li Xuelong and Yuda in the courtyard of the Duogu village government



The old (restored) main street to Weishan at the upper end of Duogu village



The site of the two mines in the bend of the track, Ms. Du, Yuda, Li Xuelong and his niece at the upper mine, and the lower of the two entrances.



The slope of the mine entrances below the track





Mr Li in the slag area in the valley bottom


View down the valley from the track


View across to Duogu village from the slag area on the saddle



The slag area on the saddle



View along the track from the end of the slag area on the saddle



The lower end of the slag area on the saddle, with detail showing a thin slag layer at the end under the recent eucalypt plantation.



Layer of smelting debris under eroded soil



Enlarged detail of rocks, slags, charcoal and furnace wall debris

Layers in the cut of the track, with two dark zones of smelting debris,
with detail of the debris of clay burnt red





The upper end of the slag area cut along the track



Locals grazing their horses and cattle.



Li Xuelong's niece, Ms. Li, Li Xuelong, Ms. Du, Yuda, the drivers of Yinjie, and Mr Li at the slag area on the saddle.

Results

The ancestors of mayor Li Jinghong evidently used to be the leading family of the village. As families of influence are usually among the oldest, the family tradition that the place was no inhabited when the first Lis of Duogu arrived 9 generations ago, appears probable. This would suggest, that no village existed at Duogu at about 1800. Mining thus presumably ended before 1800, and possibly a much earlier.

The scale of exploitations is difficult to assess, but the mines clearly were no insignificant. We think that they were above the scale that may have gone unrecorded in the period of restoration and re-ordering around 1700. For this reason, we believe that the main period of exploitation was in the Ming period.

Some charcoal samples might provide further information by C^{14} dating. Further research on this site depends on archaeology.

The Huangkuang Mines 黄鑛廠 in Midu District 弥渡县

Nanny Kim, draft May 2018

Records and questions

The mines are recorded without any further information in the provincial gazetteer of 1949.[1] They are thought to have been an important Ming period mine.

Fieldwork by Nanny Kim, Yang Yuda 杨煜达 and Li Xuelong 李学龙, with Li Qiang 李强, 31 January 2018

Supported by: Prof. Li Xuelong 李学龙 of the Institute for ethnic Studies, Dali University, Mr. Bi Chaoyi 毕朝义, director of the Midu Museum, Ms. Li Xiaoling 李晓玲 of the County Museum of Midu, Mr. Mei 梅, mayor of Huangkuangchang village, xiao Shi 小施, Li Xuelong's niece

Main informants: Mr. Mei 梅, mayor of Huangkuangchang village, Mr Yang Shun 杨顺 (aged 63) of Huangkuangchang village

The day before, when we had the opportunity to have a brief look at the pre-modern section of the Midu Museum, we was a small pile of ore or slag and two ceramic pipes of identified as objects found at the Huangkuanchang Mines. The ceramic objects had the dimensions of *shatiao* 沙条, but appeared to possess a narrow central hole. Director Bi Chaoyi 毕朝义 told us that these objects dated to before his time and that he had no further knowledge about them.

When we arrived at the Midu Museum in the morning, Director Bi had decided to come with us. The site is only some 10 km from the city in the ranges to the SE of the district city. Director Bi, driving his own car, led us up the valley past Huangkuangchang 黄矿厂 and Zhufang 朱坊 village to the village government. Village Mayor Mei was waiting for us. In the first conversation Mr. Mei told us that all villages in this valley were Han, while the adjacent valleys were mostly Yi. We headed back a short way and across the flat valley bottom to Huangkuangchang village. Mr. Mei took us past the northern end of the village to the point where the valley bifurcates, stopping near operating and recently abandoned mines in the western slopes.

Upon further inquiry, he told us that the old mines were in the partly rocky, partly forested eastern slope right across the valley, and that it was also called Shaizidong 筛子洞, an area up in the pine forest. He confirmed that this "sieve" consisted of well-like workings. He also told us that there was a Chaoyang Temple at the present top end of the village. The low, flat-topped ridge to the SE of the village was called yashan 衙山 ("Yamen hill"), there used to be remains of tiled buildings, but they were no longer very visible. Slags were also near the village.

We decided to go to the temple first, then have a look at the slags and then split up, with Li Yunlong and Yuda going up to the Yashan and me to the workings.

The temple is a recent reconstruction on the existing foundations and contains 3 stelea. The latest of these specifically mentions the mines and is available in a rubbing at the Midu Museum, but the others are not. Some remains of the former temple were pillar bases, the stairs to the main building, and some stone carvings. For some reason, the pillar bases of the present main building were just under 40 cm in diameter, while two in the side building were approaching 60 cm (diameter of the round surface for the wooden pillar, evidence of a far larger earlier structure).

Li Xuelong copied the less easily legible part of the Kangxi period record of the rebuilding (or extension) of the temple, while Yuda and me went off to have a look at the slag area with director Bi and Mr Mei. Locals have sold slags and re-smelting has been practiced in 1958. Behind and around

[1] *Xinzuan Yunnan tongzhi*, *juan* 64, p. 7a.

the corner of the last, quite recent house of the village, the layer still visible in the cut along the building is quite thick. There were scattered slags in the fields but the extent of the slag area could not be established. There were no slags visible in the stream or its overgrown or built embankments. In an irrigation pit, slags forming an incoherent layer were visible about 0.5 m under the present field surface. According to Mr. Mei, the slag layer used to be about 1 m below the soil.

There were still well visible layers in the bank of the driving track, with up to 3 visible layers distributed on a cut of 3 to 4 m high, with soil layers in between. While the layer at the corner of the last house was 1 m thick in its visible part; the layers in the embankment, which were below the level of the house, were between 10 and 20 cm, with 50 cm or more of soil separating them.

At 12 o'clock we drove down to Midu for lunch and returned without Mr Bi, who had other obligations in the afternoon.

Back at Huangkuanchang village around 2 pm, we decided not to bother Mr. Mei again, as he had obviously told us what he knew. We asked the owner of the corner shop, Ms Peng 彭, who said that she could contact an acquaintance to show us the mines. In the meantime, Yuda and Li Xuelong went off to Guanshan, while me, Li Xiaoling and xiao Shi waited. We were asked into the courtyard, where 3 old men were playing cards. We asked them about the history of the village, and they told us (as far as xiao Shi and me understood, Li Xiaolin was taking a nap in the car) that the village was entirely Han. There used to be 9 family names, but there were only 7 left now. There used to be a few Muslim Chinese, but they were no longer there since the time of the rioting [the mid-19th century civil wars]. The nine Han families would have been here for some 16 to 17 generations and hailed from Yingtianfu in Nanjing 南京应天府. The oldest grandfather, who is 83, also remembered a story about the founding of the mine, which we didn't quite catch. Ms Peng interrupted and said that the stories of Huangkuangchang had been published. [《中国民间故事全书:云南·弥渡卷》?] He also stated that there used to be "stone horses and stone men" up at Yashan [statues along the road to a very stately yamen].

Our guide arrived: Mr Yang Shun 杨顺 (born 1954), who turned out not only perfectly understandable in terms of dialect but also most knowledgeable and helpful. He confirmed smelting activities in 1958 and exploitation of ores since the Great Leap. We left the village by the same track as in the morning, and he pointed out one or two mines on the western slope right at the driving track, which are now blocked up, explaining that these were worked about 1958 to 1960. He directed the car to cross over and take a track that appeared to head up the next slope but actually doubled back to reach the partly wooded slope which we had seen in the morning. Mr Yang explained that there were several mine entrances, of which the Taijiandong 太监洞 (Eunuch's mine) and the Sanchadong 三岔洞 (3-forked mine) were the largest.

We stopped along the track at the bottom of the very steep, partly rocky slope, with Mr Yang indicating a pile of ore left from recent trial workings. He also directed up the slope and said that the Sanchadong was up there. He mentioned that he had seen 弥陀僧 that used to be easily dug up from the ground just behind the village, where new houses have now been built. He described it as a hard but brittle substance, which had only one use (which I didn't catch).

At the western corner of the road, we were overlooking the valley of Huangkuanchang and a relatively low and strangely broken watershed to the next northern valley. There was a deep sink in the top end of that valley with some pavilions and a large bridge built in modern-traditional style. Mr Yang told us that this area was being developed for tourism. He pointed to an area on the opposite western slope and explained that the Huizidong 回子洞 was there (apparently considerably above the recent lead mines).

We continued a little way further up and found ourselves at the entrance of an abandoned open pit. Mr Yang explained that a Mr. Ma of Midu, who was Muslim Chinese, had exploited this site for manganese. The pit had opened a cleft in the mountain with walls of some 50 m. Mr Ma had started

the pit in 2004 and worked it very successfully for some years. After he left, a guy from Sichuan took over, but he went broke. The site would have been abandoned about 10 years ago.

The northern wall of the first pit exposed numerous old workings, with a single also visible in the opposite southern wall. The second pit was partly filled with loose material, so that nothing further was visible. The working were mostly surprisingly large, almost rectangular in shape, apparently between 0.7 and 1 m wide and high.

An elderly gentleman looking after his goats had been watching us from the top of the cliff and joined us as we left the pit. This was Mr Wang 王, born in 1951, also from Huangkuanchang, who had moved up here into an abandoned building left from the mining operation to tend to his bees and sheep. He came along to help us find the Shaizidong 筛子洞 that is actually on top of the ridge.

Just around the corner from the open pit was the Taijiandong, in a small dell in the slope. The opening is slightly over 2 m wide and about 1.5 m high. It has caved in a short way in. Mr Yang related that he had a friend who at some point (before entrepreneur Ma arrived) intended to go into mining, and he had explored the old workings for and with him. In that context, he had been inside and said that the galleries used to enter the mountain relatively level, with many workings left and right, as well as pits and chimneys. There used to be large cavities inside the mountain. You could spend 3 hours walking through the Taijiandong or the Sanchadong. He had been into the Taijiandong three times.

I took out a ceramic rod specimen and Mr Yang immediately identified it as a “furnace rod” 炉条, used for smelting silver. He explained that his father had still extracted silver, although he himself had not seen him doing it. For silver separation, the furnace rods were arranged inside the hearth. He also said that he had seen hollow furnace rods, it was said that these were used to enter branches into the melt in order to entice the silver to separate.

Once we had seen the Taijiandong, Mr Yang and Mr Wang became very reluctant to continue for the Shaizidong. Only when we confirmed that we really wanted to see it and that we didn’t mind walking, they finally set out again. We followed our guides for short way on a vaguely visible path along the ridge into the pine forest, passing a pit that was much smaller than the one first visited. According to Mr Yang, this pit had also been exploited by entrepreneur Ma. Some 300 m along, they turned up towards the ridge and into the young pine forest. Mr Wang eventually hit the right spot, a relatively level part of the ridge, that is about 10-15 m wide here. The shafts were set close to each other, most only 4-8 m from the next, forming a cluster of about 10-12 now visible and still open shaft mines. Mr Wang explained that he didn’t take his goats here, so there was no need to block the them. Mr Yang explained that they had not been down these shafts.

Our guides took us back down by a different route without providing a reason. We first followed the ridge uphill for a short while, then headed down the slope, which was slightly milder that where we had come up. I was confused to find two ruptures in the forest soil, almost like a step of around 1 m in height, clearly cut along the slope, as if the entire surface material had slid down. The explanation followed soon after the second step. A gap opened below our feet. At second sight, it consisted of two holes with a narrow ridge between. Mr Yang pointed to a fallen in chimney opening in the ridge, explaining that this was a ventilation working. The pits were roughly round, with rock walls all around and no opening. Mr Yang explained that entrepreneur Yang’s exploitation hit on the Taijiandong under here, and when they had taken out the pillars left by the historic miners, the cavities caved in. A third, even larger pit came into sight to the north. The highest probably has a diameter of under 10 m, the second of about 12, and the third approximately 15x25 m, with maximum depths over 10 m. The underground cavities must have been considerable.

A short way on down the slope we came out near the Taijiandong.

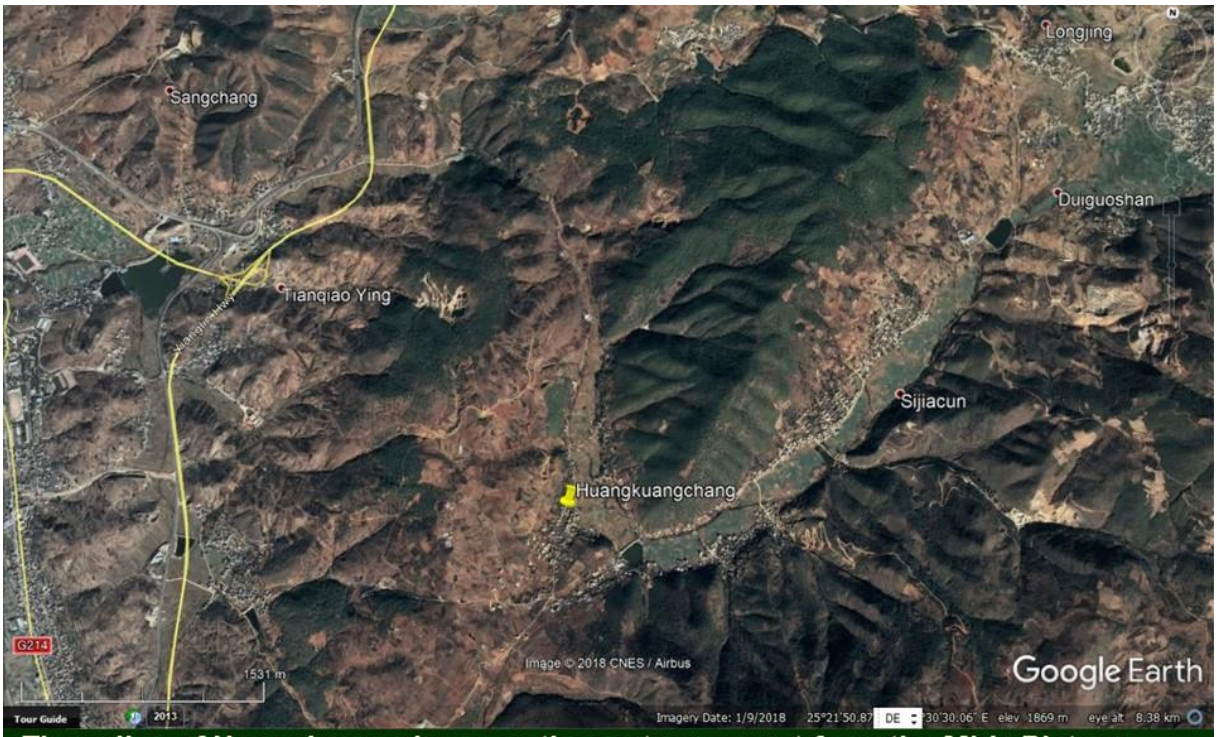
Both Mr Yang and Mr Wang confirmed that they had never seen slags on this slope or at its foot, but that the area to the north of the village was the only slag dump.

We left Mr Wang to his occupation and drove down. At the spot at the foot of the slope Mr Yang stopped again to show me the Sanchadong. We ended up clambering about the slope for a while between rocks, prickly pears, grassy patches and prickly bushes. We saw a recent trial mine that according to Mr Yang had been dug 2 years ago. He eventually found the Sanchadong, which turned out to have caved in as well, some 20 m into the mountain. The dimensions of the visited section were similar to the Taijiandong. I got rather scared on the slope and sent the two young women back down, who initially tried to follow. The route back down thankfully turned out to be easier.

Mr Yang specified that 4 of the 9 original families （彭、杨、梅、王） were the earliest inhabitants and had come some 300 years ago, from 南京应天府六？哨后（？）.

We headed back to the village at 4:50. Had to wait out a funeral procession for a woman in her fifties who had died of a sudden illness within a matter of days. Met up with Yuda and Li Xuelong, who had found foundations of extensive buildings on the top of the hill.

We dropped Li Xiaoling off at Midu and continued directly to Dali.



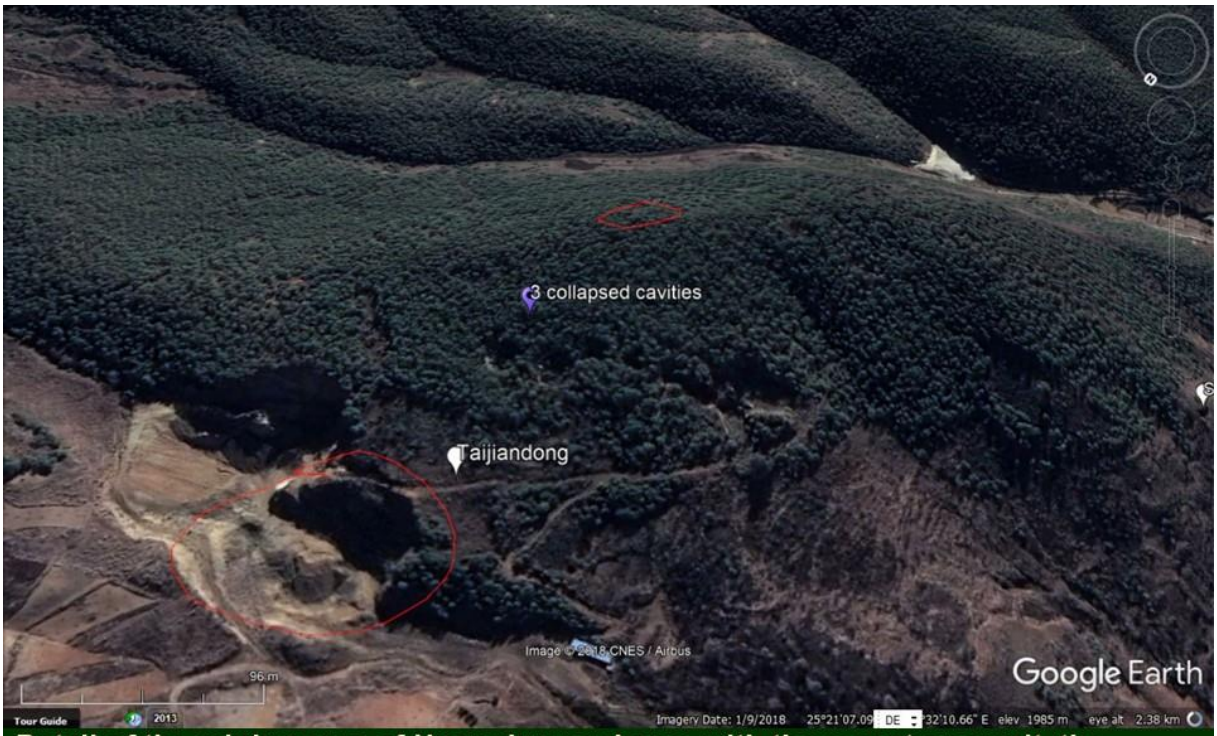
The valley of Huangkuangchang on the eastern ascent from the Midu Plateau



Huamgkuangchang village with the probably slag area and Yashan hill



The mining area of Huangkuangchang



Detail of the mining area of Huangkuangchang, with the recent open pit, the visible three collapsed cavities and the probable locations of the shaft mines and the Taijiandong



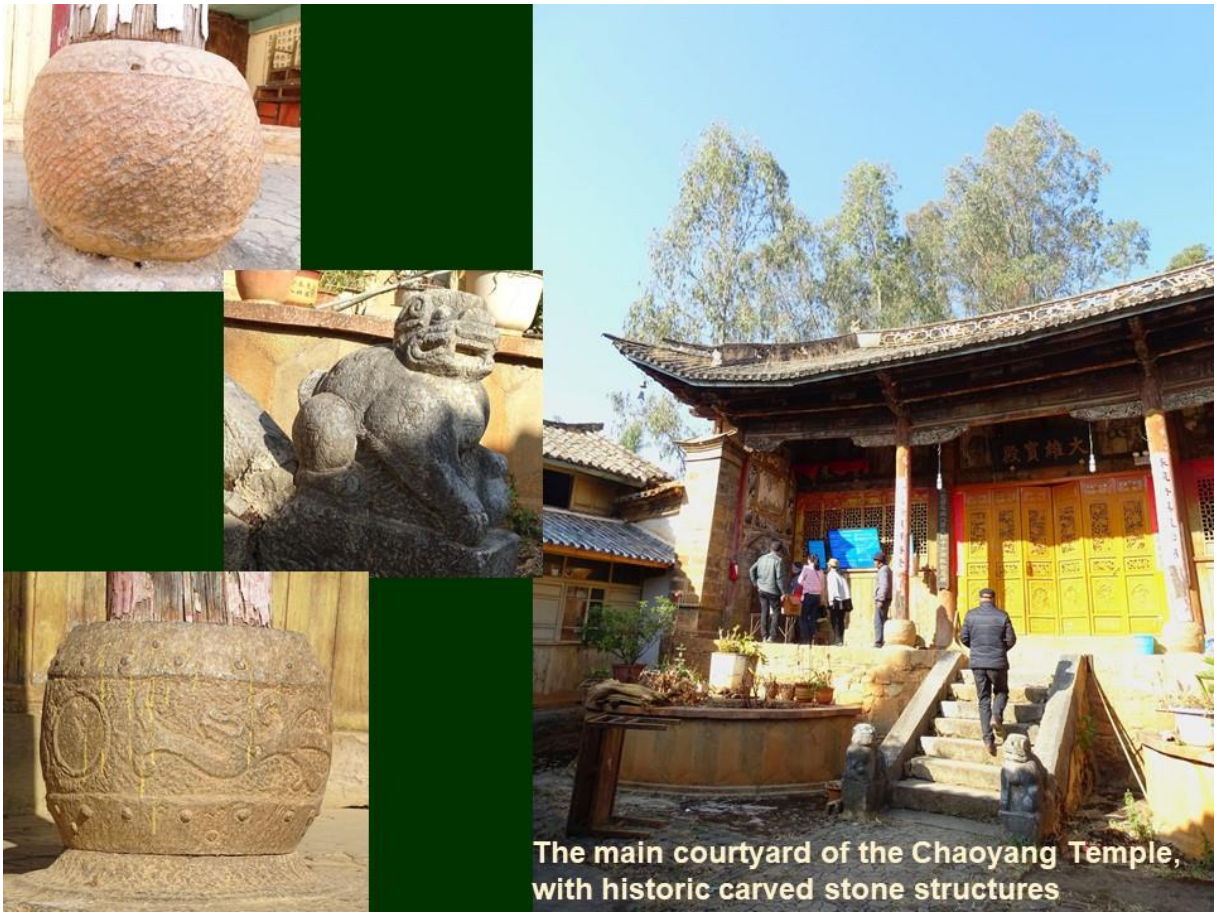
The ceramic pipes held at the Midu Museum



Yuda, Mr Bi and Mr Mei



The staircase to the Chaoyang Temple



The main courtyard of the Chaoyang Temple, with historic carved stone structures



View onto the village from the Chaoyang Temple



Mr. Mei's grandson in the driveway of the last house, with the embankment with layers of slags behind him



The embankment below the track past the last house with 3 slag layers;
Detail: middle slag layer



Corner of the last house and fields that used to be covered in slags



View northwards up the valley to the mining ridges



Mr. Yang, xiao Shi and Ms Li at the foot of the mining slope



View down the valley from the mining slope



View across to the Huizi dong (Muslim Mine)



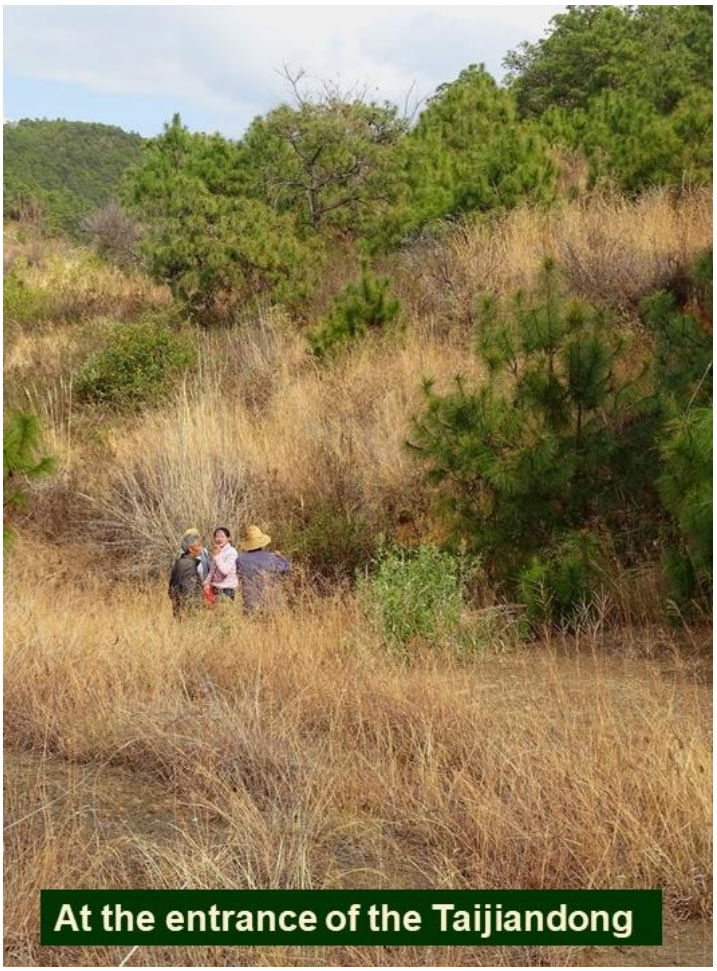
In the open pit mine of 2004ff.



Wall in the open pit of 2004 ff,
Mr. Wang standing at its top



Wall section in the open pit mine, exposing historical workings



At the entrance of the Taijiandong



At the Shaizidong



Three shaft mines of Shaizidong



The pit identified as the former chimney by Mr. Yang, between the first and the second collapsed cavity



The middle of the three collapsed cavities above Taijiandong



The first of the three collapsed cavities



Parts of the third and largest of the collapsed cavities.



View down to our car and the upper end of the valley from the slope near Sanchadong

Results

The name Yashan and the stone statues reported for this site together with the extensive foundations, as well as the name Taijian dong (Eunuch's Mine) support the interpretation that the main period of exploitation of the Huangkuang Mines was in the Ming period.

The three Qing period stele inscriptions, however, suggest that the site had not been completely abandoned even by the early 19th century. While we need the full texts of the inscriptions to pursue this matter, we expect that the scale of exploitations was comparatively small.

We expect that the shaft mines of Shaizidong on the top of the ridge are the oldest workings that entered the orebody from above.

The three collapsed cavities of the Taijiandong, together with the workings cup open in the open pit that might belong to this mining system are evidence of exploitation on a considerable scale and over long periods of time.

By comparison to the extensive workings, the slag area appears relatively small, while gangue dumps could hardly be made out. As most of the slags had been removed for re-smelting, the extent and the depth of the slag dump could not be established. In the almost level valley-bottom, the dump was exposed to erosion only by the stream. It would therefore have been largely unchanged by 1958, when re-exploitation began. During our quick survey, an estimate of the amount of slags was not possible.

The statement of the three grandfathers that the oldest families of the village had moved from the Nanjiang area to Huangkuangchang between 16 and 17 generations ago would date the beginnings of the village to the mid- to late 16th century.[2] It appears probably that this was indeed the period when intensive exploitation began.

[2] The calculation assumes that the old gentlemen referred to 16 to 17 generations counting from their own and works with relatively short generations of only 22 years.

The Baima Mines 白馬厥 in Heqing 鹤庆县黄坪镇白马厂

Nanny Kim, draft May 2018

Records and questions

The site appears in the records but has been considered comparatively insignificant.

According to the gazetteer of 1895, the mines were located southeast of Heqing city and some 10 li west of Wuyitou 烏以頭. They were highly productive at some point in the Ming period, but had been long abandoned by the late Qing. In the early 1900s, Zhang Gengliu 張賡六, who originally came from Zhejiang province, had a dream and thereupon attempted to revive exploitation, but ran out of money without having reaped any benefits. (白馬厥 在治東南距烏以頭西十餘里，明時曾旺，後因硐老停歇，讓朝光、宣間浙人張賡六繼昭感異夢招工開採，貲盡而罷，卒無所得。). It is mentioned as one of the cases in which the tax quota was not reduced or abolished even when the deposit was in fact exhausted.[1]

The same source also lists five other, now unknown silver mines as "formerly exploited but now closed" (已開今停). Because the expression "very prosperous" (大興旺) is used in connection with the Baima Mines, the fieldwork trip aimed to find out mor on the scope of this site.

Fieldwork by Nanny Kim 金兰中, Yang Yuda 杨煜达and Li Xuelong 李学龙,with Li Qiang 李强, our driver (born 1962, with 9 years experience in the mining industry), 2 February 2018

Supported by: Prof. Li Xuelong 李学龙 of the Institute for ethnic Studies, Dali University

Main informant: Mr. Li of Shuizhai

Li Xuelong, who is from Songgui in Heqing district, accompanied us again. We met up at our hotel at 7:30 (he had already driven up from his home in Xiaguan) and left for Heqing at 8 am. The weather turned cold an overcast after the first, windy but dry days, with some light rain.

Because of a detour to Duomei 朵美 on the Jinshajiang that helped with identifying Qing period copper and salpetre mines but took up much of the day, we ran late. We regained the high country of Songgui and Yixi 邑西 only in the afternoon, expecting the Baima mines to be located in Xiyi sub-county. By ringing an acquaintance in Huangping 黄坪, however, Li Xuelong found out that they were in fact located in the northern tip of this sub-county, and that the nearest existing village was Shuizhai 水寨. With directions on the only possible route via Beiya 北衙, we still took almost two hours to get to Shuizhai, on account of steep gradients, rain, and narrow roads damaged by heavy traffic of the Beiya Mines.

Shuizhai is a village perched on a small triangular slope with a very low gradient that sits on top of a massive rock that protrudes out into northern end of the Huangping valley. We reached the village at 5 pm and turned to the person closest at hand, a woman around 40 in her vegetable plot near the road. She knew about slags and workings and guided us up along the track. The driving track hugs the eastern slope above the little plateau. After less than 2 km we saw massive layers of slags in an eroded brook bank, and workings in a low cliff just above. She told us that there were even more slags just above the knob, which was the case.

The valley fans out here before narrowing down sharply and is cultivated in dry field terraces. The fields right above the knob were covered in slags, further on there were slags to be seen in the soil and in terrace embankments to the upper end of the area and also down a fair way. There were bricks and

[1] *Heqing zhouzhi*, 1895, *juan* 1 [no pagination], also in *Heqing xianzhi*, 194?, *juan* 1, 138-9 and 142.

tiles in the top middle fields. The slags ended towards the middle of the fan but extend right down the eastern corner.


Mr. Li

In the meantime, Yuda and Li Qiang had met Mr Li who knew the area well. Mr. Li took us to see a mine entrance at the upper end of the fields and two more a little way further up in the bushes of the limestone zone. The accessible one was at a visibly built path just above a cliff, with remains of walls that might indicate two very small buildings either side of the entrance. A little way down was another square structure about 70 cm across, which I think might have been a cooking hearth. The third mine entrance was at the foot of a small cliff below the built path. There had been trial exploitations recently, but they had led to nothing. The ore excavated from the old workings was deposited in sacks in an unused area in the fields (we met up there).

Mr Li also pointed out that the grassy area at the entrance of the narrowing valley was called Changjie 厂街 (Mine market) and would have been the old center of the mine.

Mr Li told us that his grandfather had move here and that most inhabitants of the village hailed from Sichuan and had come here only a few generations back. He later added that there was one family that had older ancestors buried here, but they were had moved away.

Mr Li was certain that there had been no smelting or exploitation during the Great Leap.

The small ledge on the eastern mountain slope above the driving track was called guanfang 官房 (official's house).

We returned to the village at 6:30 and briefly stopped at some graves with tablets just above the village. There were several rows of graves, dating between QL 16 and DG, with one of the Republican period. The number is uncertain on account of thick brambles. I photographed some of the stele. Mr Li told us that the Wang's buried here still have descendants.

We returned to Dali, getting there at 9 pm. Li Xuelong, who had been a very interesting and knowledgeable travel companion left us at our hotel to drive his own car home to Xiaguan.


Shuizhai village, seen from the west

Four photographed grave stele, dating to the turned out legible. They all belong to the Wang family, as Mr. Li had told us. A late grave inscription, dating to the ealr yRepublican period, stated that the founder of the Wang family had moved to Yingshuizhai 盈水寨 in Heqing in the early Ming, founding and unspecified livelihood

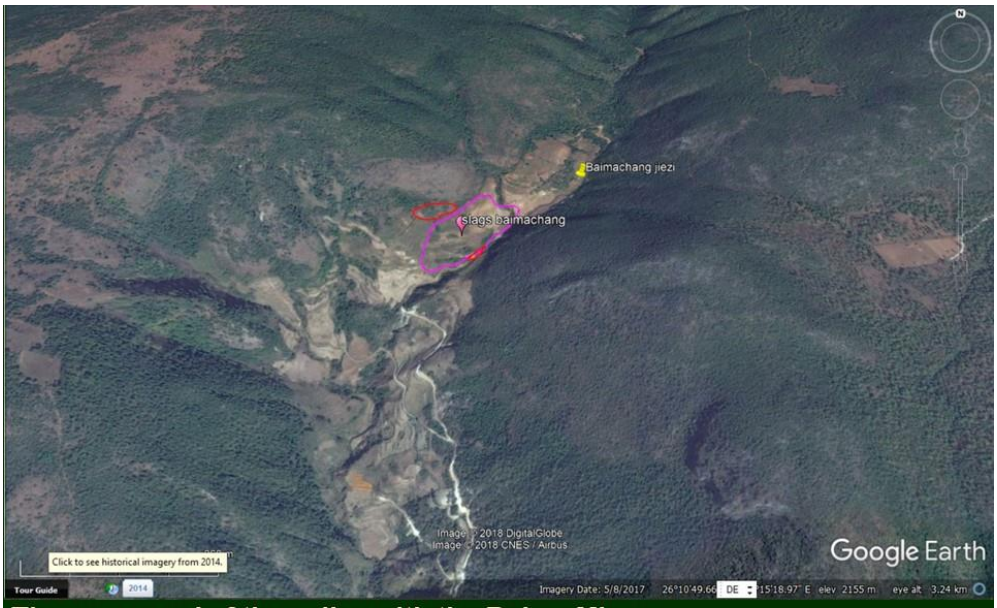
here (緣我先祖於明之初年移居創業於鶴慶，盈水寨住居). This information would identify Yingshuizhai as the original name of the village and the beginnings of the mine to the early Ming.



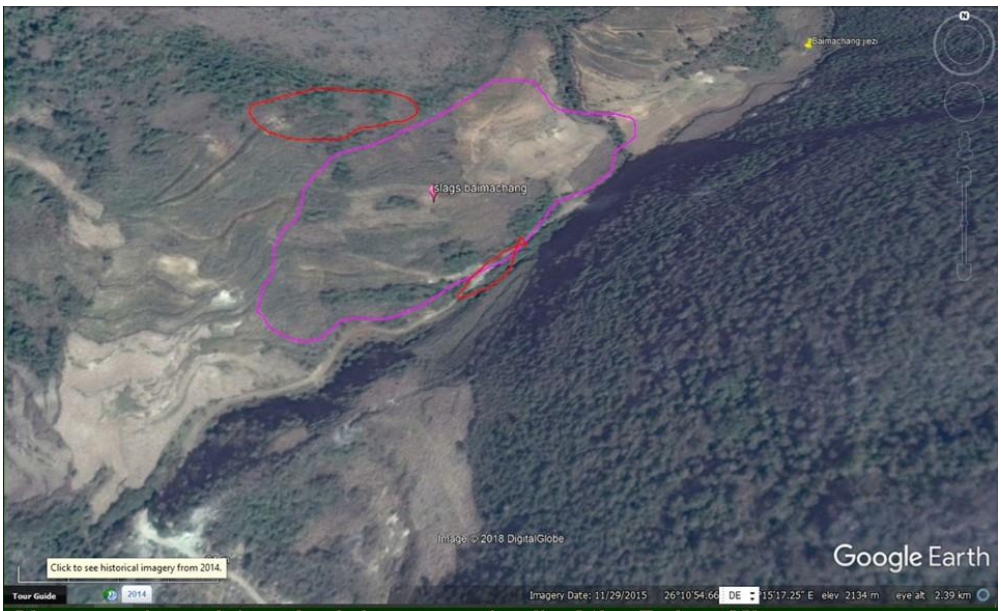
The Baima Mines in the ascent to the north of the Huangping Plateau and east of the Beiya Plateau and the huge open pit mine. The ridge (with little dots that a wind rotors) in the left at 3200 m m to the Huangping Plateau at 1500 m and the Jinshajiang at 1100 m.



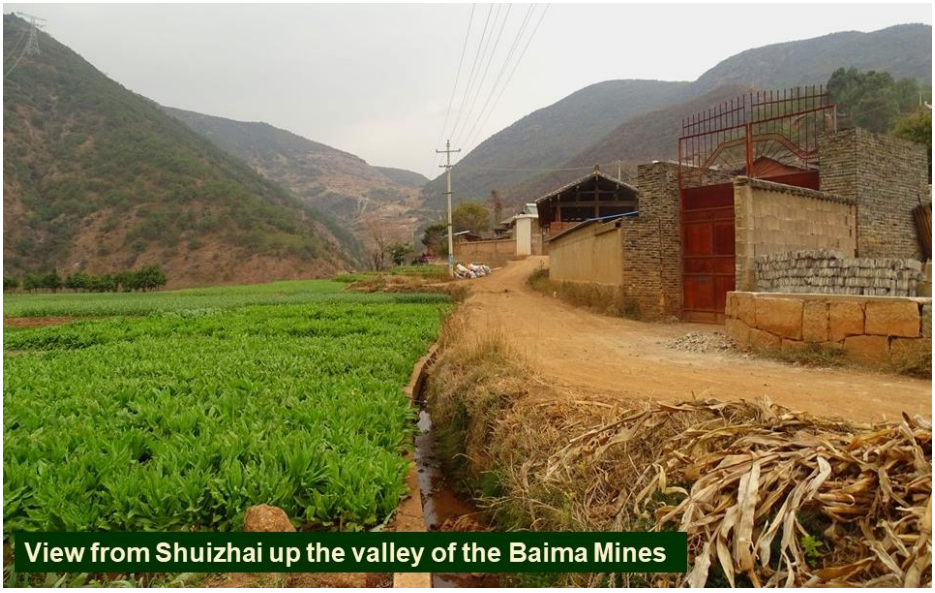
Shuizhai and the Baima Mines in the ascent from the Huangping Plateau



The upper end of the valley with the Baima Mines

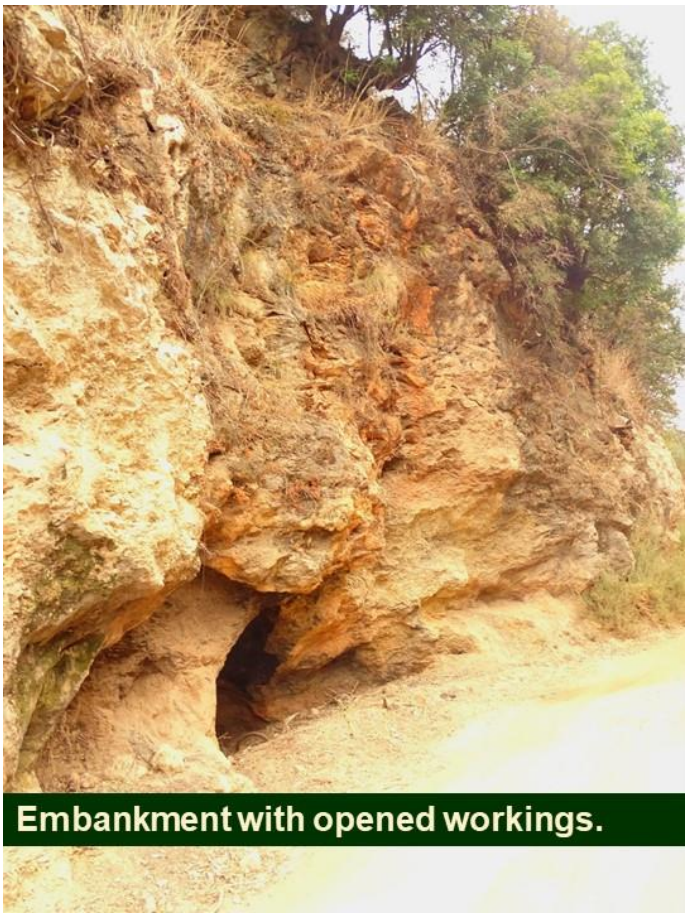


Slag area (purple) and mining areas (red) of the Baima Mines.


View from Shuizhai up the valley of the Baima Mines



Yang Yuda, Li Xuelong, our informant and Li Qiang at the lower end of the slag area, with a compact slag layer in the embankment of the track.



Embankment with opened workings.



View from the lower end of the slag area onto Shuizhai and the Huangping Plateau in the mist below



View down the valley from the middle of the slag area


View from the top end of the slag area


Slags, mixed with furnace remains


A distinct slag layer in a recent cut of a field terrace

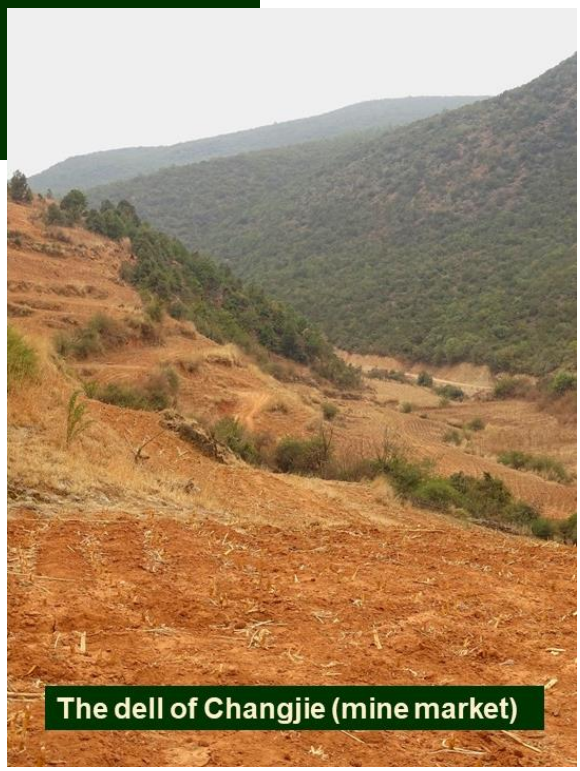

View up the ridge from the top end of the fields and the slag area





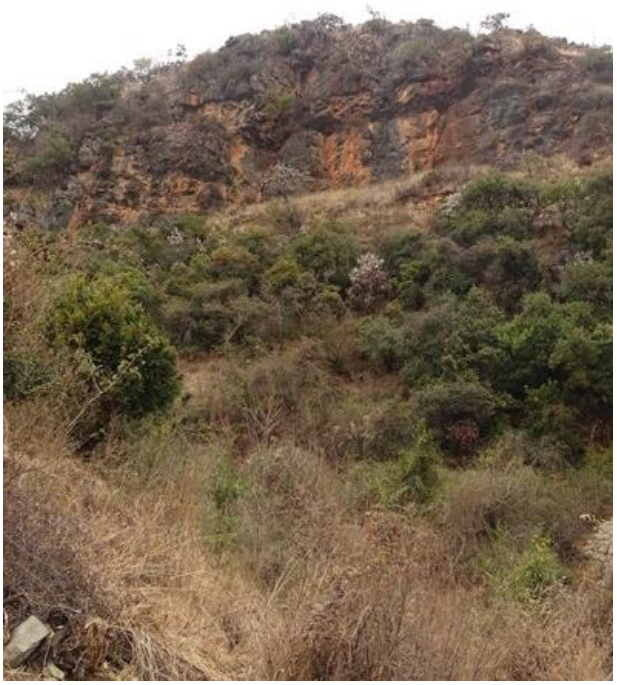


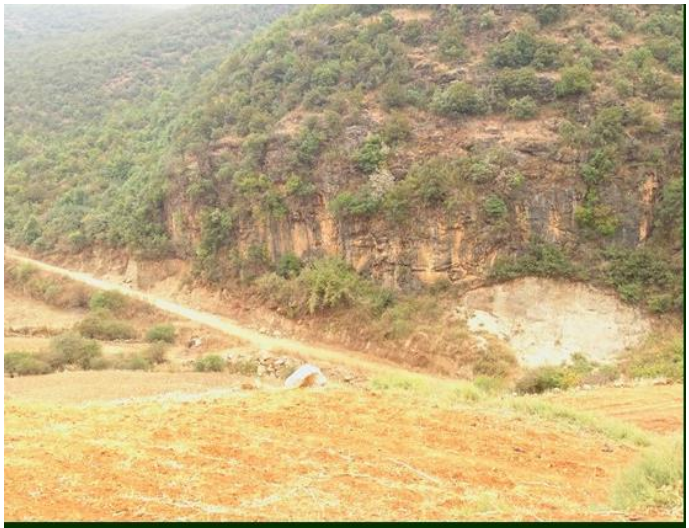
Remains of tiled buildings in the fields at the top end of the slag area



The dell of Changjie (mine market)

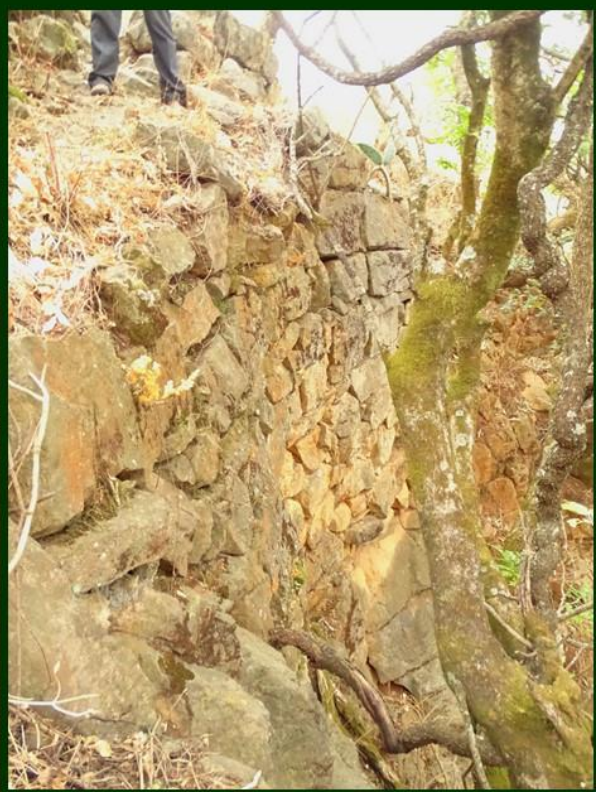
Limestone cliffs in the slope northwest of Changjie





Limestone cliff on whitish bedrock to the east of the Changjie dell





Wall remains near the mine that Mr Li showed us, workings, and path built on a small cliff just below the mine entrance





View down from above the fields



Grave stele of the Wang family, of JQ 14

Results

Remains of the Baima Mines, especially of the slag area, are evidence of a far larger scale of exploitation that expected. The mine probably was highly productive in the first half of the Ming period, and may have become exhausted well before the end of the period. The grave stele reflects the existence of Shuizhai village by the early Ming, and hence dates exploitation to this period, or possibly reaching back earlier. Because the mine does not appear in the Qing tax records, the difficulties with the tax quota maintained even when the mines were no longer worked can be dated to the Ming period, suggesting that operations largely or entirely ceased before 1644.

The remains of workings with visible paths and remains of walls probably date to the attempt at reopening exploitation in the 1910s. The site of the actual Ming workings is uncertain.

The slags, however, almost certainly were mainly produced during the period of intensive exploitation.

The fact that re-smelting only began recently suggests a low metal content and differentiates the slags of Baima from those of Beiya, the most important mines of the area and only about 10 km as the crow flies.

The Yongjin Mines 湧金廠 in Fengqing 凤庆县三岔河乡涌金村

Nanny Kim, draft May 2018

Records and questions

The Yongjin Mines are recorded in the handbook of the mining administration of Yunnan as identical with the former Lisiji Mines 立思基舊廠 and located southwest of Shunning city (modern Fengqing). They were formally opened in 1781 and fulfilled a tax quota of 560 *liang*.[1]

The Shunning gazetteer of 1904 records 1800 as the year of the official opening and that the county government reported taxes of 298 *liang* in the year 1829.[2] An account of events dated by cyclical years to 己亥 and 辛丑, and would fall on the years 1779 and 1881 or 1839 and 1841, is added. When the mines were prosperous, Cao 曹, the mine official of the Ningtai 甯臺 copper mines, put pressure on the prefect to have the silver mines closed. However, a man by the name of Xiong 熊生至(?) organized men of Jiangxi, Hunan and Sichuan to re-open the mines and had the site renamed Yongjing. Cao was against, and when he came to be in charge of the prefecture, he had them closed. The account ends that the ores were no longer abundant by then.[3] It appears that the Ningtai Mine official was concerned about the workforce at his mine and therefor wanted to have the silver mine closed, as the latter which might have offered better conditions. According to the account, he was successful in having it largely closed down.[4]

The provincial gazetteer of 1949 also gives the year 1800 as the opening of the mines and adds that they were abandoned in the mid-19th century civil wars. This entry also details that the Yongjin Mines were 5 to 6 day stages from the Ningtai Mines.[5]

The records suggest a mine that was of some importance at the time when the original tax quota of 560 *liang* was set, and the reported tax of 298 *liang* in 1829 suggests decreasing productivity.

The story of the closure of the Lisiji Mines and immediate re-opening under a different name but in the following year is confusing. On the one hand, the account states that the mines were flourishing, yet only two years later the ore is stated to have been exhausted. The main information contained in the story is that at some point the mines were important enough to attract miners away from the Ningtai copper mines. The dating, however remains uncertain. No further records on the Ningtai mine official named Cao or Cao Kan could be located, which might have resolved the dating problem. While the later date is within the period of official operations, it would suggest a productivity in the late 1830s that was well above the tax quota recorded in the handbook of 1844. Moreover, in this case the mines would have been opened as Lisiji Mines in 1795 or 1800, which is odd. If the earlier date applies, the story would have taken place before the mines were officially opened, which is odder. In short, the Yongjin Mines we expect that the Yongjin Mines were important for a short time, which has to remain undefined.

Fieldwork by Nanny Kim and Yang Yuda 杨煜达, with Li Qiang 李强, our driver (born 1962, with 9 years experience in the mining industry), 5 February 2018

Supported by: The Yongjin village government

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[1] Wu Qijun 1944, *juan* 2, 103.

[2] *Xuxiu Shunning fuzhi* 1904, *juan* 13, 28.

[3] *Xuxiu Shunning fuzhi* 1904, *juan* 13, 29. The text appears to be partly corrupt: 湧金廠原爲立恩基銀廠。正旺時，有管甯臺廠員曹湛譖於上臺，遂封閉，己亥明年有潛山熊生至合江、楚、川三省走廠者，謀於白石生，改名湧金山。聞於上臺請開而曹力阻之。辛丑曹兼管順甯，廠甫開而礦亦不旺。

[4]

[5] *Xinzuan Yunnan tongzhi* 1949, *juan* 64, 2b.

Main informants: Mr Chen Shuwen 陈树文 (born 1972) and his father Mr. Chen Xingxiang 陈兴祥 (born 1948) of Yongjin and Mr. Yang Minde 杨民德 (born 1965) of Yongjin

The distance from Yunxian to Yongjin village is only 50 km, but the road was caught in the narrow valley of the Youdianhe 右甸河 and in a bad state. We set off at 8 am but took a good time to reach Sanchahe 三岔河 at 1200 on the Youdianhe, then climbed to Yongjincun at 1700 on a much better, but narrow road. We reached the village government towards 11 am. The official in charge, Mr Yang 杨 was suspicious at first, but eventually accepted us as harmless and contacted Mr Chen 陈 who lives right next to the government building to show us around. According the Mr Yang, there were numerous old working up on the slope at about 1900 m, and the area of old slags was also some way further up, Place names in the vicinity were Changjie 厂街 (Mine Market), Caiyuanshan 菜园山 (Vegetable garden), and Qincaiyuan 芹菜园 (Qincai Garden).

Mr Chen Shuwen (born 1972) arrived back from Sanchahe just after noon and we set off. We decided to go up to Changjie first, as this was probably the center of the former mine. The administrative village center is at the lower end of the upper part of the valley, which widens and fans out with several small brooks from this point. Mr Chen directed us a short way further up the ridge, near a village that was Caiyuanshan. We walked into the bowel-shaped valley, crossed the stream of Caiyuanshan and an almost imperceptible ridge, then headed up towards Changjie. This village was now out of sight due to the steepness of the slope.

In the narrowest part of the Changjie stream valley, still at least 80 m below the village, slags started in a thick layer filling the breadth of the bottom. To some extent, slags may have been piled up for selling or due to the contruction of basins used for irrigation. The banks were free of slags, showing that the slags down here had eroded from above. Ceramic poles were easily found. Coming up to the terraced fields below the village, the lower area was all covered in slags and only partly terraced. According to Mr Chen, slags had been sold for some time and fields re-terraced afterwards. It appears the Changjie village occupies the widest part of the valley and the mildest slope, in fact the only relatively accommodating spot in this as well as the adjacent valleys.

The slag layer in existence is still quite thick. At the upper end, a relatively freshly cut bank of 2-4 m hadn't reached the bottom. In the fields above, slags were only occasionally visible. As this might have been the effect of relatively recent terracing, the extent of the original slag dump is difficult to judge. According to Mr Chen, smelting in 1958 was on the same site (An inhabitant of the village later stated the same, while Mr Chen's father said that smelting in 1958 was further down at the present administrative village).

Yang Yuda found parts of a rather crude ceramic pipe, (unintentionally) glazed. The pipe had a regular round diameter of about 5 cm, the outer diameter including caked on substances was about 20 cm.

We continued up into the village. There is an evidently once stepped road about 2 m wide at it's lower end and leading though most of the village. Near the top end was a small improvised shed that turned out to be the recent revival of the old Main Temple 大庙. Mr Chen explained that the temple had been destroyed in 1954. Two women, an 85 year old grandmother and a relative in her 50s, were looking after the temple. We had a chat in the yard, unfortunately the grandmother was largely inaudible to me. The old temple used to be the Six-Provinces temple 六省庙, the a 寿佛寺. She had not heard about other temples around.

From Changjie, Mr Chen took me to the mines that were in the area of Yongjin village, while Yuda went down to visit Mr Chen's father.

From the temple, we headed into a well-trodden path that gradually reached the next ridge to the north, crossed over it but kept northwards and upwards. Changjie is the highest village, the slopes above are forested. We entered an area that descended NE, initially mildly, and was curiously broken, with bumps and two streams running partly between walls 7 to 10 m apart, apparently tectonic ruptures. Mr

Chen first showed me remains of sheds or houses used by a forced labour camp set up in 1958. Next, he took me through a stretch of bush to workings a short way above. These descended steeply into the mountain in rocky walls to either side, in apparently natural clefts. The bottom of the small valley was covered in gangue.

We continued northwards to the next stream, which began at a blocked up mine below a tea plantation that appears to reach right up to the top of the ridge. A short way below, we met Mr Yang Minde 杨民德 (born 1965) Mr. Yang spoke very good Putonghua, and immediately claimed that he would be the person who knew most about the mines of Changjie, because he was from the village and because his father had been the smelting expert who directed the prisoners in their work, and also because he had helped an entrepreneur from Guangzhou who made preparations to restart mining a few years ago. The mining plans were eventually abandoned.

He told me that the mines were run by the British after the burning of the Yuanmingyuan, and that the Chinese workers set up the temple, originally as a Six-Provinces temple, later as a Shoufosi 寿佛寺 (Temple of the Hunanese). Most people hailed from Hunan. His own family did, and his ancestors would have come over 10 generations ago. From 1958 (or 1956?), the mines were again exploited for some 5 to 6 years. This exploitation used old discarded ores.

Mr Chen took me down along the tiny stream and showed me numerous workings that were much like the first that we had seen. In almost all cases mines entered to both sides into the wall or the steep slope, descending steeply, at about 34 °, in most cases clearly in natural clefts. There were also some more standard-shaped entrances that were not in clefts. One of these ran level. Mr Chen said that all these workings were connected inside the mountain. The largest opening was in a large cleft about 10 m in height, and up to 1 m wide.

When I asked where the greatest numbers of workings were found, Mr Chen pointed along the creek and up the eastern slope, then considered the workings at 狮子洞垭口 (?), a slope north of Changjie and apparently belonging to the next village and said there might be as many there.

Still in the forest, we returned to the ridge at a lower point, with a nice view of Daxueshan 大雪山 (Snowy Mountain). Mr Chen said there occasionally actually was snow on this mountain.

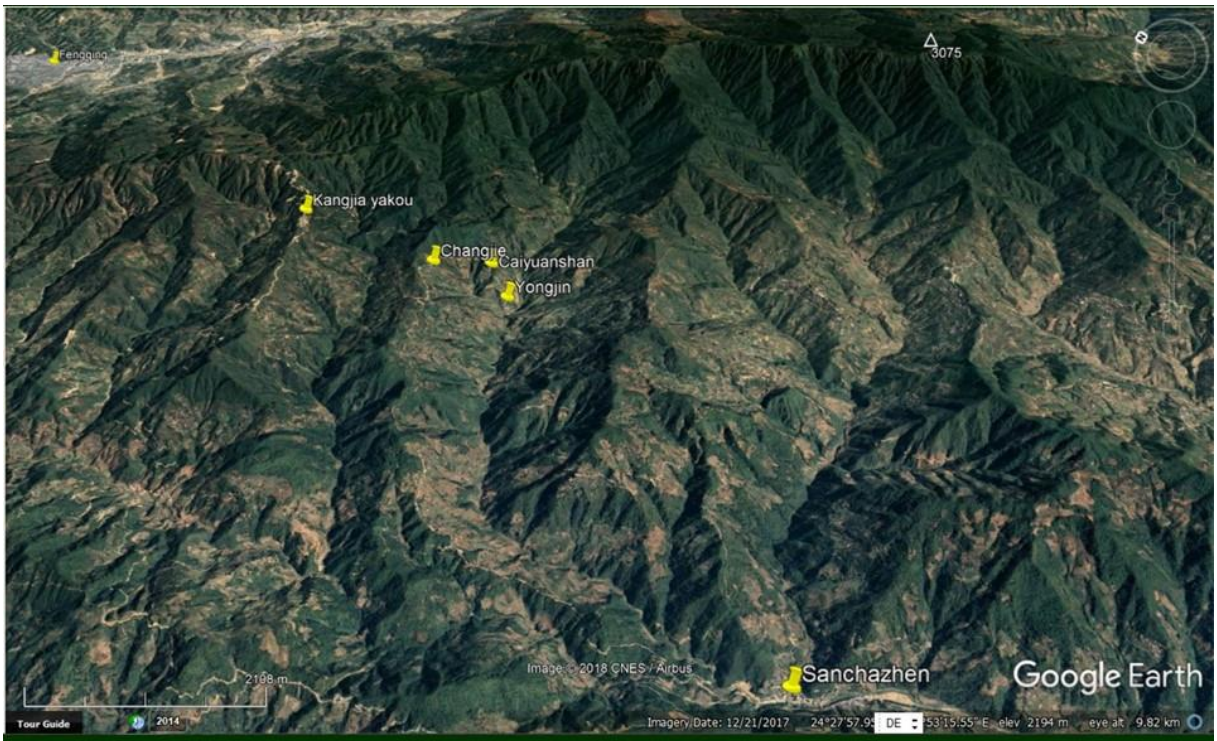
The valleys of the small streams were reduced to small rills as they reached the lower, very steep part of the slope, descending over 400 to 500 m to the bottom of a valley that ascended towards the Snowy Mountain. The opposite slope of this valley is steep throughout, worked into narrow terrasses to over half of its height.

The terrain provided an obvious reason why the only smelting site of the area is at Changjie.

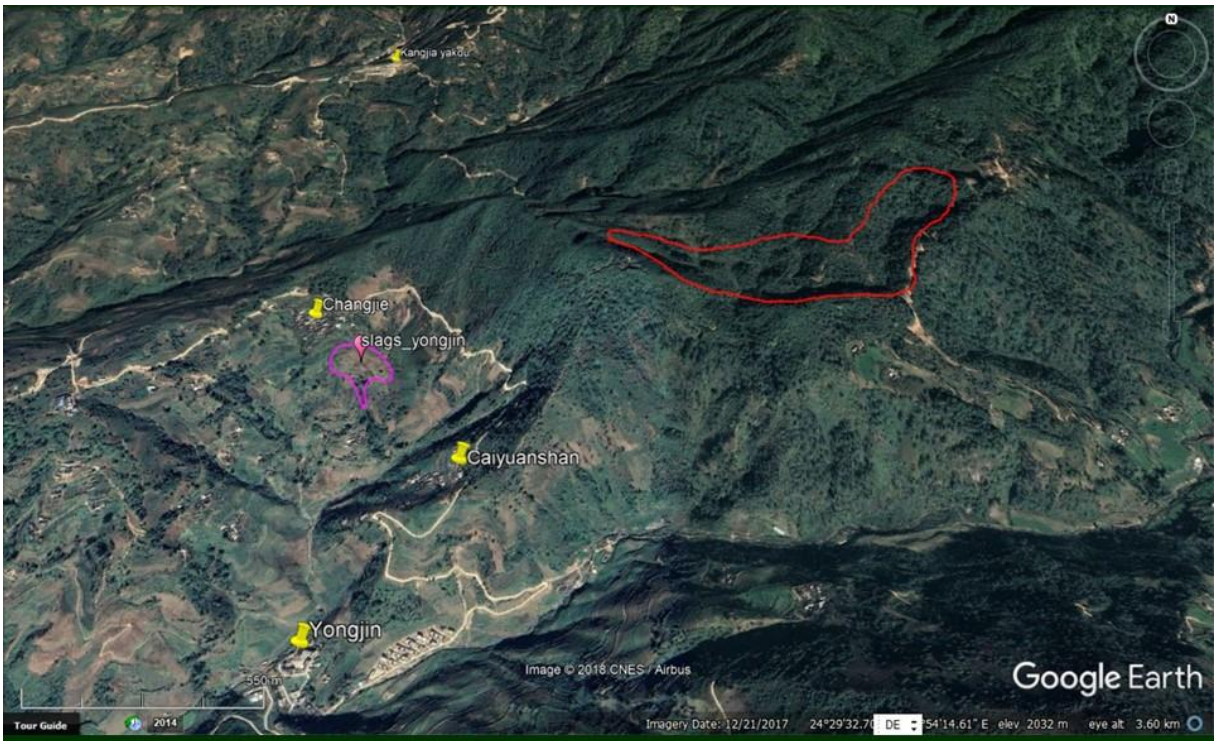
We descended on the ridge right down to Yongjin village, caught up with Yuda and Li Qiang and left about 4 pm to return to Yunxian.

In the meantime, Yuda had interviewed Mr. Chen Xingxiang. Mr. Chen had confirmed that the Six Provinces' temple buildings in former times had been very large, with thick pillars and courtyards to each side of the main hall. He detailed that the slag dump at Changjie was left by historic mining. There were also slags down at the stream nearby, these had been carried down in 1958 and re-smelted for lead. At the time, two furnaces were set up that were about 2 m high. Workings were said to be extremely numerous, with the total of 1400 being brought up.

Mr. Chen brought up the charcoal supply, telling Yuda that all the surrounding mountains had been cut bare, and that charcoal came from places such as Guodazhai 郭大寨 and Majie 马街, it was said from 60 or 100 km away. Other family members interjected that Guodazhai was very far away. Neither Mr. Chen nor anyone present could say, where Majie was. The charcoal issues appears to have been handed down and possibly shifted in the oral tradition.



The Yongjin Mines at the Daxueshan range, with the Fengqing valley to the northeast



The slag area (purple) and the visited mining area (red) at the Yongjin Mines



The fan-shaped valley of Changjie and the slag area (purple) below the village



Pillar bases of the former temple building next to the village government building.



Yuda with Mr. Chen above Caiyuanshan, heading out on the path to Changjie



Mr. Chen in the slope below Changjie



Slag layers near the lower end of the slag area, stabilized by typical lichen growth and a fresh cut



Slags and ceramic rods near the lower end of the slag dump



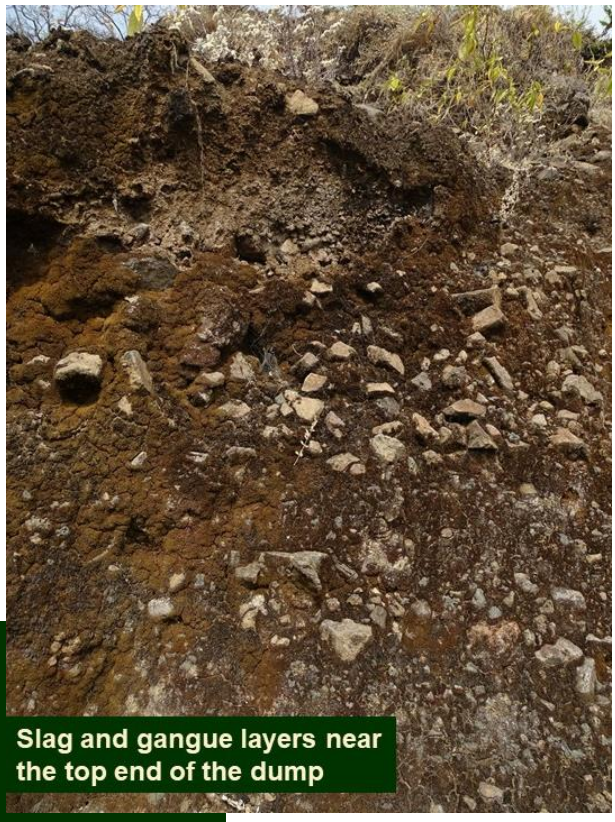
Thick slag layer under about 1 of soil in the erosion gully of the stream



Upper part of the slag dump in the terrassed fields below Changjie



Solid slag layer near the eastern end of the dump

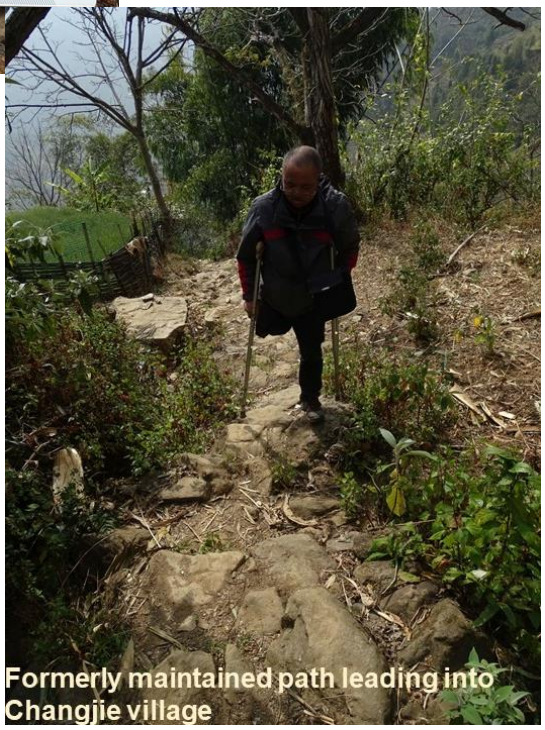


Slag and gangue layers near the top end of the dump

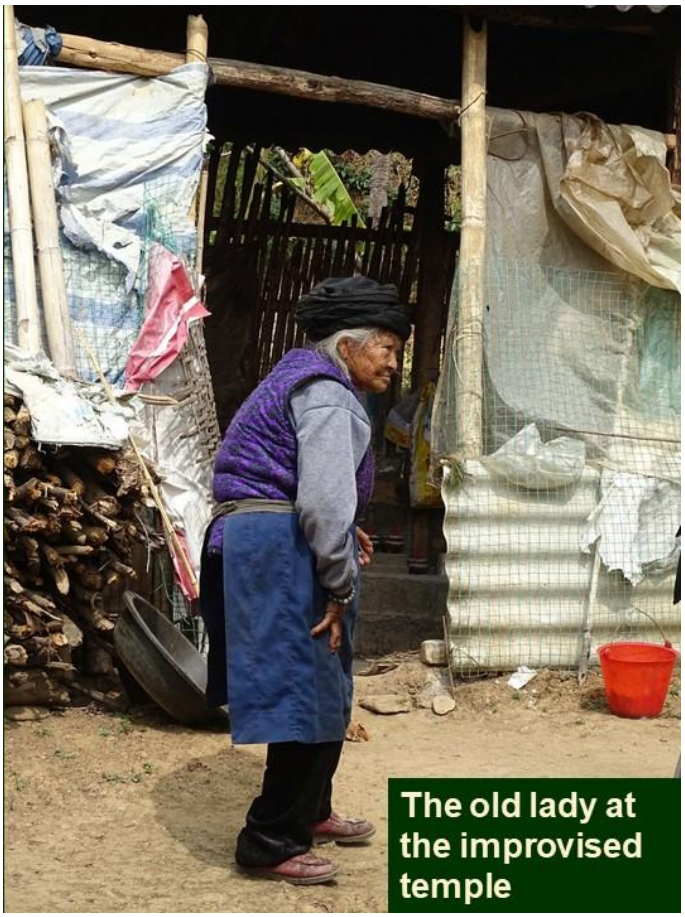




The pipe section and some unusually thick ceramic rods



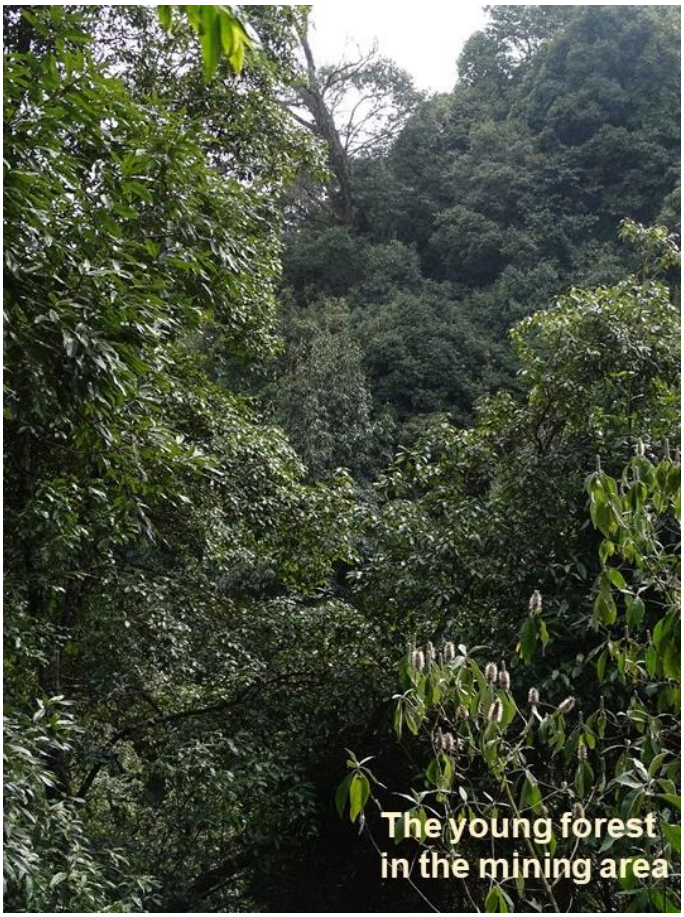
Formerly maintained path leading into Changjie village



The old lady at the improvised temple



The ridge and the top of Daxueshan


The young forest
in the mining area


Mine entrances into the low walls to both sides of the stream, most visibly following large natural clefts



Mine entrance and gangue heap below



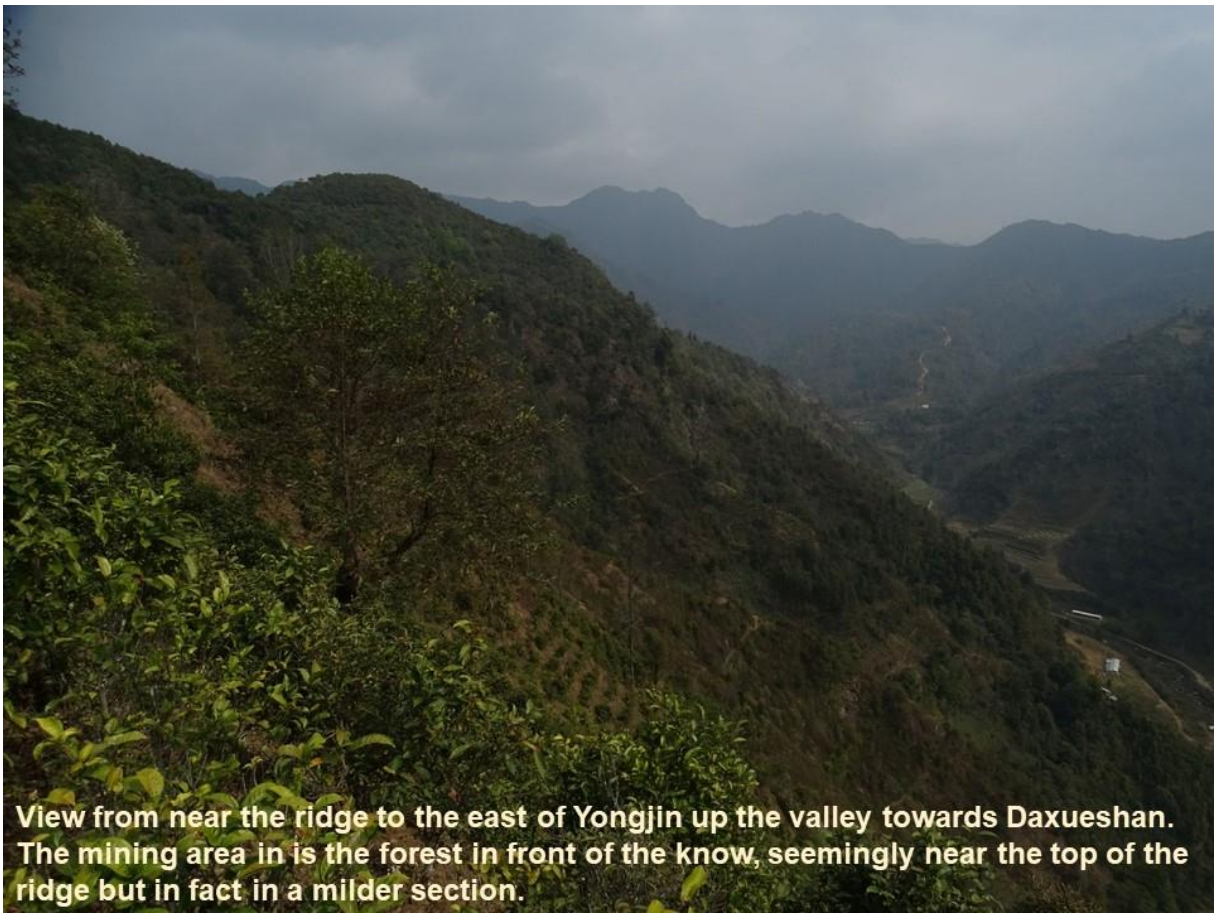
Mr Chen at two mine entrances in clefts opening in the walls on both sides



Gangue covering the bottom of the ditch between the walls



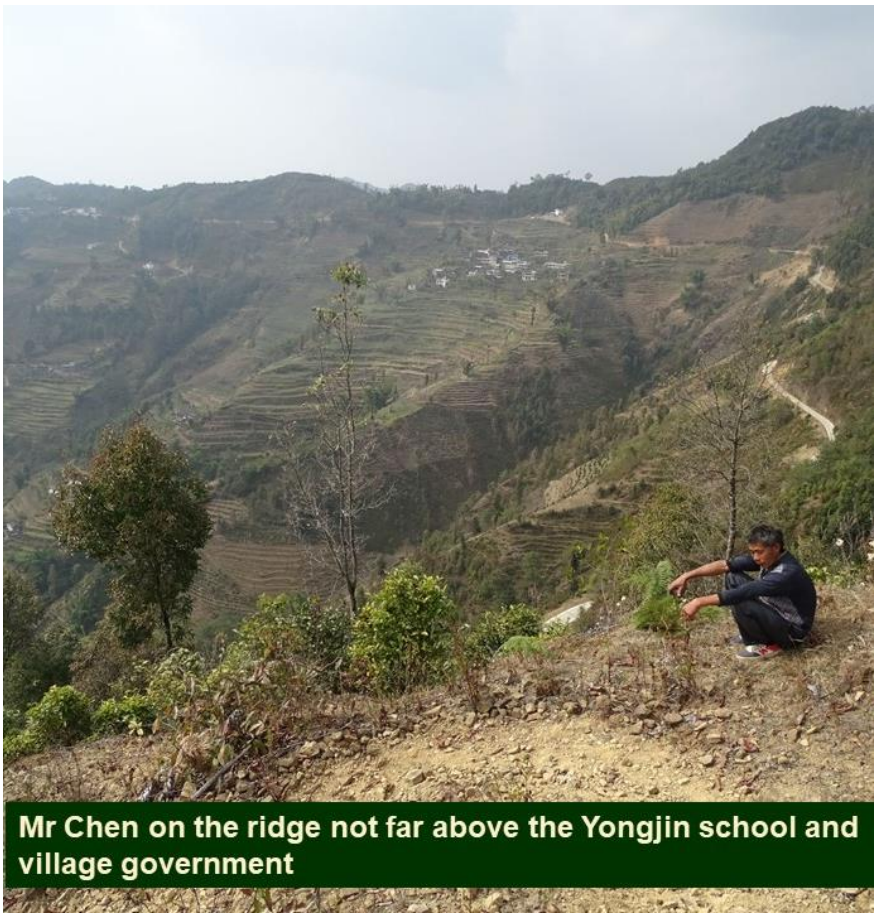
Shaft down a cleft



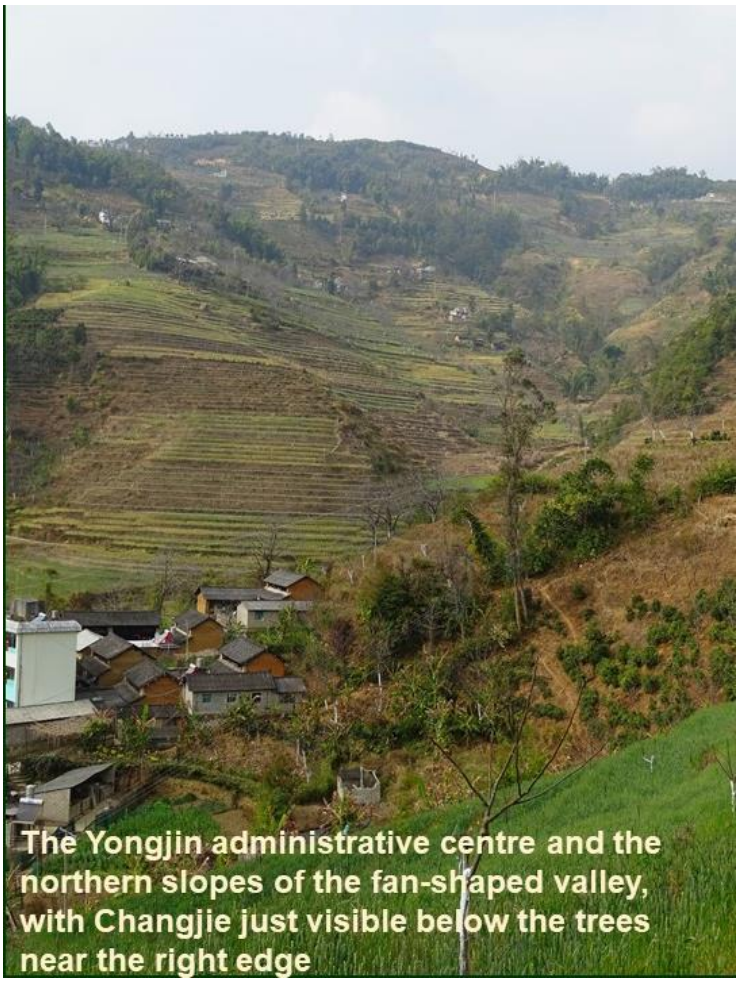
View from near the ridge to the east of Yongjin up the valley towards Daxueshan. The mining area in is the forest in front of the know, seemingly near the top of the ridge but in fact in a milder section.



The slope across the valley



Mr Chen on the ridge not far above the Yongjin school and village government



The Yongjin administrative centre and the northern slopes of the fan-shaped valley, with Changjie just visible below the trees near the right edge

Results

The substantial slag area clearly documents exploitation over several decades at the very least. We consider the slag dump below Changjie as the product of Qing period smelting, with the possibility of small additions when exploitation or re-exploitation was continued as a village industry after the end of intensive mining around 1850. The great number of workings and the extent of the mining areas, of which I saw only the northern part, are even more extensive. The findings concerning the workings are, however, uncertain, as exploitation of historic gangue and mining by traditional means was continued while the forced labour camp was in existence. The overall scope of Qing period mining on the site is considerably greater than we expected on the basis of the records.

The Taihe Mines 太和廠 in Xinping 新平县老厂乡太和厂

Nanny Kim, draft 2018.5.16.

Records and questions

Our fieldwork in Shuangbai in 2011 and 2016[1] had shown that exploitation in this region of western central Yunnan had been more extensive than expected, and that numerous sites existed. For this reason, we wanted to see the situation in Xinping, the adjoining region to the south of Shuangbai that is part of a very of mining area.

The local gazetteer of Xinping 1827 records 3 silver mines in the district:

> The Mingzhi Mines 明直銀厰: exploited since the Ming period and originally fulfilling a tax quota of 330 *liang*, formally closed in 1698 because the ore had long been exhausted and the tax had become a burden to the local population. (開採自明，年額課銀三百三十兩，遇閏加銀二十七兩五錢八分，後硐老山空，邑令賠累，康熙三十七年巡撫石琳奏請封閉。)
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> The Fangzhang Mines 方丈銀厰, opened in 1699 with a tax quota of 68 *liang*, closed because the ores were exploited during the Qianlong period (1736-1796) (康熙四十八年總督和貝諾題開，年額課銀六十八兩零八分，遇閏加銀七分二厘，後硐老山空，商販裹足，邑令賠累，乾隆年詳請封閉。)
>
> The Taihe Mines 太和銀廠, exploited since the Ming period, opened and closed several times, and re-opened in 1785, closed again, and again re-opened in 1806 without a fixed tax quota, and no longer reporting any taxed by 1826, when the gazetteer was compiled. (開自前明，屢開屢閉，乾隆五十年 1785 又報開採，後又以迄無成效禁止，嘉慶十一年知縣田興梅重報開採，儘収儘解，無定額。今又日漸哀歇，課無所出，行將詳請封閉矣。)[2]

The handbook of the Yunnan mining administration records the Taihe and the Baidamu Mines 白達母廠. It gives 1812 as the opening date of the Taihe Mines and states that no tax quota was set. The Baidamu Mines were opened as a branch mine in 1832 and made part of the Taihe Mines in 1835.[3]

The provincial gazetteer of 1949 records four sites, namely Taihe, Xiaoliqing, Baidamu, and Diebadu 太和、小里箐、白建母、迭巴都, noting that all had been worked in the past and that the Taihe Mines were worked during the Jiaqing and Daoguang periods.[4]

None of the recorded sites appear to have been important. The lack of overlap between the gazetteer of 1827 and the later records is strange, indicating that the sites not mentioned in 1827 were either not exploited before or that historic place names had become forgotten within a short period of time. In the case of Baidamu as the name of a branch mine, the re-opening of a formerly exploited site, presumably either Mingzhi or Fangzhang) under a different name seems also possible.

Fieldwork by Nanny Kim 金兰中 and Yang Yuda 杨煜达, with Li Qiang 李强, our driver (born 1962, with 9 years experience in the mining industry), 7 February 2018

Supported by: Mr. Chen Yantao 陈彦涛 of the culture office of Laochang and the village government of Taihe

[1] See 03_shiyang, 15_malong, 16_yeniu.
[2] Xinping xianzhi, 1827, *juan* 8.
[3] Wu Qijun 1844, juan 2, 104 and 105 (滇南矿产图略，卷下，104、105。)
[4] Xinzuan Yunnan tongzhi 1949, juan 64, 6b (新纂雲南通志卷六十四，6b).

Main informants: Mr. Yin Wenjing 尹文经 (born 1962) of Guanfang, Mr. Shao Zhong 邵忠 (born 1947) of Mayishan, former teacher at the Taihe primary school

We stayed at Gasa 戛洒, a town at only 500 m west of the Upper Yuanjiang (called Gasahe on this section), which has undergone recent development for tourism in the Ailaoshan 哀牢山 range. The mining areas were within a range of 15 km as the crow flies, but in the mountains at around 2000 m to the east of the river.

We set off at 8:30 and first drove to Laochang 老厂乡 (Old Mine, at 1700 m), a sub-county seat 32 km east. My guess was that this might be the site of the Mingzhi Mines 明值厂, while the Taihe Mines 太和厂 would be at Taihe Village, and the Fangzhang Mines 方丈厂 perhaps at Fangzhang village 80 km further east. Based on recent materials, Yuda had information on large amounts of slags at Baidamo 白达莫, so he expected a mine of some importance at this site.

We reached the Culture Office of the sub-county government towards 10 am, where three young officials were at work. Their head, Chen Yantao 陈彦涛 contacted the village government of Taihe for us. While he was doing this, we had a chat with the other two, who had never heard that there had ever been a mine in their or near their town, nor what had been exploited at the "old mine." They knew that there had been a silver mine at Taihe.

The distance to Taihe is 28 km, in fact not far north but a long way across very broken country. It circles and eventually crosses the valley of the Manbanghe stream and eventually ends up on the slope high above the Lüzhijiang 绿汁江, the arm of the Upper Yuanjiang that descends from Shuangbai and along which we had come down to Gasa the day before.[5] We reached the village at 11:30 and were promptly invited into the village government kitchen for lunch.

There are clusters of villages on the ranges but they are overall sparsely inhabited and largely forested. The forest is young, with evergreen broadleaves mixed with tall bamboo. Bamboo thickets can be relatively extensive in wetter stands but I saw no unmixed bamboo. Above 1500 m the bamboo disappears and pines become dominant, mixed with deciduous and evergreen broadleaves.

Taihe village sits on a narrow ridge that widens below the new main street. The main (and probably older) village is located here. After lunch, we sat in the courtyard in the sun for a bit with several members of the village government. They confirmed that there were slags as well as old workings. The digging up and selling of slags began in the 1980s, not much of the slag dumps was left by now. At the price of 3 Yuan oer 100 kg, it used to be considered a very good income to carry slags. The ridge where the present main street of the village is located is in fact called "temple ridge" 大庙梁子, occupied by several large temples. They remembered the temple names Niangniang dian 娘娘殿, Mawangmiao 马王庙 and Damiao 大庙. They also told us that there was also a large dump at Baidamo and that right across the river on the mountain ridge that belonged to Chuxiong municipality were the Baima silver mines 白马厂. We had not heard of these mines, but the place name is indicated on the map.

The village cadres further related that the next ridge northwards was called Mayishan 蚂蚁山 (and mountain). This was the main mining area, and the name derives from the masses of people milling about. The village officials were not aware of graves. Upon thinking, they mentioned that graves of people from Jiangxi used to be known, however. The village is mainly Han, and many are descendants of people who hailed from Jiangxi or from Nanjing.

Mr. Li 李, the head of the village office tried to contact informants for us. The first person probably was the retired primary school teacher, whom he though most knowledgeable, but he was

[5] According to the 1:100,000 maps of the Republican period, the lower section of this river used to be called Taihejiang.s

unwell. Mr. Li then found then Mr Yin Wenjing of Guanfang village who could show us around. We decided to first look at the slags and the temple site, then to split up in the usual way, with me wandering into the mining site and Yuda interviewing more informants in the village.

With Mr Yin as our guide, we first went to the closest location, the slag dump that extended from the upper end of the village to a brook in the fields to the north, over a length of about 100 m. Not far from the brook was the open space of the size of a smaller field that had been used for dumping and sieving the slags. The extent in the fields was impossible to establish. There were ceramic bars.

The next stop was in a courtyard just above the primary school where bits and pieces of older temple buildings had been reused in a relatively traditional house, presumably dating from about the 1980s, possibly earlier. There were some lintels, pillar bases with a small diameter, and two pieces of worked stones that may have been top pieces of small stele. Mr Yin also showed the new primary school, which was still a building site. The school had been rebuilt on the site of the old temple several times, leaving no historic remains.

We got in the car to drive to Guanfang 官房, the village just below that practically merges into Taihe. There were again slags at the upper western corner of this village on a steep embankment. They did not extend to the driving track below. I took some charcoal specimens from the slag layer.

Mr Yin had told us that their old family home was said to be 200 years old, although his family had not inhabited for that long. It now stands empty and he showed it to us in the lower end of the village. It formed part of a row of very small, 2-storied houses with flat roofs. Mr Yin told me that they probably originally had tiled roofs, as it was said that most houses had tiled roofs in Guangfang in the past. He also told me that the village well was not far along the track, and that the village used to be short of water. Mr Yin had worked as a miner fo 9 years, most of the time at Baidamo. He told me that they had worked old mines and that all the work was done by hand, in a crouching position.

Mr Yin showed us the area of a small brook just below the village, where the slag layer formerly used to be particularly thick. Bands of slag were well visible in the embankment of the driving track.

Two further very condensed slag areas were further down at Cha'ermiao 茶耳庙. Mr Yin and other informants of that village could give no further information on the temple. Mr Yin said these were copper smelting slags. There was a densely packed area just at the upper northern corner of this very small village, and a larger dump a little way on the ridge. A small quarry had eaten into the larger dump at its lower end. The layer here was not thick, about 20 cm. Further up on the more level ground, however, it appeared quite thick, and the bases of a row of 4 furnaces were still visible. The best preserved on had a rectangular shape and appeared deeper than wide. There were no ceramic rods. Mr Yin related that he had heard that some people had found a copper plate here. As far as he had heard, the plate had been round and fairly thick.

On the entire slope from Taihe to below Cha'ermiao used to be several mine entrances. Mr Yin pointed out the location of some. We saw a ventilation chimney right next to the driving track that according to Mr Yin was 80 m deep before it got blocked up by rubbish. He had been in the mine way down the slope below and actually climbed up the chimney somehow.

Mr Yin gave the number of mine entrances around Taihe with over 90 and specified that he himself had been into over ninety. Besides the mines on the slope of Guanfang and Ch'ermiao, there were more numerous workings on the slope of Laobiaodong 老表洞 (Laobiandong 老扁洞 on the map) and Mayishan 蚂蚁山, two sections of the ridge north of Taihe, with characteristic low cliffs. His explanation of the names was that the Laobiaodong was opened by two brothers, and that Mayishan used to look like and anthill with all the miners moving in and out of the workings.

Mr Yin's knowledge of mining came from working as a miner, mainly at Baidamo, for 9 years. In his opinion, the recent exploitation of Baidamo had produced more ore that at Taihe.

From the lower end of the slags, we drove back up into the village, where Yuda was introduced to the former teacher. Mr Yin took me on to the mines. We drove from the upper end of Taihe to the upper end of Mayishan. The recently retraced driving track had eaten into the moutainside, exposing several old workings above the cliff area of Mayishan.

Mr Yin had mentioned part of a stele still carrying and inscription, but as we drove up to Mayishan he said that it was now buried by the new roadworks. We drove down along the northeastern side of the ridge, ending up above the small village of Laobiaodong. Mr Yin took me to a mine that was being worked but according to him was exploiting an old working. The gallery was slightly widened to allow for very small rail pushcarts. There was a tent, but everybody had left for Chunjie. There was a pile of ore. Mr Yin told me that the mine was worked for zinc and that picked up a piece of ore that he estimated to contain 40% of zinc.

I had to insist a bit to convince him that I could walk further than 20 m from the car. Eventually he took me down in the forest, while Li Jian headed back to Taihe village. We walked down an increasingly steep slope at what I think is the upper end of Laobiaodong. Mr Yin showed me some more workings. All entered the mountain at a mild incline. Mr Yin wanted to take me further into one of the mines, which allowed for relatively comfortable stooped walking, but I preferred daylight after some 50 to 70 m. Mr Yin showed the veins of metalliferous rock that had provided the lead for driving in the mines in the past. He took it to be mainly a zinc ore, perhaps also seams of (apparently oxidized) lead. The veins were accompanied by quartz veins.

I would have liked to see the distribution of workings on Mayishan, but the terrain was too steep and the forest too dense. We ended up clambering down the steep little side valley that separates Laobiaodong from Mayishan, and walked back in the forest below Mayishan, then crossing the brook in the valley between the Taihe ridge and the mining ridge and heading up towards the village.

Mr Yin told me that before the reforms (the 1980s), they hardly dared to come to this forest, as there were still panthers then. About the knowledge about the old workings he said that locals just knew about them, they did not need to search for them. He also pointed out that the workings inside the mountain were connected, even between Laobiaodong and Mayishan. The slope below Laobiaodong is called Xiaomidi 小米地 (Millet land), the valley between the mining ridge and that of Taihe is called Lufangqing 炉房箐 (smelters' thicket).

Slags and bits of ore began to appear as soon as we began heading up the slope.

While Yuda and Li Qiang drove down, Mr Yin showed me the antiques he had at his house and which were left by his father. These included a piece of metal lead in the shape in which it had flowed from a furnace, a rod of lead, a piece of raw silver (which I think is valuable), two silver ingots that Mr Yin thinks are fakes, and a number of Qing and Republican coins.

In the conversation with Mr. Shao, Yuda obtained more information on the local history:

Mr. Shao provided the same explanation of the name Mayishan as the others, there were sites known as Jiangxifen 江西坟 (Jiangxi graves) and Jiangxitan 江西田 (Jiangxi field).

There were altogether five temples on the temple ridge. The highest of these was called Huazi miao 花子庙, le largest Great temple 大庙, then there were the Mashen miao 马神庙, the Tuzhu miao 土主庙, the Guanyin Temple 观音殿, the Laojun miao 老君殿 and the Niangniang miao 娘娘庙. He had not heard of guild temples of a Xiaogong temple 萧公祠 or of a Shoufo 寿佛寺, the typical guild temples of Jiangxi and Hunan. The Tuzhu Temple used to have an opera stage. He could not say who the deity was. The Tuzhu and the Guanyin temple were relatively large. Each temple had two or three stele recording donations. Quite a few of them were used in the walls of the [former] primary school, each as large as a table.

Taihe used to be within Chuxiong prefecture, and was later made part of Yuxi. The people who built the temples would have come from Chuxiong. At Guanfang there used to be a Yamen specially built for the official, and also a tax office 课房, that is where the silver was handed in an smelted into ingots.

The two slag areas to both sides of the temple ridge, but not the one we had seen, were left from selling the slags. That would have been about 1984 and continued for two or three years, everybody from the surrounding villages participated. They would dig up slags and carry them up to the track, making 0.01 to 0.04 Yuan per pound. Some could carry over 10 loads up in a day and made 7-8 Yuan, most managed 6-7 loads. Mr. Shao remembered the two years as a busy time for Taihe.

The old Taihe market 太和街 was the village below. There were also two villages called vegetable garden 大菜园 and 小菜园 that used to grow vegetables for the mines, and there were other related pace names, such as Great horse hostel 大马房, little horse hostel 小马房, shops 铺子房, which were along the caravan road. The place names Dagongzhai 打汞寨 and Sanjiazhai 三家寨 were related to mining.

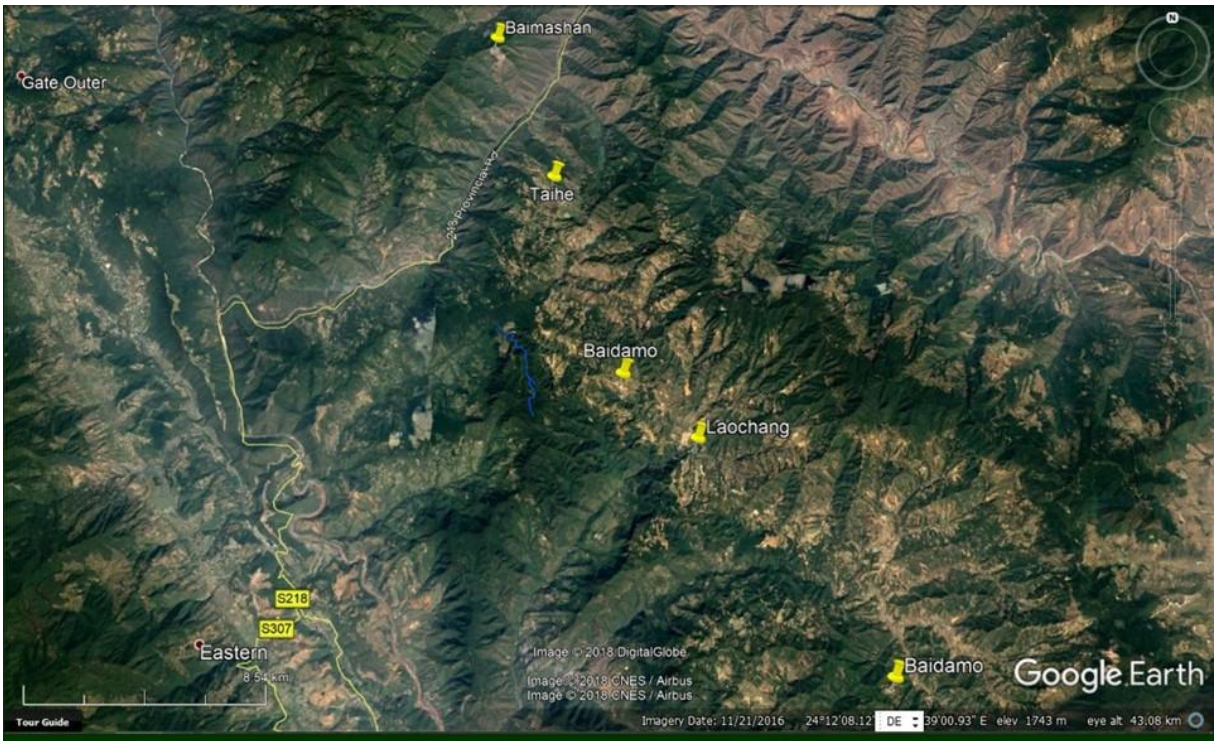
There used to be hardly any trees on the mountains around, and Mr. Shao still remembered them as bare when he was young. Charcoal used to be carried from quite a distance, on the backs of men and pack horses, such as Heichamo 黑查莫 [5-7 km away]

Mr. Shao's ancestors had come to Taihe 8 generations ago from Yuxi 玉溪 and were involved in mining.

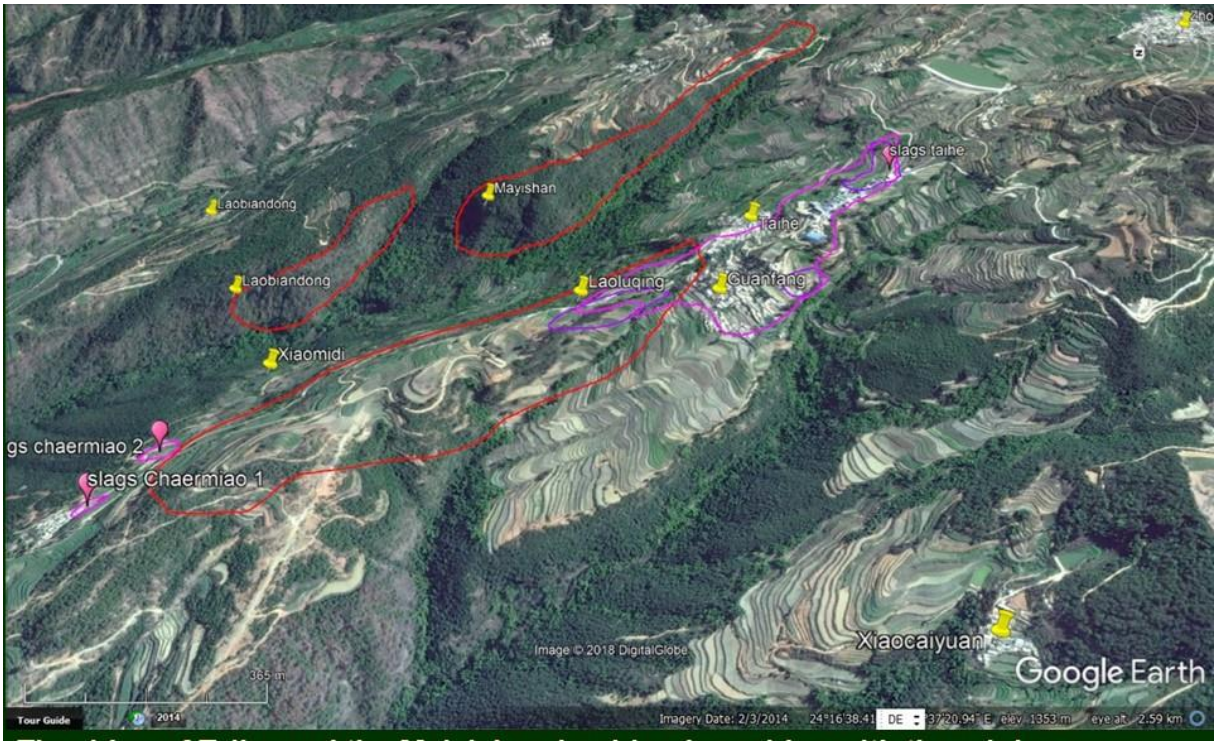
He related that the miners of the past held their lamps in their mouth, and called it liangzi 亮子. They used chisel to work the ore bit by bit and ore sacks to carry it out. Smelting was in large furnaces, but he would not know how it was done.

There was a saying that in the past, because of the treasure hidden at Baidamo, Taihe and Baimachang, it never rained on these sites. According to another story, the ore had the shape of an ox, and Taihe worked only a leg, the rest had run away to Baidamo.

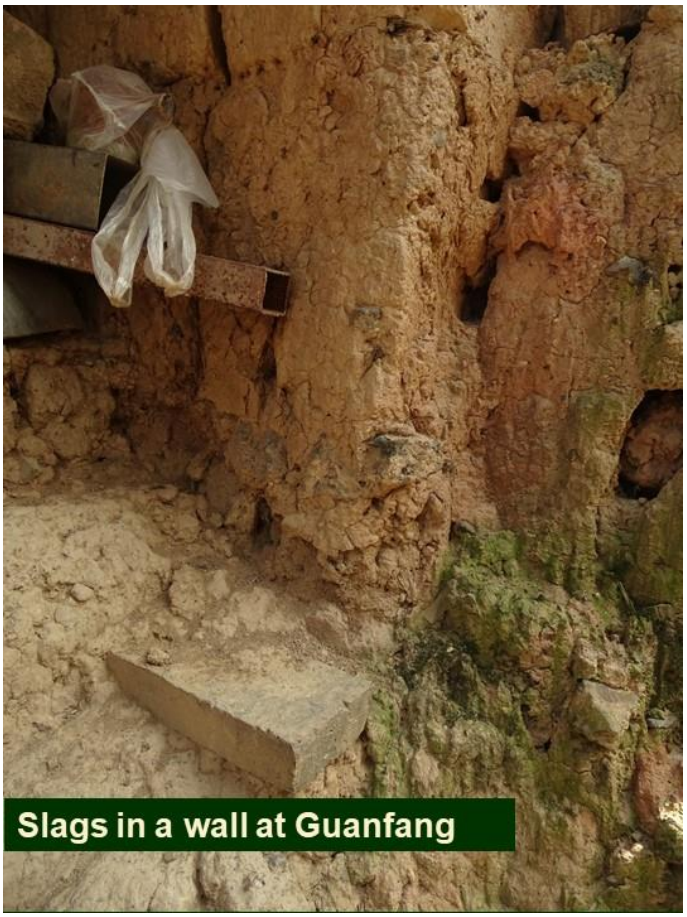
We left Taihe at 6 pm and got down to Gasa by 8 pm.



The sites in northern Xinping. Laochang, Baidamo and Taihe are in the ranges approaching 2000 m, the Yuanjiang is in the left third, with the ascent to the Ailaoshan range on the left rim of the map.



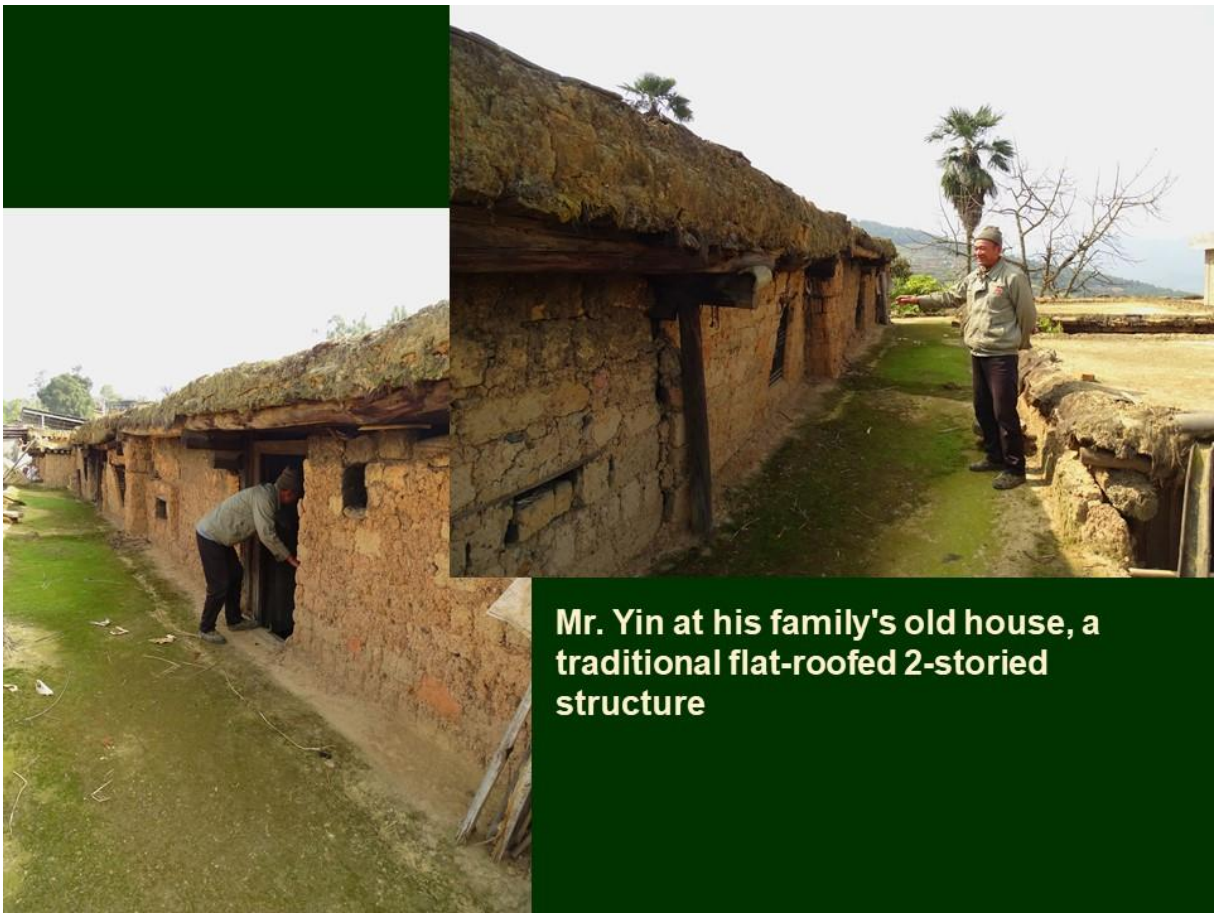
The ridge of Taihe and the Maiyishan-Laobiaodong ridge with the mining areas (red) and the slag areas (purple).



Slags in a wall at Guanfang



Mr. Yin Wenjing 尹文经



Mr. Yin at his family's old house, a traditional flat-roofed 2-storied structure



A window and the old stove in Mr. Yin's old family home.



Layers of soil, slag, red burnt soil, and soil near the rill of Lufangqing



Slag layer in the rill of Lufangqing





Yuda and Mr. Yin at the ventilation shaft below Guanfang

Gangue layer over soil in the fields below Guanfang



The slag dump at the entrance of Cha'ermiao





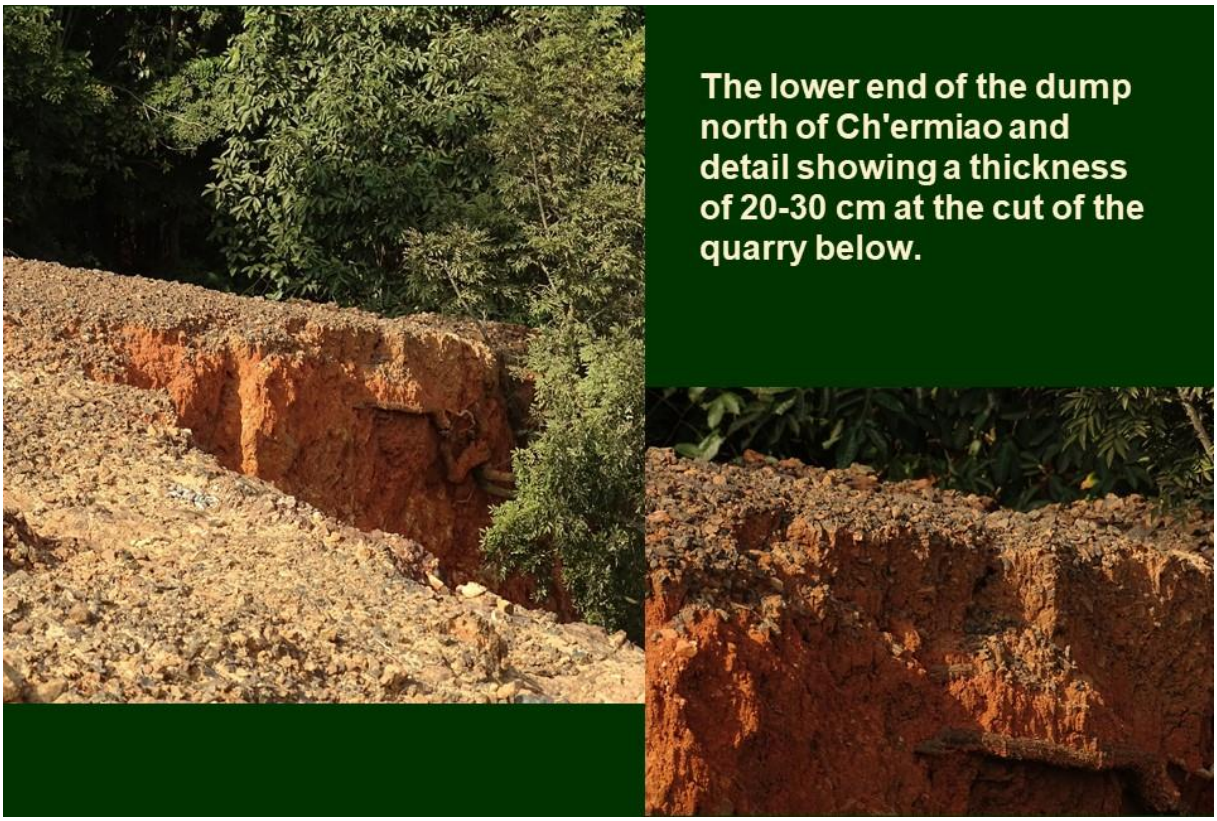
Packed slag at Ch'ermiao and detail of (copper?) slags



View north from near Ch'ermiao to the Laobiandong ridge and the ridges beyond, all descending to the Lüzhijiang



Mr. Yin in the slag dump north of Ch'ermiao. The of structures in the dump ar probably furnace remains.



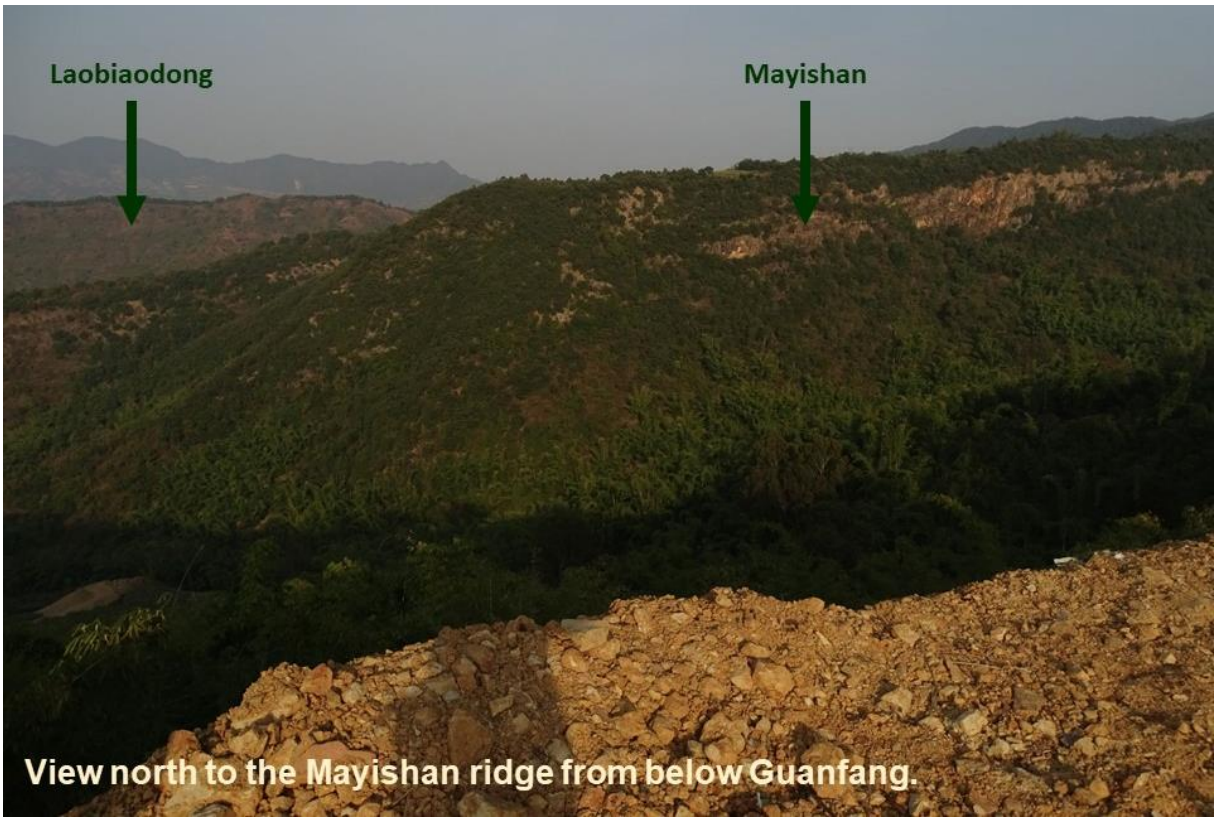
The lower end of the dump north of Ch'ermiao and detail showing a thickness of 20-30 cm at the cut of the quarry below.



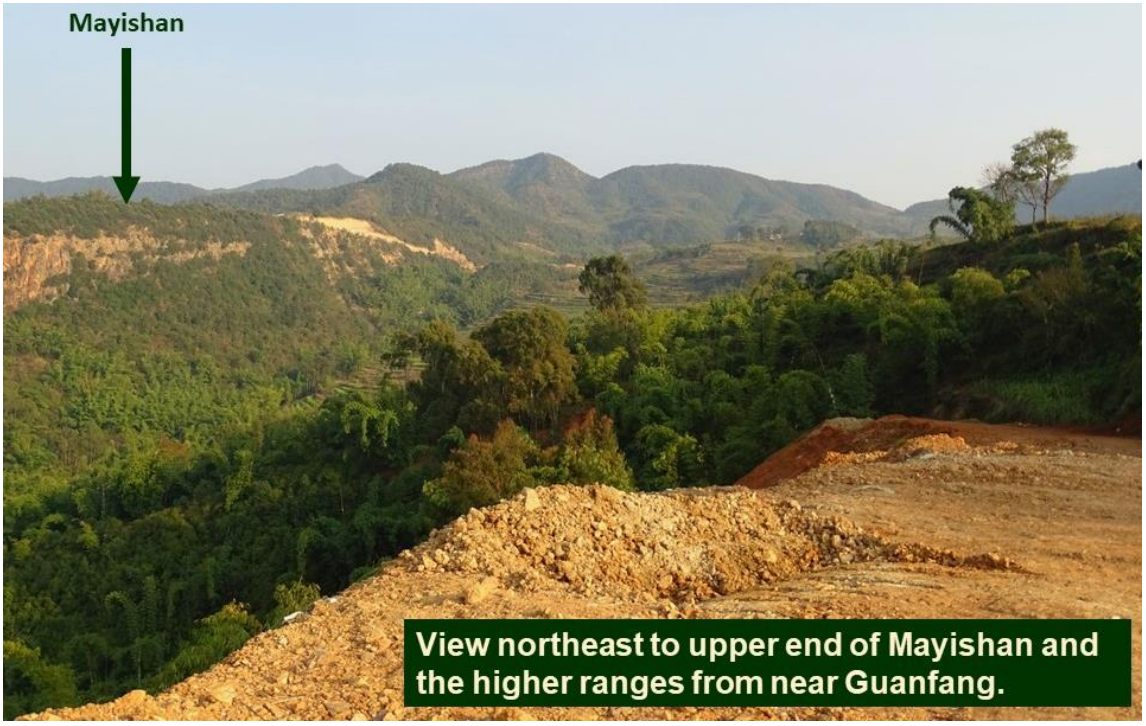
Pieces of ore recently extracted from the worked mine near Laobiandong village



Mine entrance in the Laobiaodong slope and detail of ore seam that according of Mr. Yin contained zinc and was the indication of that the miners in the past followed into the mountain.



View north to the Mayishan ridge from below Guanfang.


Mayishan
View northeast to upper end of Mayishan and the higher ranges from near Guanfang.


Laobiaodong
Mayishan
View north to the Laobiaodong ridge from near Guanfang.


cm 1 2 3 4
The button of raw silver that Mr. Yin inherited from his father.



Results

The remains at Taihe are evidence of an important mine. The extent of the slag area and the information concerning formerly massive slag layers reflects large-scale exploitation. The workings both in the Taihe slope and at Mayishan and Laobiaodong are also extensive.

On account of the absence of Qing period temples and the vague identification of the historic temples in the oral tradition, we think that exploitation was relatively limited during the Qing period. This would mean that the mine was extremely important in the Ming period.

The Baidamo Mines 白达莫厂 in Xinping 新平县老厂乡白达莫 (The Mingzhi Mines 明直厥?)

Nanny Kim, draft 2018.5.16.

Records and questions

Our fieldwork in Shuangbai in 2011 and 2016[1] had shown that exploitation in this region of western central Yunnan had been more extensive than expected, and that numerous sites existed. For this reason, we wanted to see the situation in Xinping, the adjoining region to the south of Shuangbai that is part of a very of mining area.

Two mines in the district could not be located so far. These are the Mingzhi Mines 明直厥 and the Fangzhang Mines 方丈厥. According to the local gazetteer of 1827, the Mingzhi Mines go back to the Ming period, were still fulfilling a tax quota of 330 *liang* in the early Qing and were formally closed in 1698 because the ore had long been exhausted and the tax had become a burden to the local population. (開採自明，年額課銀三百三十兩，遇閏加銀二十七兩五錢八分，後硐老山空，邑令賠累，康熙三十七年巡撫石琳奏請封閉。) The Fangzhang Mines appear as a minor Qing site that opened in 1699 with a tax quota of 68 liang, closed because the ores were exploited during the Qianlong period (1736-1796) (康熙四十八年總督和貝諾題開，年額課銀六十八兩零八分，遇閏加銀七分二厘，後硐老山空，商販裹足，邑令賠累，乾隆年詳請封閉。)[2]

The handbook of the Yunnan mining administration records the Baidamu Mines 白達母廠 as a branch mine opened in 1832 and made part of the Taihe Mines in 1835.[3]

The provincial gazetteer of 1949 records four sites, namely Taihe, Xiaoliqing, Baidamu, and Diebadu 太和、小里箐、白建母、迭巴都, noting that all had been worked in the past and that the Taihe Mines were worked during the Jiaqing and Daoguang periods.[4]

There is a possibility that the mines opened in 1832 exploited an older site under a different.

An article on the historic records and exploitable deposits by Xue Bugao and Wu Liangjun mentions the site as Baidamo 白达莫 and describes a compact deposit that runs north-south and consists mainly of sphalerite, followed by galenite and chalcopyrite, and possessing a silverization of 100 to a maximum of 400 g/t, while the copper content reaches up to 1%.[5] The average metal content is evidently far below the viable minimum of pre-industrial exploitation. Historic miners would have targeted veins with special conditions, probably of secondary enrichment.

As Baidamo is the name in present-day maps, we use this name instead of Baidamu, Alternative writings as 百大摩 are also found in recent materials.

We expected a relatively minor site but were interested in finding more information on the connection of Baidamo, Laochong, and possibly of the Mingzi and the Fangzhang Mines.

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[1] See 03_shiyang, 15_malong, 16_yeniu.
[2] Xinping xianzhi, 1827, *juan* 8.
[3] Wu Qijun 1844, juan 2, 104 and 105 (滇南矿产图略，卷下，104、105。)
[4] Xinzuan Yunnan tongzhi 1949, juan 64, 6b (新纂雲南通志卷六十四，6b).
[5] Xue Bugao and Wu Liangshi 2002: 301.

Fieldwork by Nanny Kim 金兰中 and Yang Yuda 杨煜达, with Li Qiang 李强, our driver (born 1962, with 9 years experience in the mining industry), 8 February 2018

Supported by: Mr. Chen Yantao 陈彦涛 of the culture office of Laochang and the village government of Taiqiao

Main informants: Mr. Xu Yun 许允 (born 1976), village secretary of Taiqiao, Mr Yao Shun 姚顺 (born 1954) and Mr. Li Shaotang 李少堂 (born 1938) of Baidamo.

Due to a navigation error, we first went to a village by the same name but in a different sub-county, Baidamo in Xinhuaxiang 新华乡白达莫村, that is almost 30 km south of the site we wanted to get to. We reached Taiqiao 太桥村, the administrative village that is on the ascent some 5 km north of Laochang about noon. Baidamo actually means a wider and more level section in a ridge and hence is a relatively common place name.

Mr. Xu Yun 许允, the village secretary of Taihe, had been informed by the Culture Office and was waiting for us. Mr. Xu (born 1976) had served in the army and therefore spoke very good standard Chinese. Mr. Tang Jialiang 汤家亮 (about 50) joined us at lunch and provided some information on the mines. After lunch, Mr Xu, Mr. Xu Xueyong 许学勇 and another village official whose name we forgot to ask, took us to the historic sites. While chatting over lunch, we were told that Baidamo village is mainly Han and has about 18 families.

We first went to the workings in the SW slope of a small valley. There were recently abandoned workings at the bottom end of the valley. According to our informants, the mine that had been exploited until recently was called Baishuidong 白水洞 and used to be quite important. All existing mines exploited old workings. Most were on this slope, a few on the opposite slope across a small stream.

We walked along the slope at some starting some way up and gradually ascending, passing through the entire length of the main mining area. Exploitation had been carried on, entirely by traditional means, from the 1980s to about 2006, without rails and even without the building of driving tracks on the slope. There were altogether 22 numbered mines for which permits had been procured at some point. Mine number 3, which is located near the upper end of the valley, is said to be the largest and had 3 exits. The reworked mine entrances were still no more than 1.20 high and not much more than 1 m wide. The entire slope is very disturbed between the pine forest, with recent dumps of gangue and historic gangue heaps visible in some places. Mr Xu told me that the workings were all connected and reached far into the mountain. Warmish and humid air appeared to emerge from the entrances.

The dating of the historic workings is uncertain. According to Mr Xu, people generally think that the mines were worked by the British after the invasion of the Eight Allied Armies [The Boxer Rebellion].

Yuda established thick layers of gangue along the driving track, also to the east of the driving track.

Back at the driving track, we continued up the norther side valley and reached the fields between Baidamo and Bajiao 坝脚. Mr Xu told us that this was the lower end of the slags, and the place where locals sieve them for selling. There certainly was a clean pile of slags there and slags were quite prominent in the surrounding fields. There were ceramic bars.

We went up to the village and met Mr Yao Shun 姚顺 (born 1954), together with Ms. Li Mei 李梅, who is probably his daughter-in-law.

Mr. Yao was specific that the terraced field from the village down the slope to Bajiao had only been brought under cultivation in 1972 or 1973. Prior to that, the area used to covered in slags and unusable. The estimated the former slag area at 20 to 30 mu (二三十亩) [13,000-20,000 m^2].

There was a saying that the mines were “highly prosperous for 60 years, tolerably prosperous for 60 years, and carried on for 60 years” (大旺六十年，小旺六十年，敲敲打打六十年。). There used to be people from 13 provinces working the mines, with only people from Lin’an 临安 left in the end.

Mr Yao told us that there used to be a Great Temple 大庙 and a Public Office 公所 [possibly also a guild hall], but they were gone by his time. He had only seen wall remains and tiles. There would have been stele, but they were destroyed. He had heard about an opera stage in the public office. There also used to be a Gongwangmiao 汞王庙 for the mountain deity on the next mountain. All these temples were built by mine officials.

Mr. Yao’s ancestors had come from Lufeng in Chuxiong 楚雄禄丰 6 generations ago [about 1800-1830], and had been involved in mining. According to the family tradition, three brothers travelled down, and while the two older brothers eventually returned, the youngest could not find the way back because they had lost their map and therefore stayed and founded a family.

We went to visit Mr. Li Shaotang 李少堂 (born 1938), who related that his family originated from Hunan and moved here from Chuxiong, he couldn’t say how many generations ago. He largely confirmed the information on the temples provided by Mr. Yao, but added that there used to be opera stages at both the great temple and the public hall. He had still seen main hall with two side-buildings of the Great Temple. There used to be one of the great bellows that was kept in the temple. As children they had climbed in. He would think that it had a diameter of 1 m and was 2 m long. The bellows were worked by several men.

The slag dump was thicker than a man’s height, covered the entire flatter area and could cut your feet.

He had heard the names of five mines, but he did not remember all of them. One of the mines was called Goat Mine 山羊洞, you could walk into it upright. He had heard that the mine boss who opened this mine never hit on ore for a long time and became very poor, but eventually found rich ores and became rich. Then there was the Genius Mine 天财洞 tha produced a great amount of ore, but not all of it could be brought out. The 10,000 Horses Mine 万马洞 is the present No. 16 Mine and was also very productive in the past. Other known mines were the White Water Mine 白水洞 and the Great White Mine 大白洞. There were places inside the mines that were as high as three houses.

Mr Xu added that when the mines were worked, they would hear the explosions in their houses in the village, as the village was right above the mine-riddled area.

There used to be numerous small graves on the slope below the village, graves of miners, mostly without gravestones. In 1972, when all had to learn from Dazhai, the graves were levelled and turned into fields.

From the 1980s, the slags were sold and the area converted into fields.

There used to be a market held at Baidamo; Mr. Li’s grandmother used to attend it.

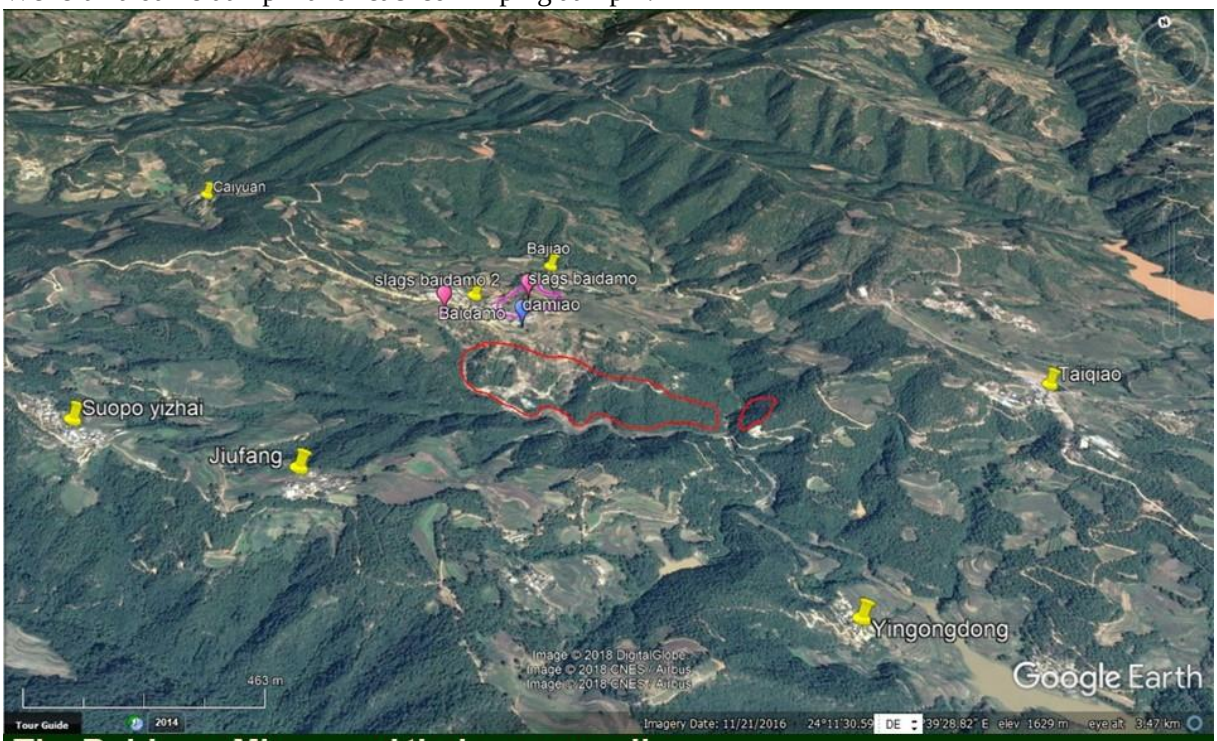
We had another look for slags in the fields and found layers some of the terrace walls. I took a couple of charcoal samples.

Li Mei took us to the temple site, on a small wooded knob that ends the saddle of Baidamo.

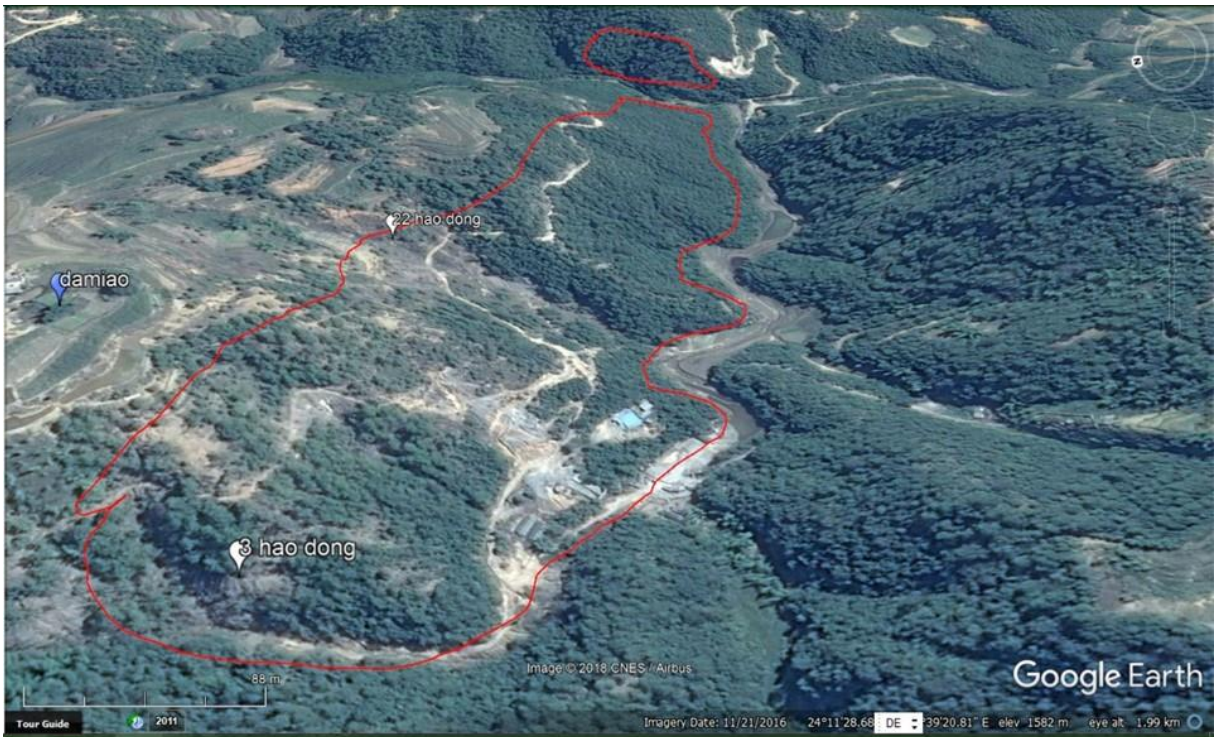
Mr Xu explained that Yingongdong 银汞洞 was further down SE towards Laochang, while the slope SW was called Laogongshan. He had however never heard about mines in the context of these place names.

Li Mei also took us to a smaller slag dump a little way down to the NW from the village. The extent is uncertain due to recent terrassed fields.

We left Baidamo at 4 pm and reached Xinping at 7 pm.



The Baidamo Mines and their surroundings



The mining area (red) below Baidamo village

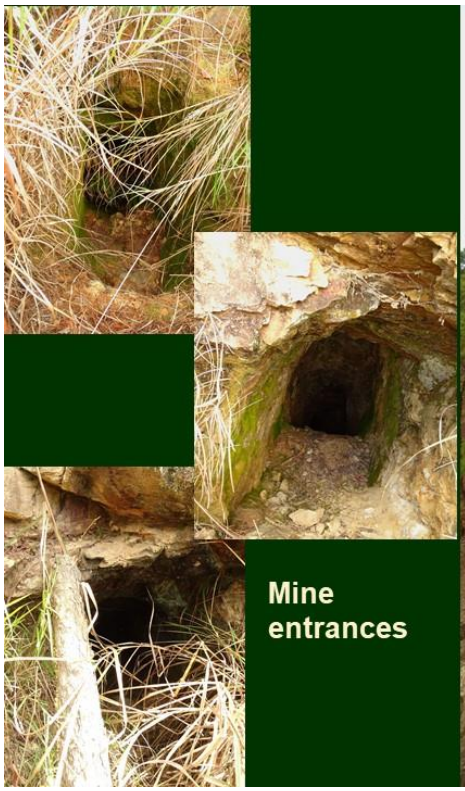


The probable extent of the slag areas (purple) at Baidamo village





Li Qiang, Yuda, Mr. Xu Yun, and the two village officials at the Baishuidong



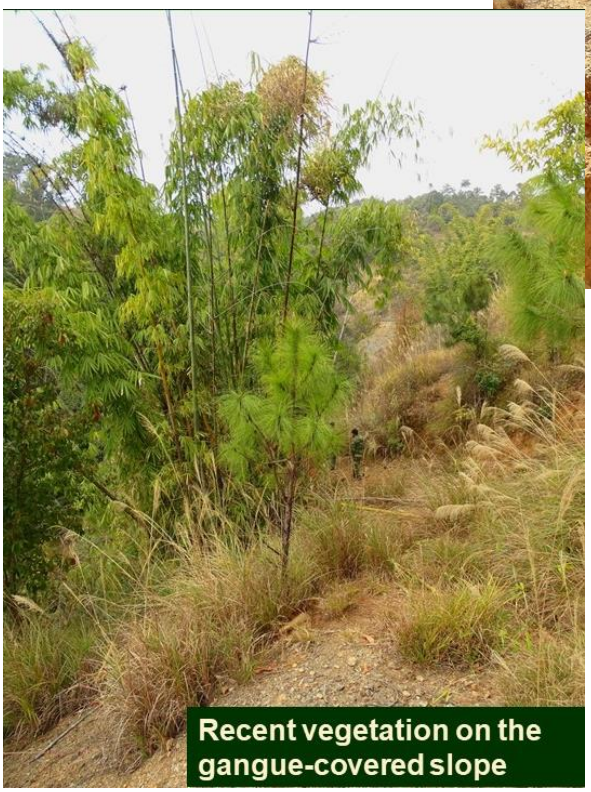
Mine entrances



The upper part of the mining slope



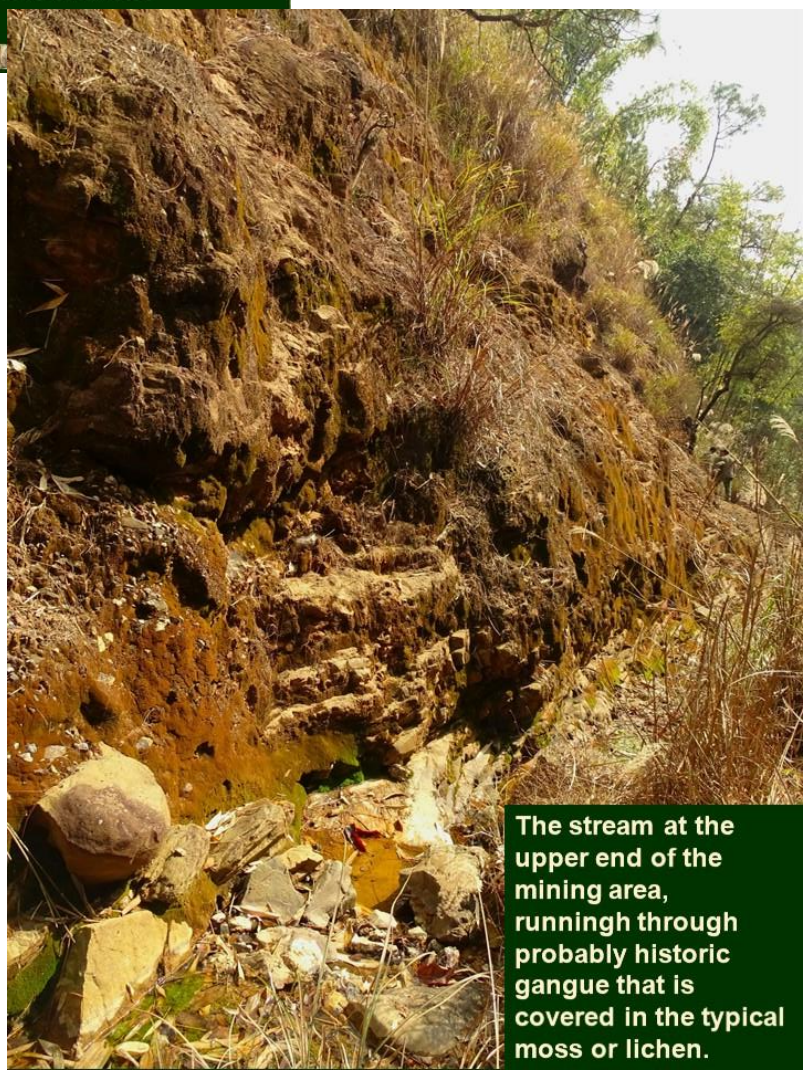
Remains of recent mining with minimal technology



Recent vegetation on the gangue-covered slope



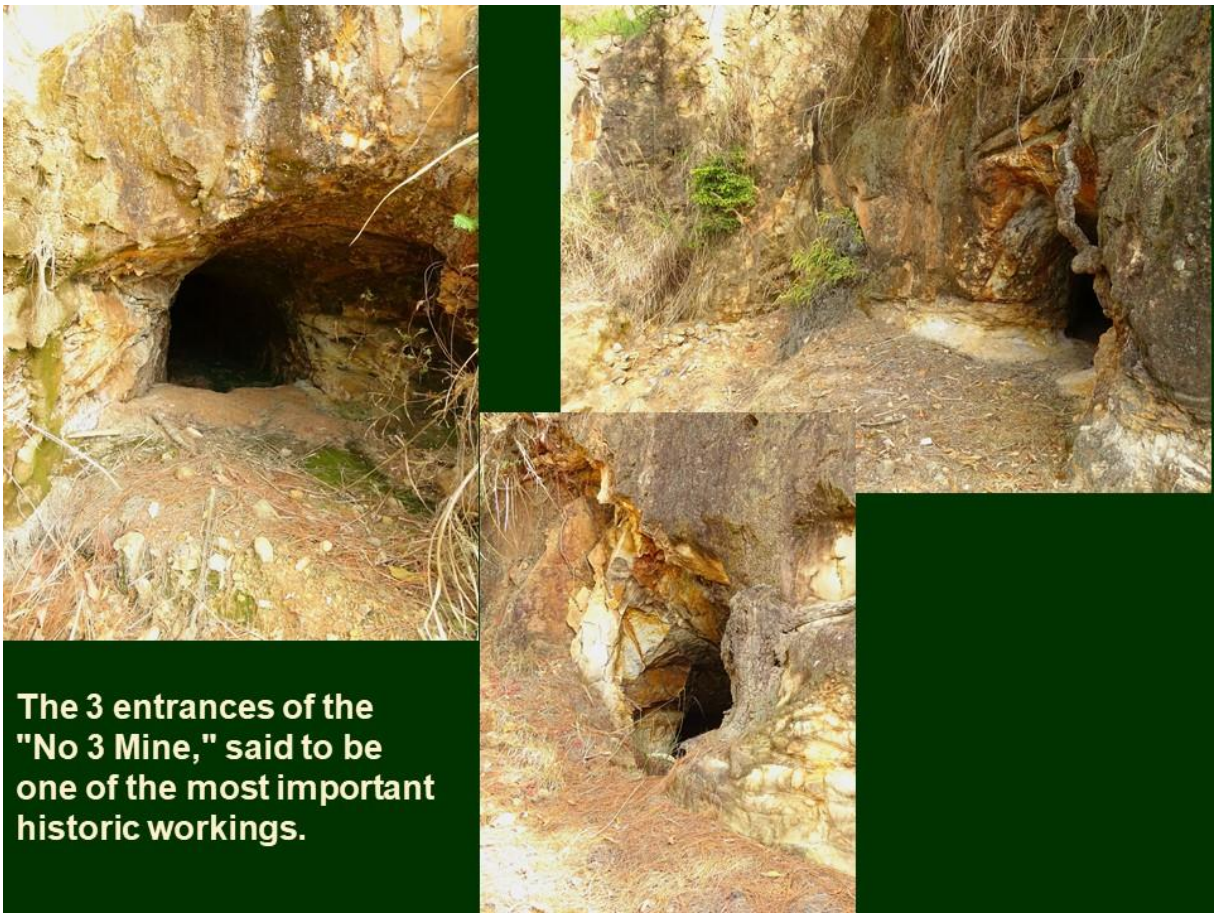
Our informants at a two-storied mine entrance



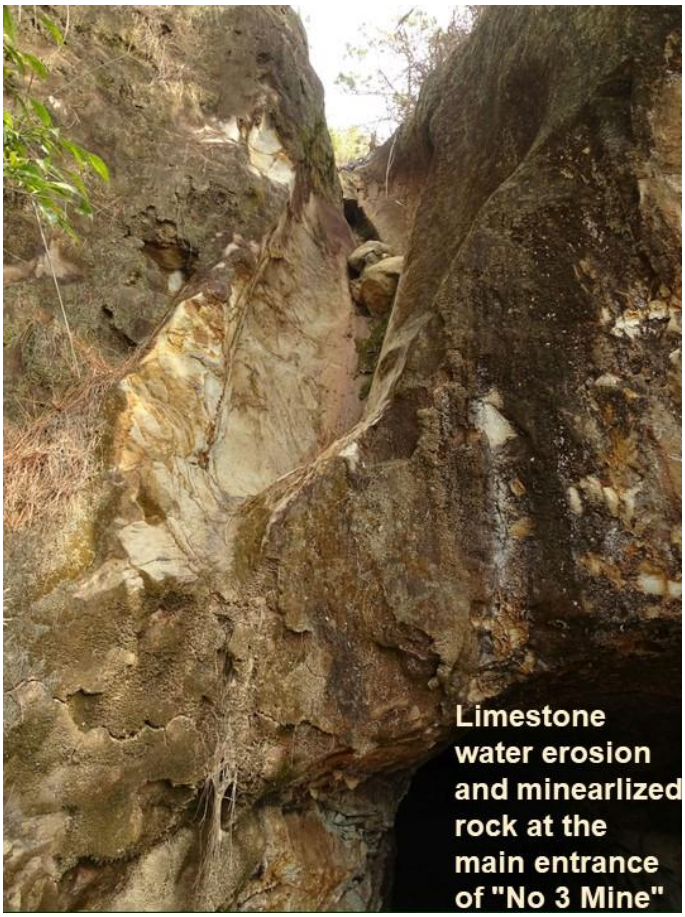
The stream at the upper end of the mining area, runningh through probably historic gangue that is covered in the typical moss or lichen.

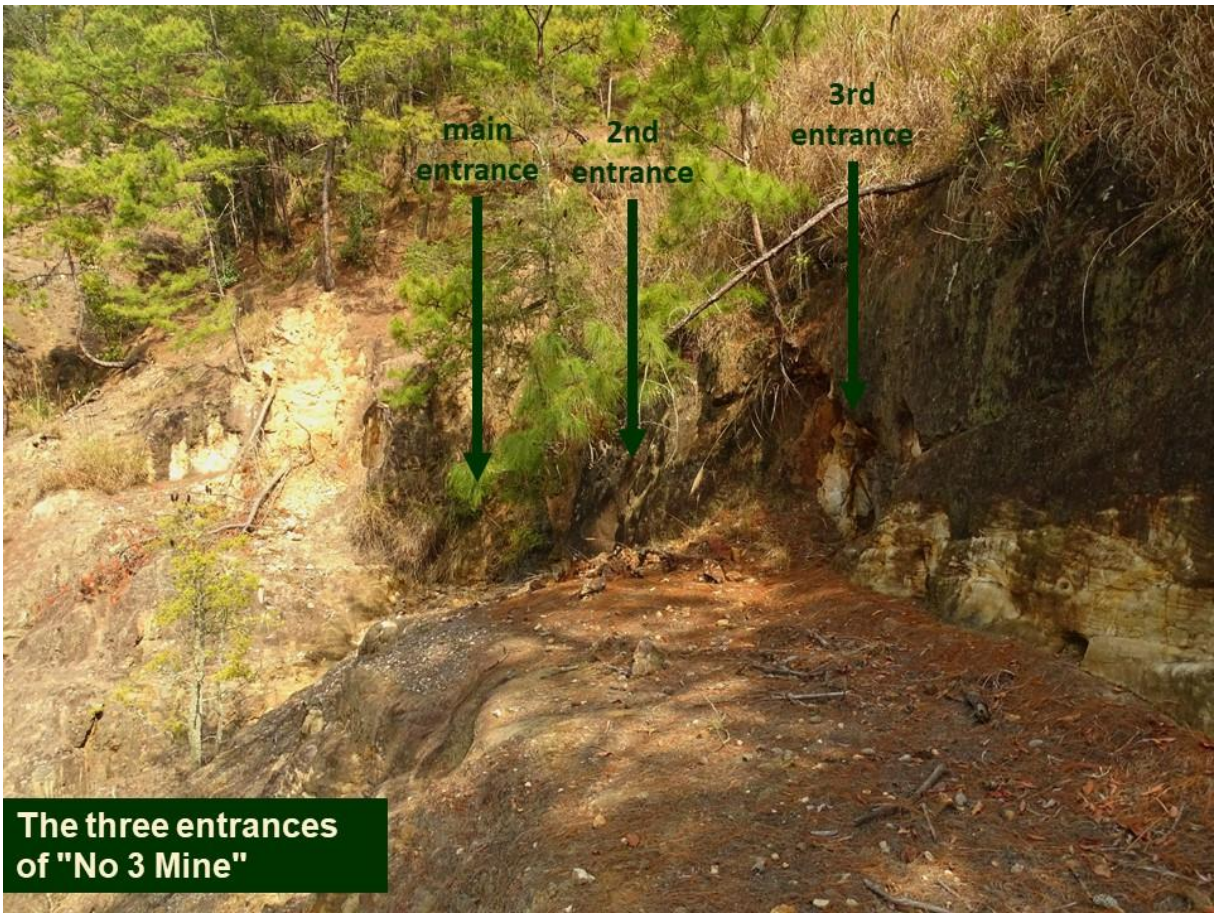


Recent gangue layer over old compacted gangue



The 3 entrances of the "No 3 Mine," said to be one of the most important historic workings.


Limestone
water erosion
and minearlized
rock at the
main entrance
of "No 3 Mine"


main
entrance
2nd
entrance
3rd
entrance
The three entrances
of "No 3 Mine"



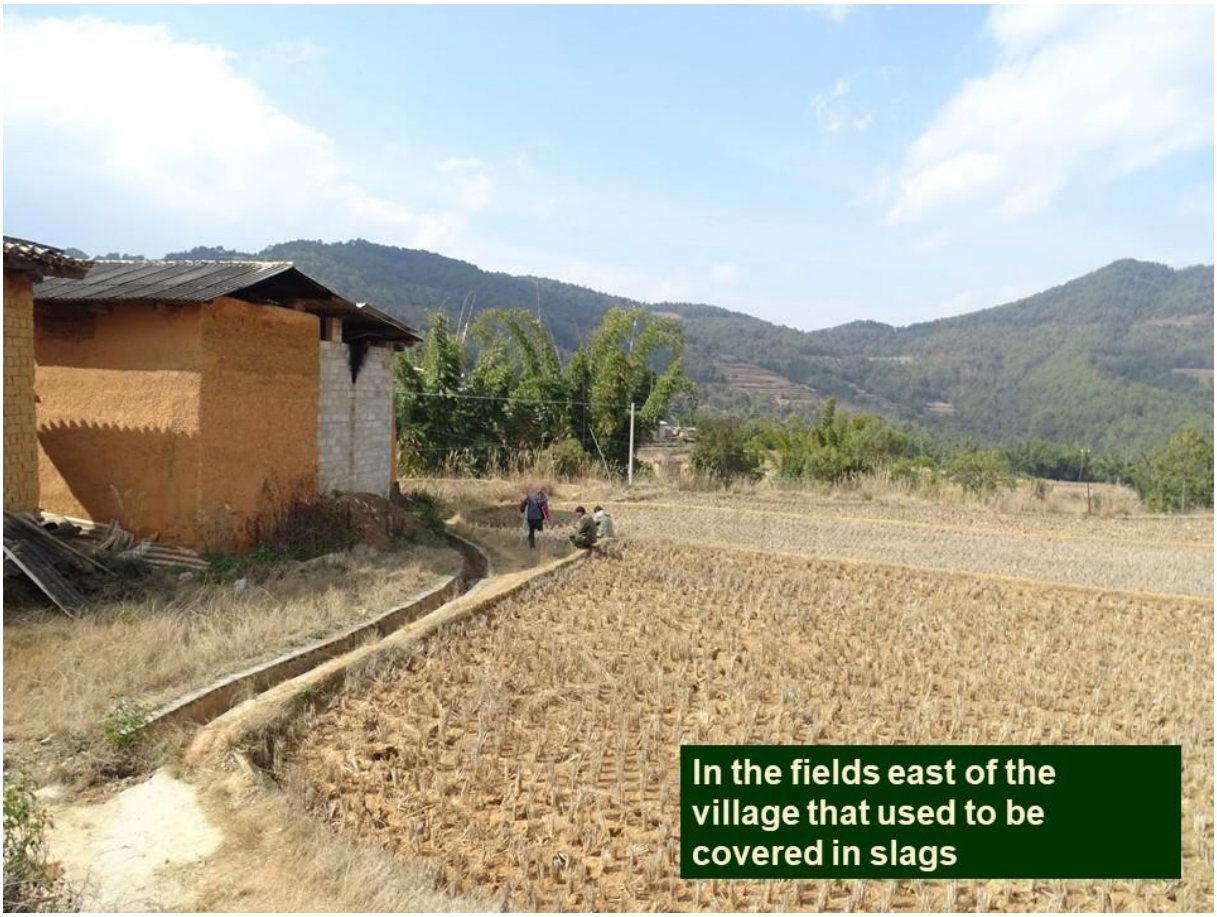
Baidamo village on its saddle, seen from the ridge to its northeast



Our informants in conversation with Mr. Yao



Mr. Yao and Mr. Li



In the fields east of the village that used to be covered in slags


Slag layers in the terraces between fields


Lower end of the former slag dump



Southeastern end of the former slag dump near the end of the saddle of Baidamo



View northeast towards Taiqiao and the higher ranges



Look north over the village



The temple site, now becoming a graveyard and a single pillar base



Ms Li at the temple site



Results

The Baidamo Mines were larger than a site exploited between about 1830 and 1850 would suggest. They are clearly not on the scale of the Taihe Mines but clearly more significant that we expected.

The relatively rich oral history related by Mr. Yao and Mr. Li might contain some overlap with stories that of the Taihe or the Laochang Mines. The story about the difficulties of the mine owner who started the Goat Mine 山羊洞 is a generic story, but the tradition of 60 years prosperity, 60 years relatively fruitful exploitation and 60 years hanging on is interesting. If it actually refers to Baidamo, the history of these mines was far longer than we expected on the basis of the historic records. However, we cannot exclude the possibility, that the story originally referred to another site.

The clear evidence of a concentrated and largely unmixed slag dump reflects continued intensive exploitation. While the period of the early 19th century is probable on the basis of the historic records as well as of Mr. Yao's family history, the scale and duration evidently exceeded that of a minor branch mine.

The names Laochang, Yingongdong 银汞洞 and Laogongshan in the vicinity that in the local oral tradition were not linked with the Baidamo Mines suggest that an older exploitation existed in the vicinity.

Further names that appear to indicate mines in existence in a relatively distant past but following the exploitation at Laochang are the name Xinchanghe (New Mine River) and Caiyuan (vegetable garden) on the stream that descends westwards down to the Yuanjiang between Baidamo and Taihe. For this reason, I expect that older mines predated the Taihe and the Baidamo Mines, with Laochang being the oldest site and Xinchang a mine dating later. It appears possible that Laochang was the site of the Mingzhi Mines and Fangzhang a relatively unsuccessful later venture also called Xinchang.

Materials

Field reports:

2011, March-April: Field trip by Yang Yuda 杨煜达 and Nanny Kim

- 6 silver mining sites in western Yunnan
- *coming soon*

2014, August: Field trip Nanny Kim, Yang Yuda 杨煜达 and Li Xiaocen 李晓岑

- 1 silver, lead and zinc mining and smelting sites in Northeastern Yunnan
- 会泽县者海矿山厂和倭铅厂
- Field report

2015, October-November: Field trip with Nie Xuanhua 聂选华

- Transport routes between Huize and Zhaotong

2015, November： Field trip by Yang Yuda 杨煜达 and Nanny Kim, with Ma Qi 马骑, Zhang Kefeng 张轲风, Nie Xun 聂迅, Xia Zijin 夏自金, Jiang Jianguo 姜建国

- 3 silver mining sites in southern Yunnan

2016, November: Field trip by Yang Yuda 杨煜达 and Nanny Kim, for one site by Nanny Kim and students of the Yunnan University History Department

- 8 silver mining sites in northeastern and western Yunnan
- *coming soon*

2017, October: Field trip by Nanny Kim, Liu Peifeng and Li Xiaocen

- 8 silver, zinc and copper mining sites in northeastern Yunnan and western Sichuan
- Field Report Part 1
- Field Report Part 2
- 滇东北和川西银锌铜矿遗址考察报告，上
- 滇东北和川西银锌铜矿遗址考察报告，下

2017, November: Field trip with Yang Yuda and Vu Duong Luan

- 3 silver and zinc mining sites in northern Vietnam
- Field Report Part 1
- 越南北部银锌矿遗址考察报告，摘要 *coming soon*

The Kuangshan Mines and Woqianchang in Zhehai, Huize District 会泽县矿山厂和倭铅厂, 22-23 August 2014

Field trip by Yang Yuda, Nanny Kim and Li Xiaocen 杨煜达、金兰中、李晓岑

Supported by Gui Shengfu 桂胜负, Manager at Yunnan Chihong Mining Corporation 云南驰宏锌铬股份有限公司

Draft report Nanny Kim, 2018. 08. (not for citation!)

2014.8.22. Kuangshan

We left Kunming by 8 am. Because the more direct road from Daibu to Zhehai is in a poor state, we took the highway to Huize and the overland road to Zhehai. We arrived ca. 12:30 and were rpomptly met by manager Gui Shengfu. Plans were settled over lunch, with half a day at Kuangshan, and the following morning at Woqianchang.

Manager Gui is in his 30s, Muslim Chinese and from Kuangshan zhen. His family had been involved in mining and caravan transport, and he proved highly supportive and knowledgeable throughout.

We left Zhehai for the Kuangshan mines at about 2 pm. Mr. Gui picked up Mr. Hou 侯, an older manager in the company at the main ore sorting plant, at about 2300 m, and took us straight on to the operating mines in the Niulanjiang valley.

These are the Qilin Zinc Mines. They have been in operation since 1980s (?), and both informants confirmed that they know of no premodern mining traces here. The slopes of the Niulanjiang valley are extreme, around 80°, and the mine enters the mountain on several layers in a tiny side gully. The highest mine, at which we were standing, was a roughly 2000 m. Descent to the lower levels was by cablecar down the gully. You could see right down to the Niulanjiang at about 1000 m. Mr. Gui pointed out a site on the Guizhou side that is called Yinchang 银厂 and was exploited. The village sits on a small ridge above the river at roughly the same height.

We crossed back over the ridge and visited the open pit a short distance west of the main plant. The pit exploited the layers of historic mining, enters a ridge on an area of 5000 m^2, reaching a depth of about 200 m from the top of the ridge to the bottom. The pit is mainly the result of modern open pit mining by the state company, followed by exploitation by locals by traditional means during the 1990s, when work by the company was interrupted (I think due to low returns). Mr. Gui and Mr. Hou remember that the topmost layer, some 40-50 m into the second layer where full of old workings, with the timbering made from pine trunks not over 10 cm in diameter still in place and hardly decayed. The old adits either gradually sloped down or descended in steps.

Gui pointed out the location of the former Longwangmiao (Dragon Temple) just to the east of the mining area, now a newly washed out gully next to a still working private plant that uses small furnaces and (used to use?) pipes for zinc smelting.

Beyond the plant on a slope below the old mining area that descends into a small valley of red earth is a large burial ground, mostly destroyed by grave robbers in the 1990s. Recorded a handful of still standing stelea (see Yuda's notes). One grave of descendants of Yi lords, all other graves are Huizu. Oldest stele is the grave of a couple, 张 ?? QL15/7/9-JQ23/6/12 (1750-1818), wife QL 32/3/26-DG6/3/19 (1767-1826). Three stele a bit off the modern graves: Ma (Muslim), probably DG 24 (1834).

Toppled stele on shoulder: JQ 6/9/15 – XF 10/4/19 皇清待贈鄉典謹厚余公偉？大人之墓 (1801-1860)
孝男余熙榮、女桂余氏、李余氏，孫學 …
光緒二十二年臘月初十日共立

Toppled stele on top of ridge: DG 12/9/7 – GX3/7/5 (1832-1877)
皇清待贈顯考 馬公成龍之墓
GX？/12/？

Mr. Gui had heard of the Longwangmiao and knew the site of a mosque, but not of guild or other temples.

The mosque used to be located on the same slope as the Longwangmiao, close to the grave area but higher up, probably used to be a small promontory overlooking the side valley. Some 40-60 m of the original surface have been removed in connection with the open pit mining, therefore hard to tell.

In the stream just below the mining area layers of old slags are still easily found. According to Mr. Gui, the slag layers that still form the bottom of the stream are the oldest. Xiaocen took samples from the slag layer that is now about 80cm thick (but unevenly washed away) above a compounded harder layer of black slags, and under a mixture of bricks, slags and other material.

Mr. Gui warmed up to the topic and related the slags used to extend all the way down the stream almost to Zhehai town. At Laohuzui 老虎嘴 three dams (with about 1 km between each of them) were built in the late 1970s to prevent the slags from being washed down and to preserve the slags for re-smelting. Below the dams locals were permitted to collected slags, with the sections being reopened gradually when industrial re-exploitation ended. Most slags were caught behind the dams, some 10 m deep layers. The re-exploitation lasted from the Republican Period to 1994, with the re-smelting by the state company between the 1970s and 1994 the most intensive period. The smelting plant mainly produced lead, secondarily zinc.

On the way back to Zhehai, we stopped in Kuanshan town. Mr. Gui and Mr. Hou both remembered that some 30 years ago there used to be a comparatively large grave (already robbed by then) with a stele that mentioned taijian (eunuchs). In the falling dusk around 6:30 pm we had to abandon any idea of finding the stele on this visit.

2014.8.23. Woqianchang

We set out from Zhehai shortly after 8 am and reached Woqiancun, the first village on road to Daibu on the ascent from the Zhehai Plateau on a decent road. The distance from Zhehai is less than 20 km. The pre-motor-age road probably followed a more direct route up the next valley to the east. Before reaching the village, the road follows the edge of an eroded gully below the bottom of the village. The gully has been left by removing slags, still showing shows slag layers of at least 7 m depth. According to Mr. Gui, the slag layers in the valley used to be some 10 m thick, and slags were re-smelted by traditional retort distillation, especially during the 1990s. Evidence of the activity are retorts stacked up as walls in many places, though not as omnipresent as in northwestern Guizhou. The top end of the evident slag layers is near the upper end of the present village and extends some way up the slopes to both sides of the valley, about 50 m from relatively wide valley bottom. The slag layer next to a house near the upper end on the western slope was about 80 cm thick, reaching at most 40 cm on the steeper slope just below. On the opposite eastern slopes the slags appear to reach higher on a red soil slope, height difference perhaps 10 m. Vegetation on compact slag layers is poor to non-existant, but slags under earth layers appear to have little impact on the vegetation. In fact, the carrots of Woqian are locally famous for their taste (which might not correspond to their healthiness for human consumption).

The slags extend about 1 km along the valley, and roughly 0.5 km across at the wider upper end, narrowing down between a limestone shoulder on the eastern slope and into the gully. The surrounding red soil is planted in maize.

Slags have not been industrially recycled, and we saw no trace of lead slags. The typical slags of Woqian were granular and reddish, presumably zinc slags. We saw no remains of retorts in undisturbed layers.

According to Mr. Gui there had never been mines near Woqian, but it used to be the site of zinc smelting, with all ore carried from the Kuangshan Mines.

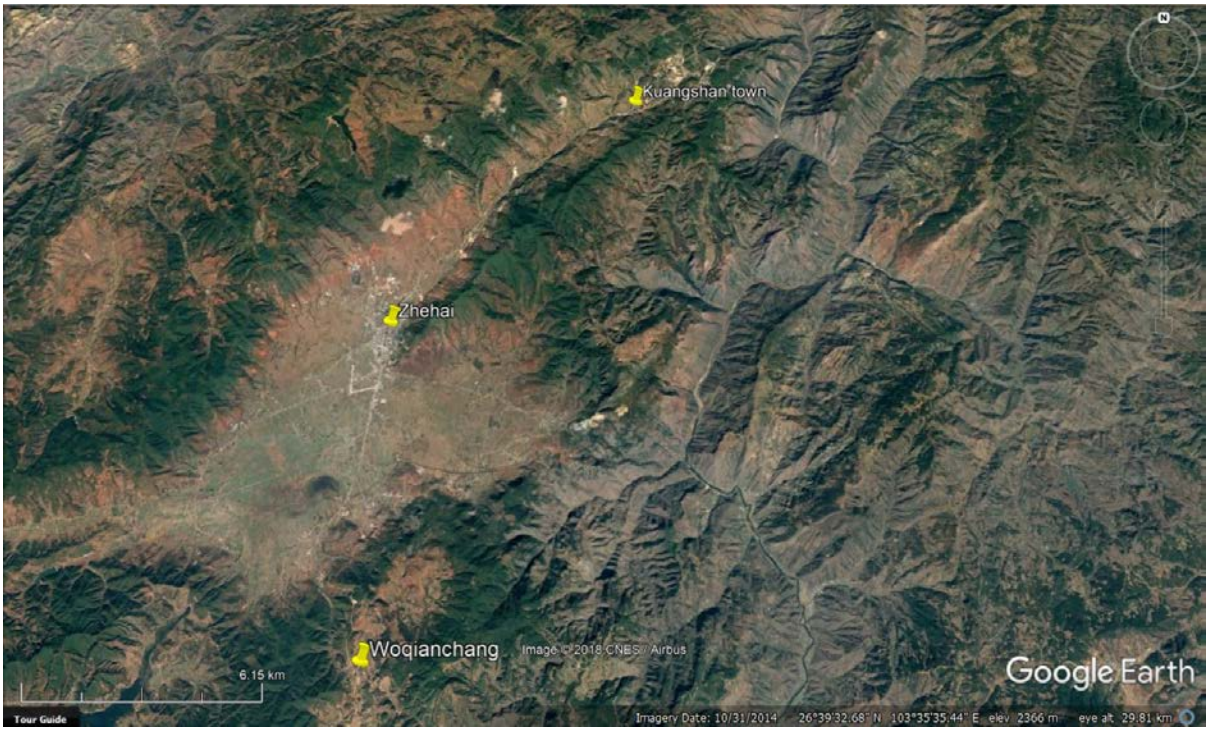
He also had some vague hearsay that coal was available in Yulu 雨碌 some 15 km south along the road to Daibu.

The information provided by Mr. Gui is corroborated by Huang Mengju 1849, who records the distance of the “zinc mines” from the Kuangshan mines, and by late 19th century to early Republican records on coal in Huize District. It is reasonably certain that the zinc smelters were moved from their initial location on the Zhehai Plateau (hence the name Zhehai Mines in the Qing records) to Woqian (Yunnanese pronuciation

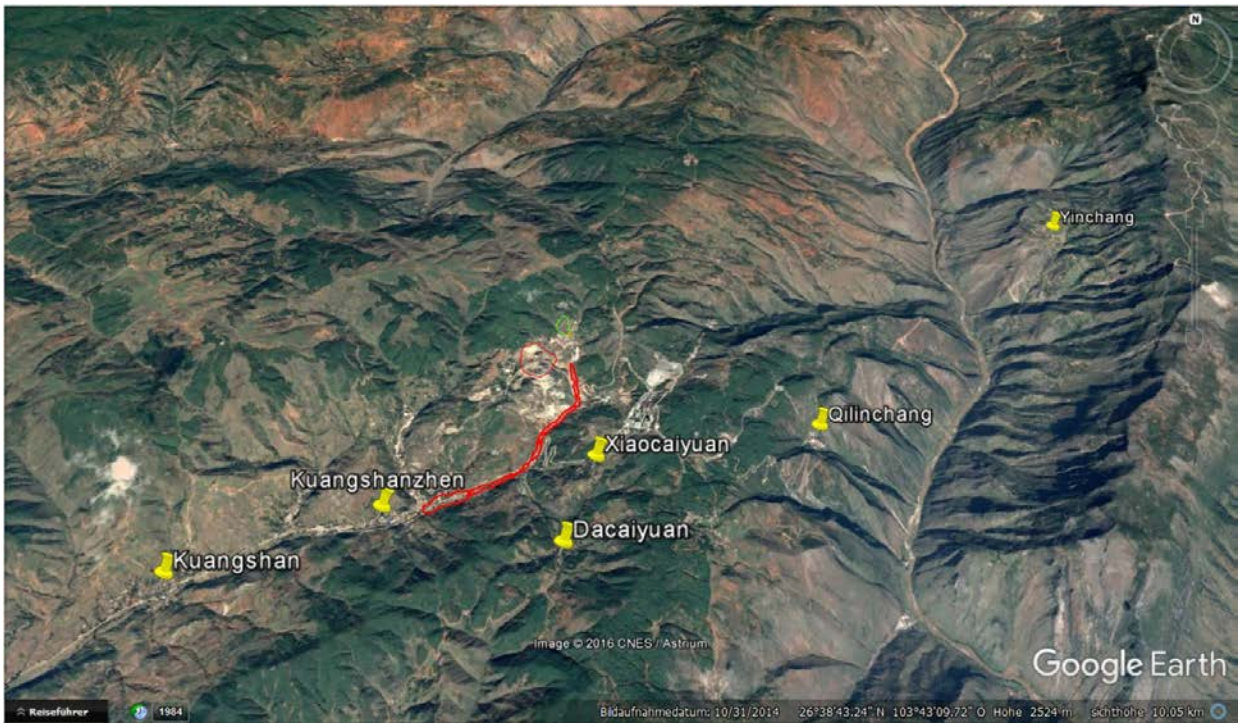
"Yuanyan"=zinc) to be nearer to the source of fuel.

We finally visited the smelting plant that was closed in 2011. Its core parts are Soviet technology, and it has been in operation since 1965. (We were told that the new plant is only 7 km from Huize city, and equipped with German filtering technology, and that it has been in trial production for about 1 year.) The industrial ruin looks as if people had just left. Of formerly almost 3000 workers, 800 remained at Zhehai, with a few employed to watch the abandoned plant, while some about 600 (?) moved to the new plant in Huize, and about 800 found other work. Mr. Gui would like to transform the plant into a museum, which appears an idea with considerable foresight and quite adequate in the quickly changing tourism boom in China.

We returned to Kunming, and arrived 9:30 pm.



The Zhehai Plateau with Kuangshan Town, Zhehai town and Woqianchang village.



Sites in the Kuangshan Mines. Red area: minimum extension of the slag dump along the stream.



The open pit area at the Kuangshan mines.



Woqianchang village and the slag dump.



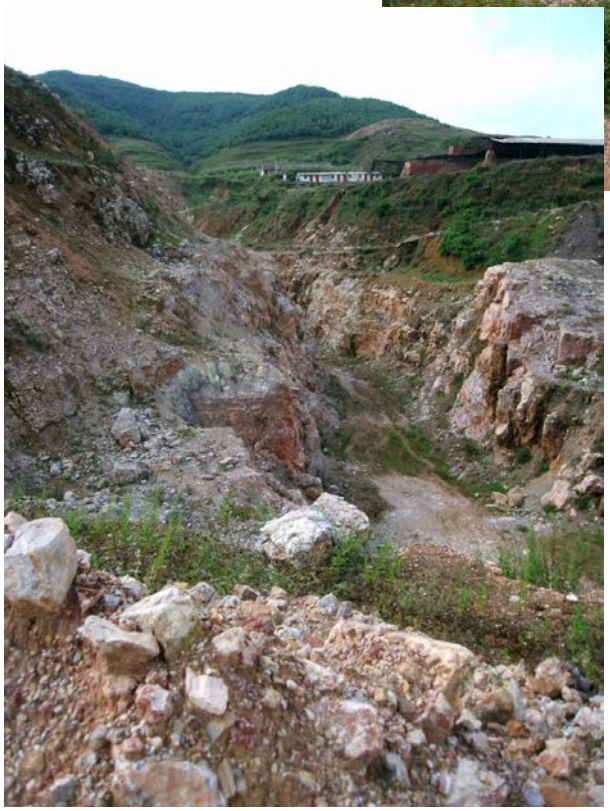
The valley of the Niulanjiang.



Yang Yuda, Mr. Hou, Mr. Gui, Li Xiaocen and an employee at the Qilin Mines







The upper and the lower open pit, which exploited the ore around and below the old workings, and the ruptured and mined out ditch to the east of the pits, which also contained old workings in the upper layers.





The graveyard slope. (Located above and behind the factory buildings in the preceding photo.) And a toppled gravestons of a robbed grave



The stream running through a slag layer





Li Xiaocen at work and the layers in the stream bed.



The Kuangshan school and the ridge where the old grave used to be behind it.

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The dup up gully at the bottom end of Woqianchang.







Left: Typical recent zinc smelting waste. Right: Massive old zinc smelting layer near the top end of the village, and eroding layer of historic slags on red soil just below the compact, undisturbed layer.



View across Woqianchang.







The abandoned smelting plant of Zhehai.

Fieldwork on mines in northeastern Yunnan, 5. – 16. October 2017

滇东北古代矿业遗址考查，2017年10月5日到16日

金兰中、李晓岑、刘培峰 Nanny Kim, Li Xiaocen, Liu Peifeng

金兰中，2017年12月18日稿本

Objectives: There are indications of important silver mines in northeastern Yunnan in addition to the known sites of Lema and Kuangshan.

Of these, the importance of the Jinsha Mines 金沙廠, which also produced some copper, is relatively well established. Records on taxation that suggest relatively high productivity. The most specific information appears in the 1804 gazetteer of Yongshan District that mentions some 30 workings. The site with high certainty is the present-day village Jinshachang, some 35 km from Lianfeng.

The locations and importance of the other sites are uncertain. Tongchangpo 銅廠坡 nor far from either Yiliang or Kuixiang is recorded as a place name in the 1720s and as a silver mine by 1830. Garnier recorded information on important silver mines on the Co-kouy River (Luozehe?) not far from Zhaotong, which reportedly used to employ 1200 men just to work the drainage pumps. Research on the basis of available maps suggest several possible locations in Yiliang District, but could not locate any location still called Tongchangpo.

Dayingchang 大银厂 and Xiaotongchang 小铜厂 are place names recorded in the 1761 gazetteer of Dongchuan Prefecture as located west of the Jinshajiang. Sources suggest no connection to mining. The names still occur on maps of the early Twentieth century, and Dayinchang is an existing place name at an open pit mine that is visible on the satellite image of 2015. When Yang Yuda and Nanny Kim visited Qianxinzhen (formerly Daqiao) in 2016, we found a few remains of extremely lavish guild temples, documenting an outstanding importance of this town on the road that links Huili and Dongchuan. The nearby Mianhuadi 棉花地 silver mines would not fully explain this importance, as transport out of the mines bypasses the town. The Huili trade could be an explanation, but also appeared not fully satisfactory. It therefore appeared important to pursue the possibility of further important mines in the vicinity for which the Dayinchang and Xiaotongchang are the most probable candidates.

The aim of the trip was the locating and the collection of information and findings on silver and copper mines in Yiliang, at the Jinsha Mines, and at Dayinchang. As Mr. Zhaong Xiaoming of the Qiaojia Cultural relics office had mentioned quite large copper mines at to sites in Qiaojia just south of the Lema Silver Mines and this location was on the way from Zhaotong to Dayinchang, a stop was added here.

Part 1: Sites in Yiliang

2017.10.05 (Thu): Kunming-Zhaotong-Yiliang 昆明-昭通-彝良 2

2017.10.06 (Fri): Tongchanggou copper smelting and Huangmukuai zinc and silver smelting sites, Yiliang 彝良县铜厂沟、黄木块 2

2017.10.07 (Sat): Zinc and silver mining and smelting sites at Huangmukuai, Zhujiaying and Guanyinshan in Yiliang 彝良黄木块 8

2017.10.08 (Sun): Longjie in Yiliang 彝良 龙街 13

2017.10.05 (Thu): Kunming-Zhaotong-Yiliang 昆明-昭通-彝良

We reached Zhatong about 1:30 and met Ding Changfen 丁长芬, an archaeologist and the director of the Zhaotong Museum, and Mr. Li, a retired member of the Relics Office of Chaoyang District.

Mr. Li told us what he knew about copper mines in his district: That there were some, none of which was important and most of which were not reallz dated. He mentioned Dazhai and Sayu County. He confirmed that the exploitations in Sayu were not far from Maolinjie, according to him dating to the 1990s. His information confirmed the sites that we had visited in 2007.

Director Ding contacted Mr. Lu Hanyun 禄汉云, a retired member of the Relics Office of Yiliang.

We saw the ancient history exhibition at the new museum, which shows an impressive number and quality of objects, and is also well-presented.

Reached Yiliang in the early evening.

2017.10.06 (Fri): Tongchanggou copper smelting and Huangmukuai zinc and silver smelting sites, Yiliang 彝良县铜厂沟、黄木块

We met Mr. Lu at 8 am. He was in poor health but pleased to share his knowledge. He started off with copper mines, stating that there were numerous sites, none of which were important, and in many cases identified only by the place name with no known remains. He also mentioned some graves (location unclear), and a silver smelting site near the Mining Plant. He contacted Mr. Zhu Renwen to take us around and guided us to the latter's place.

Zhu Renwen 朱仁文, 71 sui, born in the year of the dog, Miaozu, from Tongchanggou mainly knows about Tongchanggou. He confirmed copper smelting sites and workings, several of 1958 and the Republican period, one of the Qing, but no known temples. His wife arranged for what turned out their son-in-law and daughter to drive us. After a while and after having breakfast they turned up with a very new and large car.

About 10 am headed off for Tongchanggou. Drove south on the east bank of the Luozuehe. Stopped once shortly after Xinchang 新场 to point out remains on the slope west of the river (Nanny forgot what remains).



The Tongchanggou valley. With the Luozehe on the left and Zhongzhai village well visible east of Tongchanggou, with the abandoned village on two ridges above.

Continued past Maoping 毛坪 (Luozehe 洛泽和镇) and turned into a track into a small eastern side-valley. Mr. Zhu could give no name to the stream in this valley. Driving about 5 km up, he stopped several times to point out sites of mining and smelting of 1958 and a gallery worked during the Republican period.

At a barrier, we had to leave the car within sight of Zhongzhai 中寨 village. The valley continues to ascend fairly steeply. Zhongzhai 中寨 is a Miao village, with only 1 Han family by the name of Yang. The old lady was in, but her husband had gone to Kunming. The village had been moved from a nose further up that had become unstable only a few years ago. About 1 km above the village and just past the abandoned village, the valley forks into a nrothern and a southern arm. Just into the northern arm and where a small side-stream descends from the north, we came upon the spot of old slags. Partly reddish and very glassified. Thickness of layer unclear, but probably within 30 cm, extending about 8 m along the trail. The slags are visible on the walking trail only. Nothing to be seen in the terrassed maize fields, ca. 1-1.7 m above the path, or in the small stream about 4 m below. The steep overgrown slope between the path and the stream could not be checked.

GPS measurements by Peifeng: N 27° 32.1305, E 104° 01.9326, 1258 m





Li Xiaocen and Zhu Renwen at the copper smelting site and exposed slags in the path.

Some or most of the site might have been covered by soil under the terrassed fields or eroded down the valley. Nevertheless the site appears small. The gallery may or may not be connected. Locals have no knowledge about this mine, therefore date it to the Qing. In fact, any date before local memory is possible.

Found a gallery going some 15 m into the rock at the east of the stream, only some 50 m from the smelting site. It was unknown to Mr. Zhu, but appeared recent to Nanny.





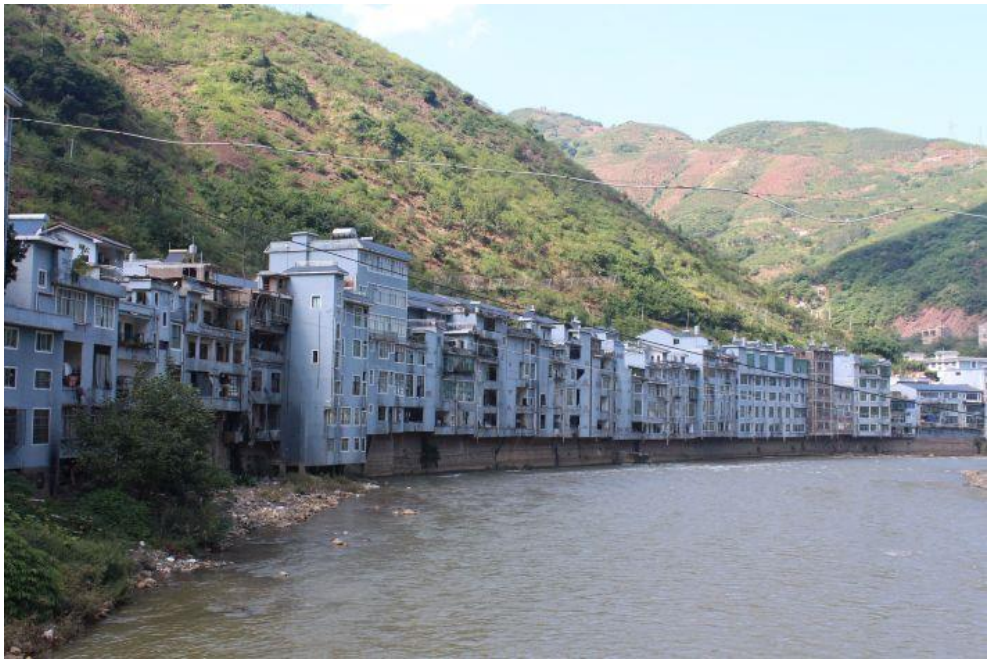
Mining gallery, entrance and interior. Photos by Liu Peifseng.

On the way down went by Tongchanggou village. No new information.

Drove down to Maoping, and we decided to go on to the mining plant, rented a car from Maoping, departing about 3 pm



View down Tongchanggou village from Zhongzhai.



Maoping town on the Luozehe.

Liu Peifeng eventually managed to hire a car and we headed out about 3 pm. The plant turned out to be a good 5 km further up the Luozehe valley, on the eastern slope. Asked a fellow around 60 sitting at the single house at the roadside right opposite the plant. He said that the old mines were Laomingcao 老明槽 on the eastern slope, high up on the very steep slope, and there were also mines up on the western slope above us, at Huangmukuai 黄木块 some 8 km along a driving track.





Above: Li Xiaocen on the slope above Zhujiaying facing the slope above the mining plant (Photo by Liu Peifeng).

Left: The northern end of this slope identified as Laomingcao ("old open workings") by informants.

We decided to try the Western slope. Drove up to Erpingzi 二坪子, where the concrete track ends and the track got too bad and narrow for the car. Upon asking for the way to Huangmukuai, some people mentioned slags that one of them had at their yard. The small heap definitely consisted of lead smelting slags. It turned out that they had bought them from Huangmukuai. Mr. Liu (ca. 48, a villager of Erpingzi who works part time at the mines) agreed to drive us up in his mianbaoche. Huangmukuai sits on the southern rim of an amphitheatre-shaped milder section of the mountain flank. Mr. Liu drove through the small village to a huge reddish zinc-smelting dump. He dates it to some 60 years old, because he is almost 50 and has not seen smelting. He had not heard about silver smelting. After ringing somebody, however, he pointed out some maize fields not far below. Also explained that the village on the slope north of this bay-like slope is Zhujiaying 朱家营. The zinc-smelting cones lying around were relatively large and therefore probably recent, but the size of the dump did not suggest recent exploitation. Liu Peifeng went back to the village to find more information, I followed but missed him, ended up asking an elderly man sitting in his courtyard right above the track with his little dog. Mr. Yi Fuzhang 易富章 (68 years old, the family came from Jiangxi 6 generations ago and has been involved in zinc smelting since 5 generations ago) told me that the zinc mines would be at least 200 years old.



View across the zinc smelting dump onto Huangmukuai.





Remains on the zinc smelting dump: Debris in close-up; layer of debris with retorts in the upper layer; retorts.

Heading back to meet the others, I caught up with Peifeng, and we figured that we would make best use of the remaining daylight with one of us should continue talking to Yi Fuzhang, while the others looked for the silver smelting site. Peifeng met Xiaocen, while I stumbled past and right down to what turned out to be the silver smelting site. Asked an elderly couple harvesting maize, understood little of their answer but learnt that the mines and more smelting sites were at Guanyinshan beyond their village.

In the meantime, Peifeng had also met Mr. Zhu Kuaiyou 朱快友, 64 sui, of Zhujiaying, who knew about the silver smelting site etc. Caught up with them on the track.

Xiaocen came heading down to the smelting site with Mr. Yi Fuzhang, who was going to show us the silver smelting site. We all met and headed there, actually in the maize fields, with the elderly couple also joining. Decided to come back the next day.



Mr. Liu, a villager of Zhujiaying, Mr. Yin Fuzhang, Li Xiaocen and Liu Peifeng on the site of silver smelting slags below Zhujiaying.



View towards Zhujiaying from the zinc smelting dump. The track on the slope leads to Guanyinshan.





Lead/silver-smelting slags in the corn field below Zhujiaying.

Xiaocen's conversation with Mr. Yi Fuzhang (68 years old): Family from Taihe xian 6 generations ago, used to smelt silver, his father still smelted zinc and also some silver, he himself was not involved. The village is entirely Han, and mainly consists of 4 family names. They used to work the zinc (and silver) because salt was very dear, they would sell their zinc to Yibin and return with salt and other goods. When they needed

to go to Yiliang, they used to set out before daylight and would be back home in after dark.

Mr. Liu drove us all the way back to Yiliang, which we reached at 5:30 pm.

2017.10.07 (Sat): Zinc and silver mining and smelting sites at Huangmukuai, Zhujiaying and Guanyinshan in Yiliang 彝良黄木块

Arranged with Mr. Liu of Erpingzi to meet again at 9 am. Got to the turnoff up to Erpingzi by public transport and walked up to Liu's house. Drove right up to Zhujiaying. Zhu Kuaiyou turned up from his fields, his wife, called an older relative (71 years old), who lives in the next house, more neighbours turned up Zhu's granddaughter, a couple of young guys, and 2 young children.





Conversation in the Zhus' courtyard, and a piece of oxidized zinc ore of Guanyinshan.

Zhu Youkuai and old Mr. Zhu provided the following information: Zhujiaying has about 300 inhabitants, with Zhu the almost exclusive family name. The Zhu family came from Beichong in Zhenxiong 5 generations ago. They are still in contact with the Beichong Zhus; the latter have a genealogy.

Both Zhu's had been professional zinc smelters, old Zhu for 40 years. They were vague about the silver smelting site, had never seen silver smelting, no furnaces, no shatiao. All they had heard that silver was extracted from lead. They were very specific about zinc smelting. "Horse trough furnaces" were used that were loaded with 2 rows of retorts, 20 to 50 retorts in a row, filled with 20 kg of ore, ground to the size of a pea, and some additives. 1 retort would produce between 1.2 and 4 kg of zinc. The coal came from coal mines right above the smelting site, the ore from Guanyinshan. They explained the ventilation system at the bottom of the smelters. In earlier times, retorts used to be smaller, they showed diameters of almost 40 cm for the late retorts, 20 cm for older ones, the latter were flat-bottomed and had a charge of about 10 kg.

Zhu Kuaiyou got out a piece of ore, not from here, while the young relative brought two pieces from Guanyinshan, crystalline and full of holes.

Old Zhu asserted that there were silver-smelting slags at Guanyinshan, so we set off, guided by Zhu Kuaiyou who was very doubtful, probably mainly concerned that it would be too far for us to walk.





Heading up to Guanyinshan, Liu Peifeng, Li Xiaocen and Zhu Youkuai. Guanyinshan village.

Guanyinshan is some 350 height metres above Zhujiayiang on the ridge, facing northeast across the Luozehe valley. A driving track leads up but is not passable by cars. Slags evident in soil before the first house of the village. Distributed relatively evenly through a layer that is up to 2 m in the visible recent cut by the driving track. Also on the walking track below for about 100 m to 150 into the first fields on the nose below the village.

Visited 梅春银 in the first house, 51 years old, his wife, daughter, son-in-law and 3 kids. Ancestors had come from Yiliang, story unclear, 6 generations ago. Connection to mining, but zinc rather than silver and some generations back. Heard a story that Guanyinshan used to have 38 streets and 72 alleys 三十八条街、七十二条巷. Now 35 families, about 160 persons. Seems that only the Meis and another family named Chen are left over from the mining period Used to be quite large. No knowledge of temples or when the mines flourished. Workings were near the village, some smaller surface workings all around, and several galleries, now all blocked up. Apparently under or in the limestone layer. Not very clear.



They brought up a story that the people who ran the mines reported to the emperor that the silver mines were exhausted, so that they would not have to pay taxes. When they came back, it turned out that the silver ores were in fact exhausted.

Guanyinshan also used to be called Yinlushan ("Silver smelters").

Zhu Kuaiyou mentioned on the way that the ore at the surface was poor, but got better as you got into the mountain, with both oxidized and suphurized ores.

Had lunch at Mei's house and walked back.

Site of old slags: Slags distributed evenly in layer of soil, no clear layer, distribution quite thin. N 27 30.7735 E 103 58.7145, 1774 m

Lead/silver-smelting slags in the soil at Guanyinshan.

Back down, Xiaocen went to Huangmukuai for further interviews, while Peifeng and me attempted a quick assessment of the dimensions of the zinc smelting site. Above the top end and to the south are coal mines. The site extends for over 200 m in length, forming a hill in the bay-like slope between two mountain spurs. Thickness reaches over 10 m at the lower centre where the driving track cuts through the area. A layer between 30 cm and 1 m extend considerably further down, with the entire slope looking disturbed. Two erosion gullys in the main dump do not expose the bottom below.

Upper end of the dump: N°27 30.2210, E°103 59.0320, height 1388 m



View NE from the ridge just below Guanyinshan, onto Guanfang and the mining slope behind the plant, with Maoping and Tongchanggou valley just visible in the next river bend.

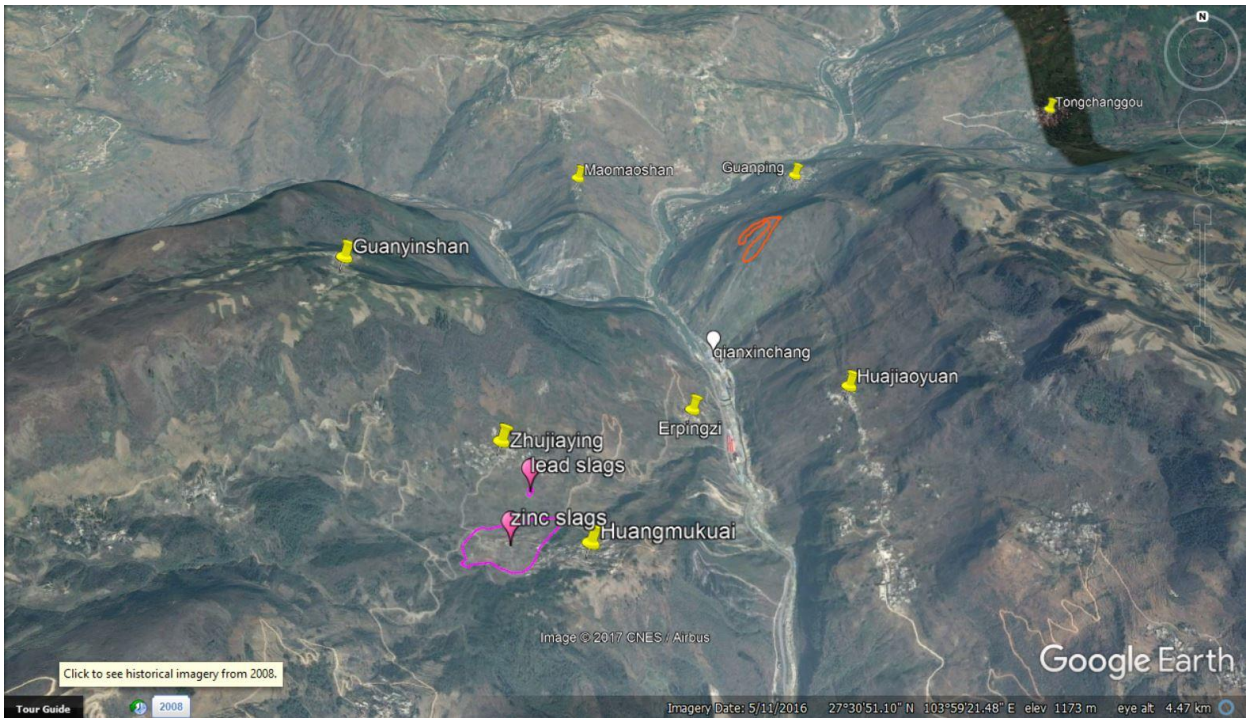


View south along the Luozehe valley from the same ridge.



View down the dump from the top end.

Li Xiaocen interviewed a villager of about 60 years in Huangmukuai: His family had also come 6 generations ago, were zinc smelting or mining workers, he himself was not. Moved down from Guanyinshan 4 years ago. Adamant that zinc smelting ended 40 years ago. [which is in contradiction with the statements of the Zhu's who should know because they were involved. Appears however that the scale of recent smelting was relatively modest]. Mentioned that they used to use horses to carry things, but could no longer after liberation, only learnt to use horses again some 20 years ago.



The sites around Huangmukuai. Purple areas: slag dumps. Red area: Laomingcao (historic open or collapsed mines).



The slope opposite Huangmukuai on the eastern bank of the Luozehe, which is presently exploited for zinc and lead and the most probable site of the historic silver mines of Yiliang. Red area: Laomingcao (historic open or collapsed mines).

2017.10.08 (Sun): Longjie in Yiliang 彝良 龙街

Hired a car for the day to go to Longjie. Left Yiliang about 8 am. The Luozehe valley is narrow throughout, forms a gorge between sheer cliffs between a small tributary not far south of the mining plant and Pengjiapo 彭家坡, with a bend where a tributary joins from the east in a tectonic valley at

the town of Shuinichang 水泥厂.

Yuanbaocun 元宝村 is near the top of the ascent up the eastern slope of the river. Got there about 9:30. The village used to be called Luozehe and has been renamed recently.

Peifeng's GPS: N° 27 30.2659, E° 103 59.1021, 1350 m



View from the slope just above Yuanbaocun over the top end of the village south, with the Luozehe valley to the right.

Asked at the village government, where the young and muscular official recommended looking for Li Daigao 李代高 56 sui. Found him in a small workshop tending to a harrow. He knew about the sulphur mine and took up op the slope where iron smelting had been carried on until fairly recently (about 1990?). Two rows of sulphur smelters used to be in operation, using the same technology as in the old times. Remains of a square structure formed two walls in the corner of a maize field, walls ca 2.5 m, with a rectangular groove about 60 cm from the present field level and 50 cm wide. The receiving end of this channel according to xxx was a little house with water about 4-5 m further up the hill. The furnace would be filled with 3-4 tons of ore and coal (the coal came from Guizhou), distillation took a week, no ventilation required. The sulphur mines were about 1 km away towards the steep end of the slope (location specific). Iron ore was (and probably is still being worked) a little way further up the slope; numerous abandoned structures of the iron mines, ore storage, and sorting possibly wet treatment facilities.



Mr. Li Daigao.





The wall remains of the sulphur smelter seen from the corn field; and sulphur crystals that had formed on an old dump.

On the way down right behind some of these buildings Li Daigao pointed out a dump of silver smelting slags. The heap was compact, with crystal growth in the overhanging section (similar to the dump at Xiaogongmiao in Mingguang, Tengchong), established depth about 80 cm but probably more. The heap was cut into in the course of digging the path, its existing extent is at least ca. 8 m long along the slope, lower and upper ends disturbed due to buildings.





The heap of silver smelting slags, and whitish cristalline formations in the protected cavities of the slag heap.



Yuanbaoshan village above the Luozehe.

We continued to Longjie to visit the several villages with Yinchang in their names and that Mr. Lu had mentioned as possible silver-mining sites. Reached Longjie about 12:00, where it happened to be market day.

Yinchangpo being the village nearest to the town, we went there first. Younger people told us to look for the grandfather in the white house. Met Mr. Zhang (in his 60s) at lunch with his son (in his 40s). Their family had come 10 generations ago, unclear from where, first mentioned Huguang, then Fujian, then said probably Wenzhou. There had been silver mines but this was a very long time ago. There used to be a Xianshuimiao and a Guanyinmiao. Yinchangpo village is exclusively Han, most have the family name Zhang, there used to be two directors (*guanshi* 管事) and an official. Longjie is also mostly Han.



Mr. Zhang.

Mr. Zhang knew where the mines and the smelting site was and agreed to take us there. Returned in direction of Longjie to the low ridge between the upper end of Longjiexiang and Yinchangpo, with three karst cones. Stopped at a transformer station and headed down the slope a little way. Met another elderly villager, who came along for a little while.



Peifeng with people near the top of the ridge above the mining slope.

Coming out of the bush we were looking along a very disturbed slope. Mr. Zhang pointed out workings and told us that part of the slope collapsed only a few years ago because of the old workings. Had a look at the workings just below, clearly old and exposed because of earlier rockfalls. Two further places along the slope, one smaller, the other considerably larger. There was a story about water from these larger workings, which I didn't understand.

The workings are evidently extensive, and in the limestone layer.



Old workings exposed by erosion

Went on back to the road and down near the rubbish dump. Some 40 m below the road along a young pine forest Mr. Zhang told us that all along there used to be silver smelting slags. Now some coal and stuff that looked like zinc smelting slags. Coal useless, according to Mr. Zhang. After a good long while we still hadn't found any slags but finally understood that the slope had been dug up for zinc

ore during the Great Leap, lots of shallow pits, the ore had been taken away, not smelted on site. No exploitation since.



View along the slope, with several collapsed sections.



Entrance to an old working exposed by a recent rockfall.



Part of the slope of the historic slag dump, disturbed by smelting during the Great Leap and probably recently.

Back on the road we hit on two men and a woman going to the market at Longjie, Zhang Guoping 张国平 (49) and Zhang Guozhao 张国照 (52). When asked about the old silver mines they said that they knew a place where there were slags left. Talked them into showing us. Old Mr. Zhang went off to the market with some family members, so did the woman, while the younger Zhangs took us to their village, Houzhai, at the end of a track leading along and down the slope from the transformer station.



View from the mining slope down the valley. Houzhai is behind the knob to the right.



At the slag dump outside the first house of Houzhai.





Mr. Zhang Guozhao. Slags and remains of a furnace at Houzhai. Photos by Peifeng.

At the entrance of the village near a recently built house they showed us a small dump of glassy slags. The Zhangs have no knowledge of who smelted these and when. From their elders they know about the site of a furnace or hearth nearby, but there is nothing to be seen now.

Their ancestors came from Jiangxi, 10 generations ago, and settled in Houzhai 8 generations ago.

They also knew about another old site where the slags looked different. When we expressed interest, they changed their market plans and took there. We drove through the village and along a dirt track

for some 3-4 km back to the main road north of Longjie, along for a short distance, then walked in some 5 min and found ourselves at the edge of an extensive zinc smelting site. The Zhangs knew that the coal was available from a coal mine in the hills nearby, and the ore came from the workings we had just seen. Called Heihongshan 黑硿山. No memories about when this was worked. The zinc slags are heavily eroded, with the bare smooth limestone rock visible in places. The upper end is under a layer of soil, 0.5-1 m thick, the lower end much thicker. [Extent can be measured on satellite photo]



The zinc smelting site near Longjie.





The thickness of the layer in the lower parts of the dump and large debris.



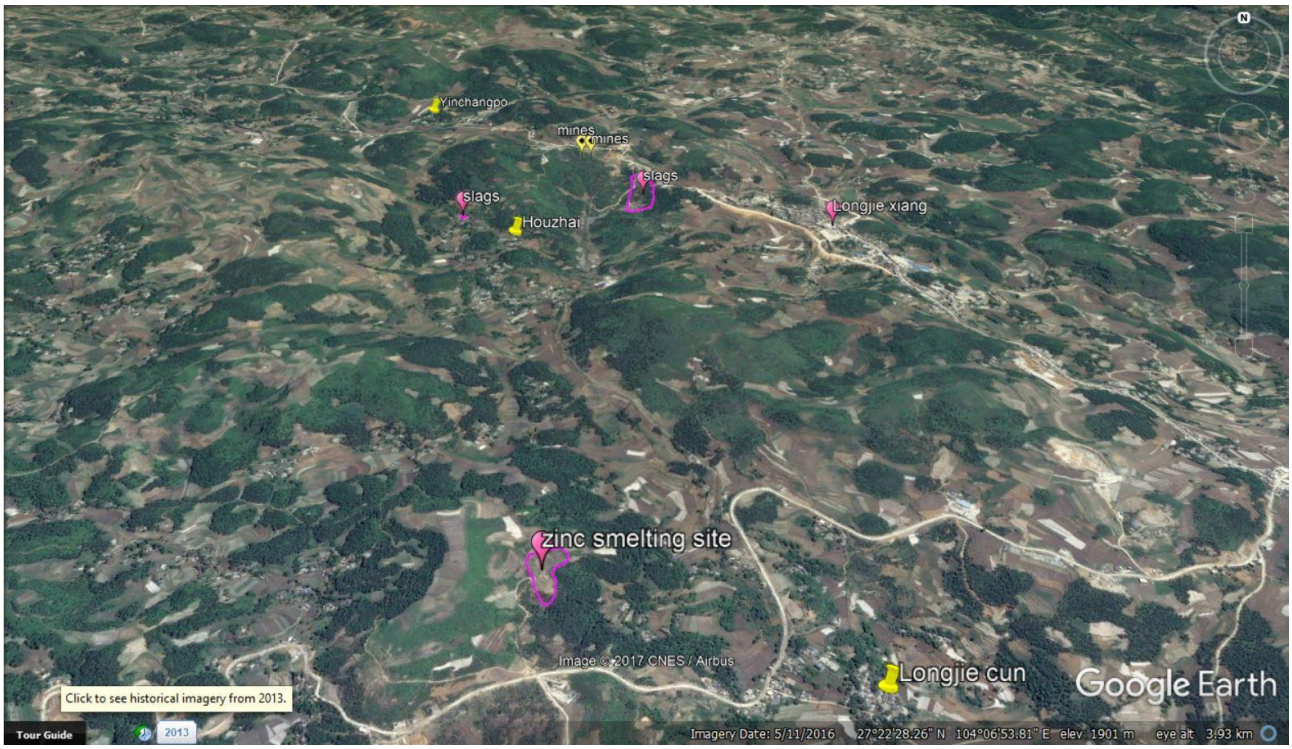
Bedrock exposed by erosion near the top end of the dump.

Site N 27 21.9768 E 104 06.7715, 1893 m

The Zhangs said that their ancestors came when this land was empty, after a war, during which the emperor had driven the Yi out to Liangshan. Afterwards the land was available. Houshan is mostly Han, with only a few Yi families.

Turned out that the Zhangs have a genealogy, so we went back to their house to photograph it. Handwritten by a relative, 2 copies.

Headed back towards 5 pm. For lack of time, did not get to Yichangping and Yinchangwan, two further nearby villages that might be connected to silver mining and are both both near the zinc smelting site.



Sites around Longjie.



The mining and the smelting slopes between Yinchangpo and Longjie. The blue-roofed building is the mosque.



The zinc smelting dump near Longjie.

Part 2: Fieldwork by Nanny and Peifeng at Jinshachang (Yongshan), in northern Qiaojia, and at Dayinchang (Huidong)

Contents:

2017.10.09 (Mon): Yiliang to Lianfeng in Yongshan 彝良县到永善县莲峰镇

We reached Lianfeng at 3 pm, and wandered down into the old town to chat with some elderly people. A group of five were sitting outside along the street at the top end of the old city. Upon asking about permodern history of the town, its temples and the Jinsha Mines, someone readily stated that there used to be over 20 temples, but there were no remains except a couple of stone lions. The mines are now being worked by a local state company, for zinc, gold, copper, silver and mangane. They were uncertain about local history and did not know of any family that had come for the mines. A 60-year old woman mentioned that she had been there and into the mining galleries some 20 years ago, at the time when they still ate only maize and no rice or other grain. The old workings were blocked up now. In the past, people came to Lianfeng for trade (shengyi) or fleeing from famine (taohuang).



Satellite image of the .Jinshajiang valley with Lianfeng on the edge of the plateau-like ridge and the Jinshachang valley.



View across the new town square onto the temple cypresses and the red school gate.

They took us to see the pair of lions and a pair of elephants, both damaged during the Cultural Revolution. They used to belong to the Wenmiao, now the primary school. The cypresses were 300 years old and used to be in the temple grounds, now in front of the school. The stone guardians had apparently been left inplace or put up again, probably at their original place along the street leading up from the northern end of the city to the temple.

They recommended that we ask at the Wenhuazhan for old people who knew more, which we did. Upon stumbling through the small building, we met diroctor Wang in the first floor. She certainly knew nothing, but after some thinking thought of a former school teacher by the name of Liu. Showed us the direction of Liu's house but didn't come along. After some asking we found the house and the son outside.





One of the repaired lions and one of the damaged elephants.

Mr Liu Bengui 刘本贵 (aged 72), was rather uncertain about the temples. Took us by some rural back alleys to his teacher, Xu Yu 徐煜 (aged 86), who lived nearby in the lowest back alleys of the old city and was home with his wife Mrs. Yin Daifen 殷代芬 (aged 83). Mrs. Yin specifically pointed out that they had been married for 61 years. Both quite fit (and understandable). They started enumerating the temples, moving from their neighbourhood at the bottom end of the old town upwards. Peifeng recorded: the City God temple 城隍庙、Guizhou Guild Temple 黑神庙、 Gog od Money temple 财神庙、 Goddess (probably Guanyin) temple 娘娘庙、Dragon God Temple 龙王庙、 张爷庙、 Sichuan Guild Temple

川祖庙、 Jiangxi Guild Temple 江西庙、 肖姑庙、 臭水庙、 God of Literature Temple 文庙、 God of War Temple 武庙.The City God temple was built 183 years ago some 20 to 30 years before.





Mr. Xu Yu and Mrs. Yin Daifen (Mr. Liu Bengui did not want his photo taken). Photos by Peifeng.

Then turning to the mines, did not think there was a connection with Lianfeng, but Mr. Xu had two stories. The first was about the opening of the mines. A group of people started digging, but found no ores. When they were about to give up, a soothsayer told them that it was not yet time and they should keep digging until somebody with a flag on his shoulder would come by. So the kept working until one day a fellow came by who had taken his trousers off and was carrying them on his shoulders. When they go caught in the wind they billowed like a flag. When they hired this guy to join they found the ores. The second was about Leifengdong 雷封洞, one day, the workers found it closed (by lightening?), shortly afterwards, it collapsed, Guanyin had sealed it to save them.

Mr. Xu had never heard about copper transports.

2017.10.10 (Tue): The Jinsha silver mines in Yongshan District 永善县金沙厂

The brand new road from Lianfeng to Jinsha village is 35 km and takes 1.5 hours. We hired a car for the day. The road descends steeply in large serpentines for the entire distance, with a single milder section at Wanhe xiang 万和乡. On the massive slope behind this large village is

planted in pine forest that looks around 30 years old. From Wanhe, the road descends towards the Jinshajiang, before turning around a mountain shoulder into the Jinshachang valley.

Jinshachang village is the first village in the valley, clinging to the slope some 50 m above the stream where a smaller stream descends from the north. The Jinshachang valley fans out into several small streams here, a huge ampitheatre that rises right up to the height of the ridge at about 2000 m. Two slightly larger streams descend from the main ridge to the east, seperated by a ridge, on the back of which the only milder slopes are found.

The entrance to the village is a gate, followed by industrial buildings of the 1960s to 1980s in the entrance of the side valley, a row of small recent shops and houses and a square to the valley side. We asked people chatting in front of the shops and were told that this was Jinsha village, and that there had been mines in the past, then a forced labour camp, and that the mines were now again worked.



The square and the shops at Jinshachang village.

The village government building was across the square, and Peifeng contacted the official on duty. While waiting, we talked to an elderly inhabitant (about 60) of a small house across the road and were joined by another villager (about 45). They were locals an told us that all inhabitants of Jinshachang village had moved in, either from Jiangxi or from Huguang. They confirmed that there were workings all around, and slags too. In former times, there would have been two rows of furnaces down in the valley (we could not establish what time this description referred to). The largest village in the valley was Guanfang 官房 (official house) and there was a place called Shuifang 税房 (tax station) below. The two large trees (one little more than the ruin of a formerly large tree) were Huangge trees and 300 years old.

Yao Xinming 尧信明 (born 1965), the deputy village secretary arrived, and suggested inteviewing some old men who lived nearby. We readily found them a few hundred metres down the main road getting ready for playing cards at the roadside. They readily packed up and came to the government office for a chat.



Meeting the informants on along the road.

The information was mainly provided by Luo Xianfang 罗现放 (aged 80), with some comments by Chen Lianshou 陈连收 (aged 85) and Li Guangde 李光德 (aged 74): The mines were started about 300 years ago by people from Jiangxi. During the Great Leap, lead was smelted by the traditional method, and also silver. At the time, smelting was re-learnt from old people. The ore worked during the Great Leap was not smelted on site, but only sorted and then transported out, by horse cart to the road and from there by truck. Later, during the time of the labour camp, lead and zinc ore was worked and carried out of the valley. It has been 100 years since the silver mining, there would be no remains. [The earlier and later statement on the smelting are contradictory, it appears probable that local smelting was actually attempted and possibly practiced during the Great Leap, while the transport of the zinc and lead ores to an industrial smelting plant came later, and evidently was the system during the labour camp.]

They could not say whether old slags were re-smelted.

There were several temples before, a Black God Temple [Guizhou Guild] 黑神庙, a Guanyin Temple 观音庙, a Three Kings Temple 三王庙 of the provinces of Yunnan, Guizhou and Sichuan, and a Yanshan Temple 炎山庙.

Other place names that were linked to the mines were Yanshan 炎山 (Fire Mountain), Zhulu (Pig Alley) 猪路 up on the mountain [now 诸路], and Caiyuan 菜园 (vegetable Garden) below.

There was a saying:

有一个说法：“有suan打suan，有引打引，无suan无引，打xx井。” [key expression not identified]

There were also some stories. The story of the opening of the mine was mostly similar with that Mr. Xu Yu had told us the day before. The man who carried his trousers on his shoulders was specified as a beggar. The other stories were of miraculous savings before a mine caved in, by the mysterious person who sold fresh peaches and by the lightening bolt that sealed the entrance.

Old workings still existed in great numbers all around.

Nothing was left of the temples, but there were a few pillar bases right on the square in front. They showed them to us and dispersed. There were eight bases lined up as stools, the square bases with a side length of about 40 cm, and the round pillat base with a diameter of about 28 cm. The now unused concrete sports ground on the lower level appears to have been the old temple ground. Some large stone steps or thresholds, one with a round hole, presumably of a door, were used in buildings and holding down the football goals.



Mr. Luo Xianfang and Mr. Wang Guangde in the office.



Mr. Yao Xinming at the pillar bases on the square.

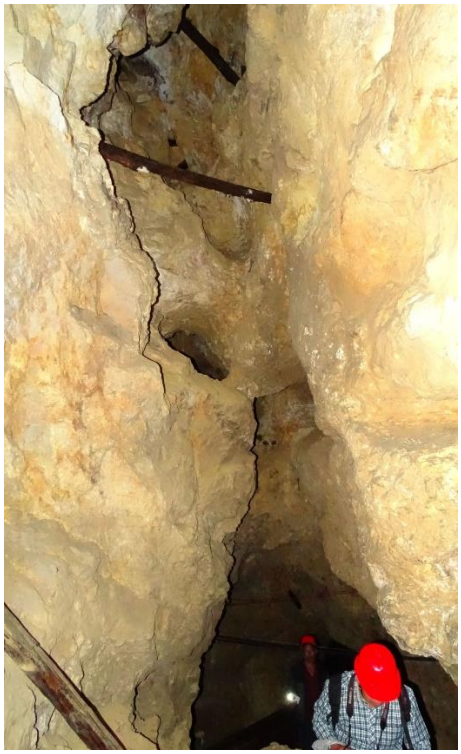


View from the square into the mining valley.

Secretary Yao took us to see some workings on the mountain flank opposite Jinshchang village and below Guanfang. There was a driving track ascending the slightly northern arm of the stream, which soon crossed over to the opposite slope and began ascending towards Guanfang. Mr. Yao first showed us intrances of old workings in the limestone cliffs on the steep slope above, which were out of reach on account of thick vegetation. At mine 026 we met Mr. Chi Shaoneng 迟绍能 (born 1949) who looks after the pumps that are worked from this otherwise abandoned modern gallery. Mr. Chi consented to let us have a look at historic workings cup open by the modern gallery, getting out helmets to conform with safety regulations. He opened

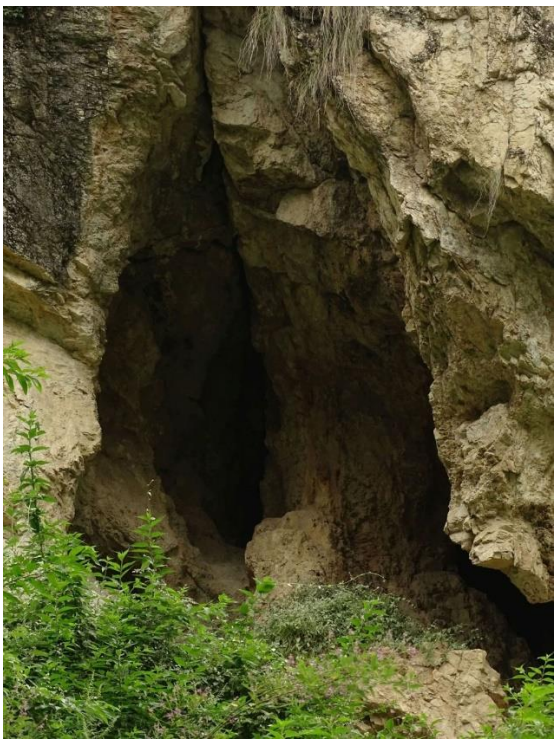
the gate, turned the light on an guided us along two level galleries. The tunnel hit on historic workings in four places, the argest of which were about 50 m into the mountain and widened a massive crack or chimney the extended far above. There were half-rotten beams in the workings. Mr. Chi explained that people had brought them in to climb up fairly recently. The rock was pale yellowish, with quartz near the old workings, and no trace of easily recognizeable ores.





The gate of the mine and old workings inside.





Workings in the cliffs.



View from Mine 26 eastwards up the northern arm of the Jinsha Stream.

Secretary Yao told us, that they used to walk to Lianfeng in 5 hours, departing before daybreak and retuning home after dark.

We returned to Jinshachang village for lunch with two other cillage cadres. One of them, Mr.

Song 宋, had an interest in history and a genealoga at home.

Further inquiries about historic slags received unclear answers. Finally secretary Yao told us that there used to be massive amounts along the stream, but that almost all were gone after a massive flood in 1990, that washed the valley bottom clea to the rock. There would be some left furthe up the slope, but he did not know the place.

Mr. Song agreed to take us around a bit more. We first drove up to Guanfang, a quite large village with a primary school, and descended towards Yanfang, that in fact consists ofeight groups of houses distributed on the steep southern slope of the Jinshachang valley.

Crossing over from the northern slope of Jinshachang over the northern arm onto the middle ridge of Guanfang and across the southern arm of the stream to Yanshan, the overall geography of the valley became clear.

Mr. Song took us to a mine below Guangfang that had made ist owner rich. The Yanshan slope across displayed a slightly raised section som 50 to 100 m wide and at the very least 200 m in height that looked like an ancient rockfall in which the entire section had slid off. The first Yanshan village is located at the top end of this section. There are a number of modern mines, which are being worked, and opened up old workings explosed in places, possibly by recent activities. The whole slope looks massively disturbed.



The ruptured slope of Yanshan.





Overhanging section with exposed old workings.

Shortly after crossing the southern arm of the stream, Song had us stop at turning a corner. He pointed out walls made from large stone blocks, the remains of the Yanshan temple.





Remains of the temple walls and view north across the southern arm of the Jinsha Stream.

We drove on to the western end of this section and stopped at a worked mine.

From this spot, the sorting plant in the valley below was visible. Mr. Song explained that it was on the site of Shuifang. It occupies the only slightly wider section in a bend of the valley, before it breaks through and leaves the main valley to precipitously descend towards the Jinshajiang. Mr. Song also explained that Caiyuan was beyond the narrowest part of the valley on the slope above the Jinshajiang, while Hekou was further down near the river. Both remained out of sight due to the gradient.



View down to the sorting plant, with Jinshachang village partially visible on the slope onthe larger road and the school and some houses visible of Guanfang on the ridge.

On the basis of the information provided by the local cadres, the greatest number of old workings were in the slope facing NW below Guanfang, with lesser numbers in the slope above Jinshachang village and again fewer on the Yanshan slope.

Mr. Song lives in Doupo 豆坡, another relatively large village located on the slope above Guanfang. The name is thought to derive from the fact that this village grew beans for the mines. We walked up from Guanfang to see his family genealogy. The first section of the path has recently been built in concrete steps. Mr. Song told us that the wife of a rich mine owner spent 10,000 RMRB only last year, with the village providing the labour. The new path ends at a tiny shrine under a rocky overhang, that has been restored with three naive figurines, and a stele recording the donations. There was an older Guanyin shrine on the same site. Part of a foot of the old statue and a most peculiar inscription roughly hewn into the live rock remain of the historic shrine.

Legible parts of the inscription date it to the Jiaxing period, with year above 10, and suggest a list of donators with professional titles:

永乘万古
计开
官房厂炭阁厂众姓人等
匠士侯 xx xxx
xxx
嘉庆x x 年



View onto Guanfang and down to the Jinshajiang.



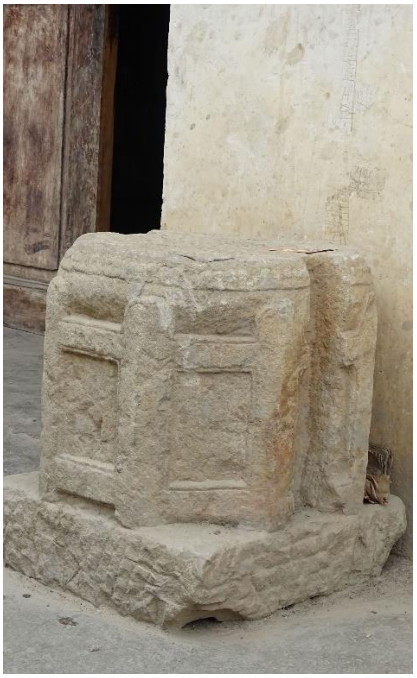


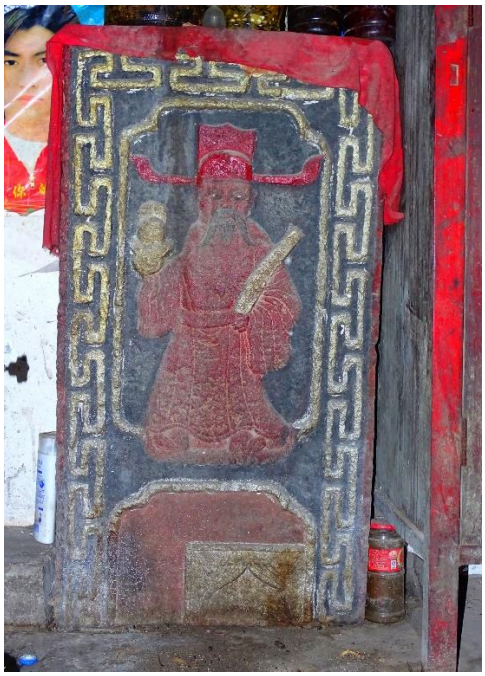
The Guanyin shrine above Guanfang and the foot of the former statur in the left coner. Nanny is trying to take photographs of the inscription in the rough frame next to the niche. Photos by Peifeng.



Mr. Song at the Guanyin shrine.

Back at Guanfang, Mr. Song took us to the house of Mr. Li Qinglong 李清龙 (aged 78), who has a crudely executed bas-relief of a god in his front room, which formerly belonged to the temple. Presumably the Heishen temple, which we were told was the largest temple that the old people had still seen. The stone was about 80 cm high and 50 wide. There were several pillar bases in the street, not large than the ones in Jinshachang village but better executed.





A pillar base in the main street of Guanfang and the bas-relief in the house of Mr. Li Qinglong.

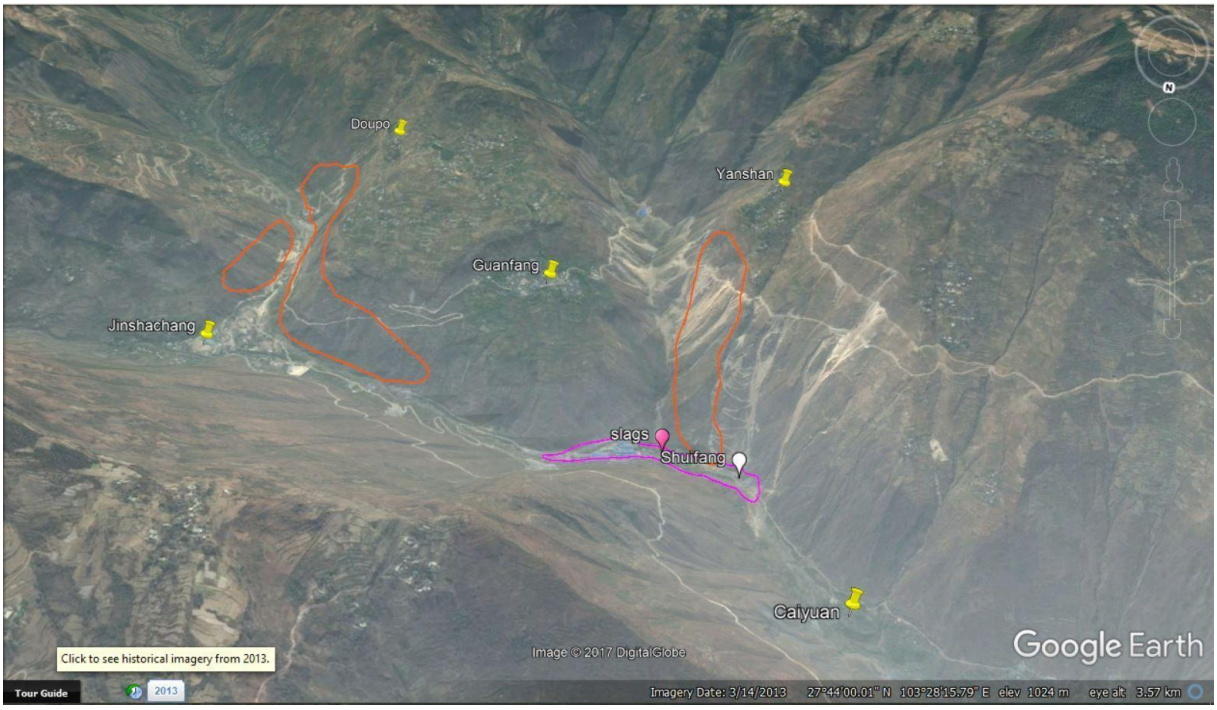


We made a final stop at the house of a blacksmith in the new upper part of Jinshachang village, for Mr. Song remembered that he used to have an old bellow. The bellow was infact still leaning against the wall richt along the road. The blackmith explained that he had had it in use until sme years back and that it was made from a wutong tree. The bellow was 140 cm in length and about 30 cm in diameter, with the piston some 25 cm in dimater and the feathers still in place. The wooden air channel was also still attached, but the two end pieces had come off. The handle was made from metal pipes.

The piston bellows. Photo by Peifeng.

We reached Jinshachang village at 5 pm and Lianfeng just after 6 pm.

Results on the Jinsha Mines: Few remains, but the number of workings as well as the layout of the valley with the villages linked to the mines indicate a considerable scale. Slags could be found at the sorting plant/Shuifang, and probably also in some spots near Guanfang. We forgot to inquire about the presence of Muslim Chinese in the mines.



The layout of the Jinshachang mines. Purple area: main slag dump: Red areas: areas of workings.

2017.10.11 (Wed): Lianfeng to Zhaotong 莲峰镇到昭通

We took the overland bus from Lianfeng at 8:30 am and reached Zhaotong at 12:30. Used the afternoon for further exchange with Ding Changfen. The overcast weather that had be welcome at Jishachang turned into light rain, which was less so.

2017.10.12 (Thu): Zhaotong to Baogunao in Qiaojia District 巧家县包谷垴

Light rain.

The information on copper mines in Bagunao and Laodian just south of the Niulanjiang had been provided by Zhong Xiaoming 钟晓明 of the Cultural Relics Office of Qiaojia, whom Nanny had met in 2016. We rang him, and he specified that the sopper smelting site was at Tongchanggou village 铜厂沟 near the site where dam was to be built at some point.

On account of the wet roads and the steep gradintes in the descent to the Niulanjiang, we rented a car to Baogunao. The driver happened to be from Babaocun 八宝村, the village that used to be the Lema Mines. She told us that she has a relative who found 120 old objects as well as a stone statue in an old mining gallery that he was unable to move, but that he photographed. The latter information is very interesting because there is mention of shrines inside the largest workings, of which this might be material evidence.



The Niulanjiang gorge.



The Ridge to the east of the Lema Mines, seen from the ascent towards Baogunao.

In Baogunao we inquired about Tongchanggou, which turned out to be 8 km by concrete driving track and 3 to 4 km by walking path. The path led up the ridge right behind the town, soon descending into a small, steep valley. We first mistook some houses on the eastern slope for Tongchanggou, had to recross to the western slope. The actual village is further up, where the valley widens out and becomes less steep.

The stream bifurcates into two arms. Zhu Zhongyun 朱忠运 (aged 64), who lives in the house just below the confluence told us that his family had come from Xuanwei 6 generations ago, first to Mashu 马树, and only some time later to Tongchanggou. By that time, the mines were no longer worked. He showed us slags in the stream bed and knew of some 40 workings up on the slope. In 1958 copper exploitation was attempted, but remained unsuccessful, some 10 to 20 years age another trial exploitation had also been abandoned.

A little way further up the stream the slags become dense at the upper corner of an abandoned housing building, presumably built in the context of the dam construction. As Mr. Zhong Xiaoming had told me, there was a stele set up by the Relics Office.



The layout of the Jinshachang mines. Purple area: main slag dump: Red areas: areas of workings.



The small gorge ascending to Tongchanggou.



Zhu Zhongyun and his son with Peifeng in the bed of the lesser stream.



Zhu Zhongyun, his son and Peifeng in conversation.

Slags continued in a layer into the small side-valley behind the building, partly cut open along the driving track that leads to a few houses and on along the slope.

As far as we could see, the slag layer was within 1 m at its lower end and 20 to 30 cm in the middle under the small fields between the houses and the track. The extent of the dump is hard to establish, as the field terraces, the houses along the upper end of the milder slope and the track at the bottom disturbed the slope. The maximum extent would be the entire milder corner from the abandoned building to the top house, interruptions and in fact several relatively limited dumps are also possible. A considerable proportion of the slags evidently have been washed down the stream, which has a wide bed, proving that it becomes a considerable force when in spate. Further dumps in the stream's valley beneath the workings are also possible.

Peifeng's measurements: N 26° 57.5144, E 103° 21.6229

Lü Guangfu 吕光甫 (aged 42) is the owner of the last house. His family came from Xuanwei 11 generations ago and settled in Tongchanggou 7 generations ago. He gave the number of workings with 48 and stated that the mines were worked in 1958 and the ore taken away. More recently, there also had been some mining. (Note: 48 is the standard number that expresses a

considerable multitude.)

Results Tongchanggou: The number of workings suggest a significant scale, while the establishable slag dump is moderate. Exploitation clearly ceased by 1850. A conncection with the Lema Mines is highly probable, with the exploitation preceding the striking of rich silver ores at Lema possible as well as an expansion into new deposits during the period of decline or to fulfil the copper quota from 1767 onwards.



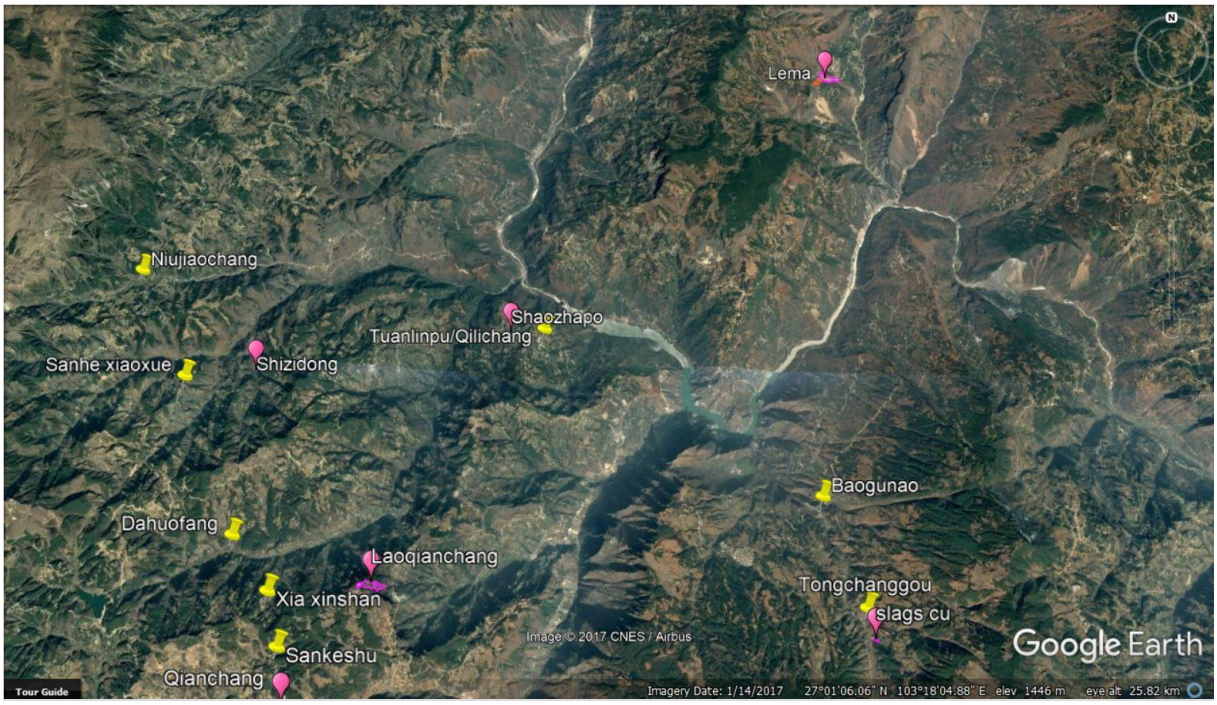
The slag area seen from below. Slags are evident in the banks of the track and in the small fields up to the houses..



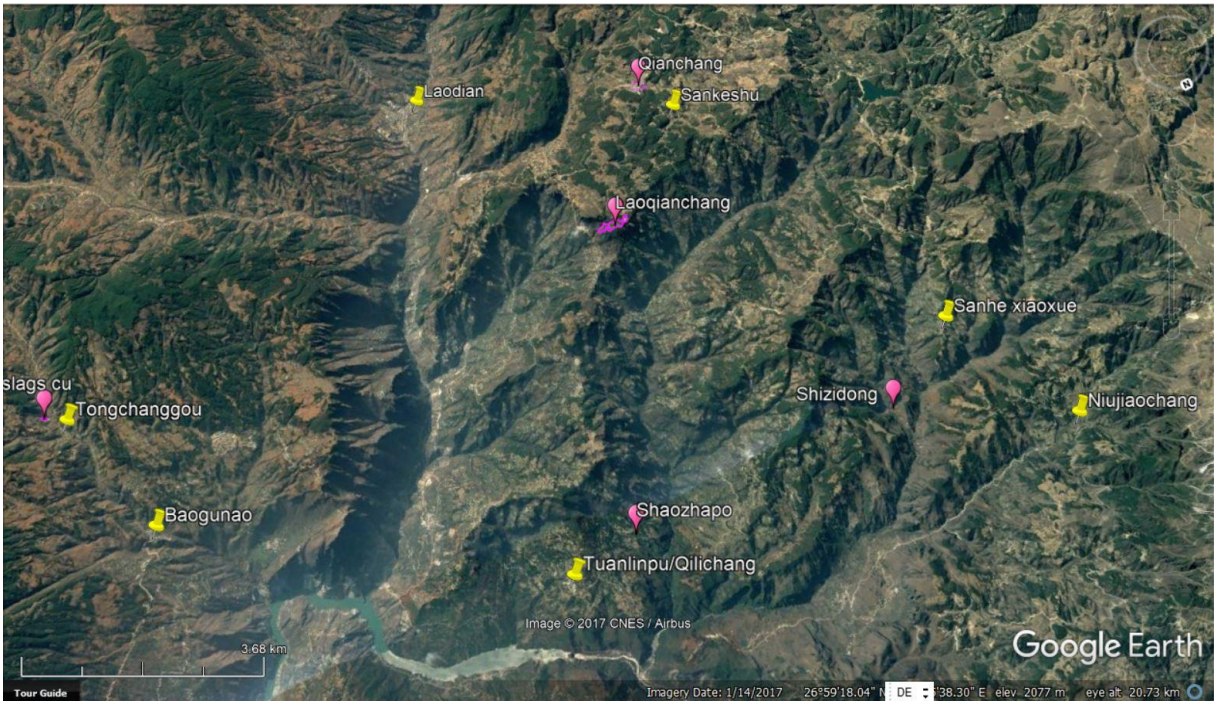
The last house in the side valley. The darker area in the dirt track are slags.



Copper slags in the soil, explosed by terrasing and erosion.



The Niulanjiang and the southern corner of Ludian with the Lema Mines and the northern parts of Qiaojia.



All sites in a perspective facing south into Qiaojia.



Tongchanggou. Purple area: Slags. The mines probably extended along the slope from the small forested area above the houses on the slag dump along to the main village.

2017.10.13 (Fri): Qilichang (Tuanlinbao) and Qianchang in Laodian 巧家县老店镇、团林堡（七里厂）、铅厂

By local bus from Baogunao to Laodian, precipitous descent into the Laodian side valley south of the Niulanjiang. We only made the bus because the hotel owner apparently rang the bus driver, who waited for us at the first stop outside town.

At Laodian, we found the Culture Station, where the official had no knowledge of historic mines, but sent us on to a young official who organized a car to take us to Tuanlinbao.



The town of Laodian.

While we were waiting on the car park outside the local government building, a gentleman in his 50 told us that there was a large smelting dump at Qianchang. The ore was however from Sanhe and Xindian, with Sanhe some 10 km away.

By government jeep to Tuanlinbao. The distance is well under 20 km, but the route rather breathtaking. For a few km, we followed the main overland road down the valley, but from the turnoff the narrow concrete track climbed along the sxtreme mountain flank, and continued to do so after turning a corner high above the Niulanjiang and into a SW side-valley towards Tuanlinbao. Cloudy and wet, with the peaks and much of the lower valleys covered.

While the accompanying official contacted his colleagues in Tuanlinbao, a tiny town, we chatted with Wang Dachao 王大朝 (aged 63), who runs a small drugstore. His family came from Ji'an 吉安 in Jiangxi 6 or 7 generations ago. He detailed that Tuanlinbao consists of 23 villages with a population of voer 3000, mostly Han Chinese. There were old workings, which had been exploited for zinc and lead. The main mining area was Qilichang, some way on into the valley. He had not heard much about temples, there used to be a Guanyin Temple, above the village.

In the meantime, the village secretary had contacted He Qingzhu 何庆竹 (aged 40) who would take us to the site. We first drove on to his house, Mr. He had been involved in the recent exploitations by a company from Guizhou, apparently for zinc. He showed us some secimens from new and old workings.

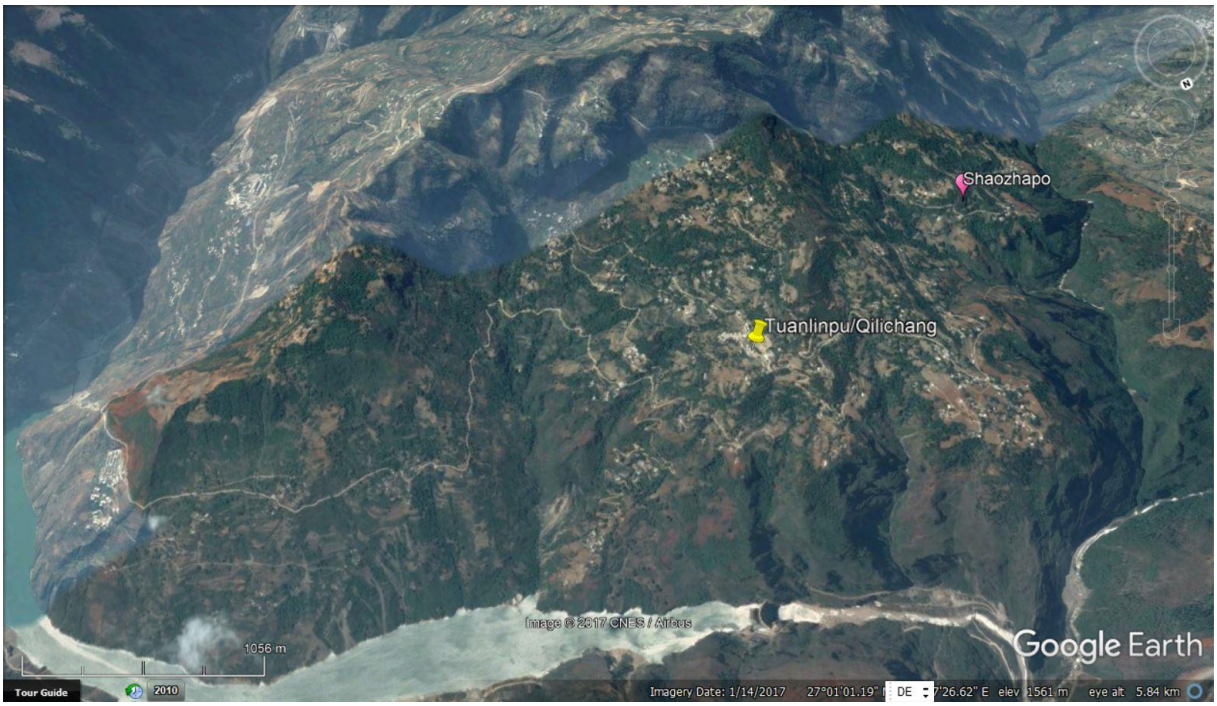
We then drove on further along the slope, for 1-2 km only. Walked up a steep slope partly covered in fields and orchards, where Mr. He showed us a slag dump under young walnut trees. The visible area was only some 20x25 m, not clearly demarcated and pssibly interrupted by terracing. The place is called Shaopo, named after the discovery of the slags.

Peifeng's GPS measurements: N27° 00.9355，E 103° 16.4895, 1724 m

Place names that appear to be connected to historic mining are Douya ping 豆芽坪, Miaoping 庙坪, Guanfang 官房 and Guolu ping 锅炉坪 (or Gulu ping 古炉坪?)

All informants stated that the mines exploited lead and zinc, while Wang Dachao thought the old mines exploited silver.

On account of the wet weather and because we had to return to Laodian so as not to overuse the government car, locations, ongoing exploitation, and the nature of historic mining remain unclear.



The Slope of Tianlinbao/Qilichang high above the Niulanjiang. The satellite image shows a dam right below Tuanlinbao, due to older height data, the river appears strangely stretched up the slopes. The location of the slag dump is uncertain.

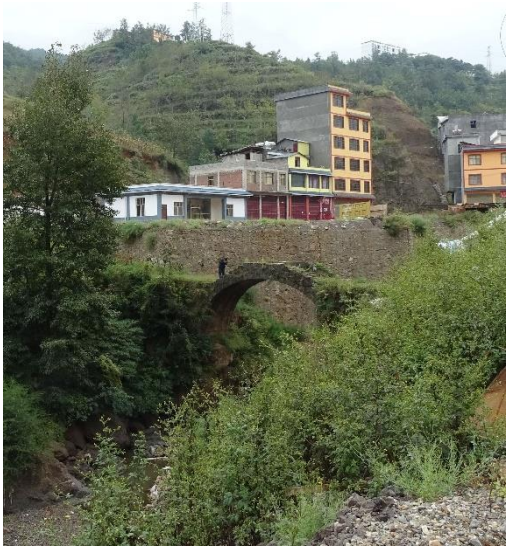


The site of historic slags. Inserts show dar grey and blish slags in the orchard floor.



Momentary view of the slopes of Tuanlinbao.

We found a driver to visit Qianchang in the afternoon. Zheng Zonghai 郑宗海, the driver was from Laodian. He mentioned that there were old copper mines near the town, he had been inside, but knew nothing of slags.





The old bridge below Laodian. The present town occupies the slope above the yellow building, with a few houses just visible.

Upon setting out, we briefly stopped at the old bridge. Mr. Zhong Xiaoming had mentioned this bridge as possibly the only surviving premodern bridge in the district, called Huaqiao 话桥. Mr. Zheng knew the brdige, which in fact was just below the town, now disused between new buildings and the four-lane overland road. The bridge spans the small stream in a high arch. Mr. Zheng pointed out that it has a little dragon head facing south, while the correstonding dragon tail facing north had fallen off.

Qianchang is only about 15 km from Laodian, but again a long drive to climb out of the extreme valley onto the western ridge. The slopes soon become quite wooded, almost exclusively pine that looks up to 30 to 50 years old. According to Mr. Zheng, the seeds were dropped by plane.

Qianchang is a small market town, and it was market day. The first old man we asked directed us to a massive dump at the far end of the town. The large zinc smelting dump filled the southern end of a flat valley, and looke partly dug up. The thickness up to 5 m, possibly more. The heavily erodes slopes in to the east seemed to show some coal. Extent at least 50x70 m.



Peifeng and Mr. Zheng at the slag dump, the houses of Qianchang in the background.



Packed undisturbed debris.





Large debris and remains: Bottom ends of clay retorts and a “sand bar,” part of the grid in silve cupellation hearths.s

Peifeng’s GPS measurements: N° 26 56.8429, E° 103 13.8410, 2563 m

Interviews with three aged inhabitants provided the following information.

Mr. Du Kaizhi (aged 81) used to be a zinc smelterer but unfortunately was very deaf. He started smelting when he was 16 and worked as a master for 10 years. From 1954 to 1956 they worked

on their onw, afterwards for a state company. It appears that the later smelters were in a different location.

A gentleman in his 70s told us that the slags were from the Qing period. During the Great Leap, attempts at re-smelting the old slags failed. The “woyuan” that was smelted was in fact zinc. The slag dump at the Laoqianchang (The Old Zinc Mine) was even larger.

Mr. Fu Zhanglun 傅章伦 (aged 81) moved to Qianchang in 1955. He had not seen any zinc smelting and therefore concluded that the slags were from the Qing period. The dump extended under the entire present town. He knew nothing of temples. The smelting efforts in 1958 were all fruitless. The ore came from Sanhe and from Xindian.



Qianchang. Purple area: Slag dump.

There was a concrete driving track to the old mines, some 3 to 4 km, past Sankeshu 三棵树. We drove a long way past Sankeshu, through forest, with much cloud making orientation difficult. Eventually we hit on a house.

Shen Zhengu 沈正富 (aged 59) was a former employed of the road maintenance team and readily consented to take us to the slag dump. We walked up to the top of the ridge, that was almost flat with some limestone cones, clouds billowing, and stumbled onto a huge zinc smelting dump along the slope. Mr. Shen took us around to see the full extent, which still remained had to judge in the mist. According to Mr. Shen, the slags contain some metal and had been re-smelted in the 1990s [and possibly later].

Mr. Shen related that his father had moved up here at a time when there was no village. The dump would be about 1000 x 500 m. There were graves further down on the slopes, but none with inscriptions. These would be graves of workers. The smelting dated to the Qing and was linked with the Lema Mines, and would have been abandoned at the same time. The ore came from the Lema Mines. Some people formerly collected broken pieces of retorts because there was samoe metal stuck to them. In the past, the ore was bought from Lema and the produced metal sold to Lema, there were mining rules that laid this down.

We returned in the dusk and reached Laodian at 7 pm.



Part of the slag dump at Laoqianchang, with coal dumped or occurring naturally.

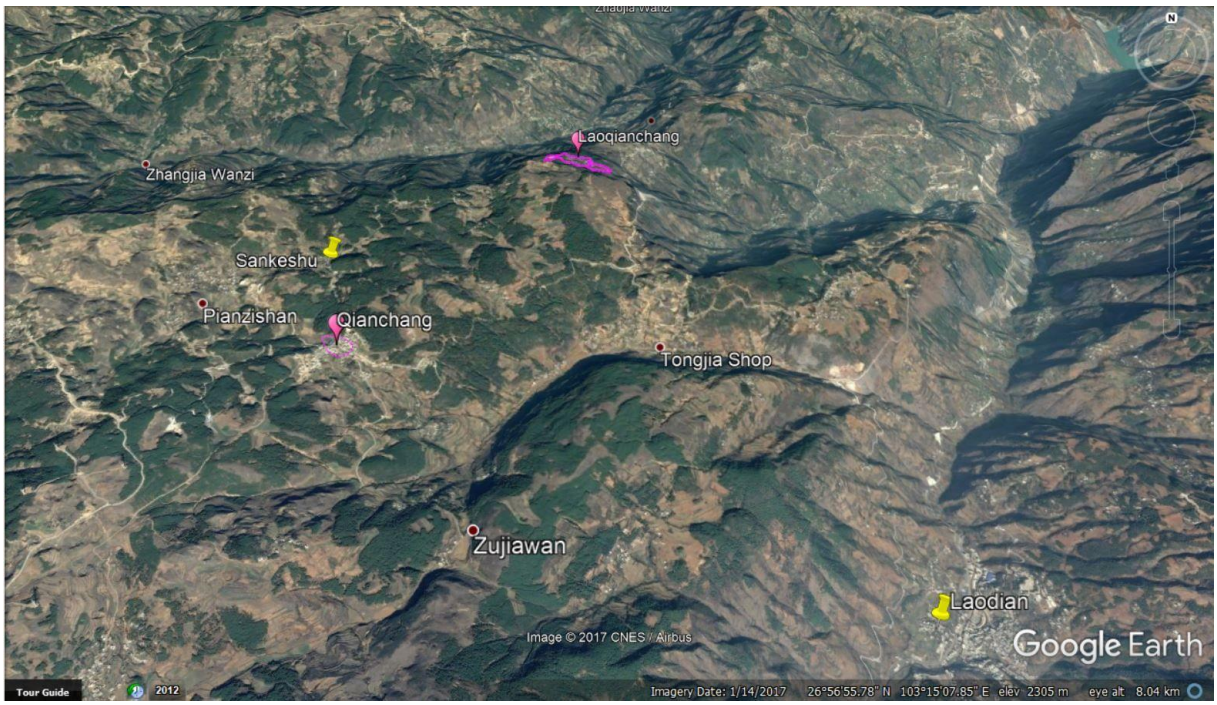




Mr. Shen Zhengu and the dump in the clouds.



The slope of Laoqianchang.



The area of Laodian and Qianchang.



Probable extent of the slag dump at Laoqianchang.

2017.10.14 (Sat): Sanhe in Qiaonjia, on to Qiaojia 巧家县三合村-巧家

Rain in Laodian, nevertheless decided to give Sanhe a try, hoping for less cloud higher up. Left Laodian at 9 am, again with Mr. Zheng Zonghai.

The route was via Qianchang, from there westwards on an initally good road that was partly under construction. The construction section began in earnest not far from Sanhe, hence the driving track into the valley and to the villages on little knobs along the mountain flank was crushed by trucks. Although the distance on this track was under 2 km, it was hard going. It continued raining.

We gave up at what turned out not to be the original village but the site of the primary school of Sanhe, with a few houses. We wandered into the school grounds. Peifeng found a retired teacher who contacted Tang Guanghong 唐光红 (aged ca. 30) a young school teacher who was from Sanhe. He had not been able to go home for the weekend, although he lived only in the next village, because of the bad track.

Mr. Tang told us that the mines were in fact below in the valley, there was no road but it was a 40 minutes' walk, about 5 km. The place was calles Shizi dong 狮子洞 (Lion's cave). He was familiar with it because his grandfather lived there. His grandfather was over 70 and somewhat deaf, but knew more about the mines. He himself had been inside and said that they were very deep. The ore looked like ordinary grey rock but with shiny specks, and contained lead and zinc.

We finally decided no give up on walking to Shizi dong, as the path looked highly slippery. Teacher Tang agreed to inquire with his grandfather.

We managed to get back to the main road without incident and drove straight on to Qiaojia. The final 30 to 50 km were on a two-lane road. Clouds lifted as wee descended the valley of the Qiaomaidihe and apporached Qiaojia.

Results of Qianchang and Sanhe: The very extensive zinc smelting sites of Qianchang and Laoqianchang are recorded nowhere. Local knowledge that the ore came from Sanhe and Xindian appears reliable, but could not be verified due to the rain. The distance from Shizidong to Qianchang by trail would be within 10 km and hence feasible, while Xindian is further away and the site of the mines unclear. Another visit with Tang Guanghong to interview his grandfather would be very useful. A link with Niujiaochang or even Qilichang is also probable,

as both sites would some 5-10 km by trail.





Mr. Tang and Peifeng sheltering in the building site and view down into the valley.



Sanhe, the Sanhe Primary School and the probable location of the mines.

2017.10.15 (Sun): Dayinchang in Qianxinzhen (Daqiao), Huidong District 会东县铅锌镇大银厂

We departed from Qiaojia at 9 am and covered the ca. 110 km to Qianxinzhen (formerly Daqiao 大桥, which still is the locally used name) by 13:30 on a very good road. Vegetation, which had been better in Qiaojia than in any other part of Northeastern Yunnan that I have seen, was even better in Huidong, with the forests on the slope diversifying, several broadleaves, and the odd fir and very occasionally a cypress among the pine majority. Some of the pines appear to be 50 years.

Upon arriving in Daqiao we started inquiring about Dachang wazi 打厂洼子 (which might be the site of the Xiaotongchang "Little Copper Mine" in Qing sources) near Chahe 岔河 on the secondary road to Huidong and Dayinchang to the southeast. Dayinchang is now part of Manyingou 蛮银沟镇, which has recently become a township (*zhen* 镇), as the road is difficult, the some 30 km were said to take 2 hours and drivers were unkeen to go there.

We eventually found a driver and headed off. He followed the road towards Chahe for about 5 km, the turned south into a side valley. The valley opene for a short section above the larger valley, but soon closed in and became a gorge. The young and sparse forest occasionally contained young cypresses. Climbing out of the gorge we reached Fawojie 发窝街, a rather large village. We got off at the upper end, which is in fact another village called Faqing 发箐乡, the two have been administratively joined as Manyingou township.



Manyingou. The larger town in the forground is Fawo, the village a bit higher up is Faqing.





Teacher Geng, and with Peifeng in front of his school.

On Sunday afternoon, there were a lot of people chatting on the street or playing in gamblings houses. Some asking around got us to talk to Mr. Geng Wuchang 耿武昌 (aged 48), a local primary school teacher with an interest in writing. He had been teaching at the school for 27 years and knew the place well.

Teacher Geng told us that there were historic mines of an unknown age. It was also unknown, what they were worked for. There were slags, right around the school. The ground used to be covered in them. When htey were childges, they used to play with them, they were like glass, very pretty, black and shiny. There used to be a a Jiangxi Guild Hall, on the site of the primary school.

He took us to the primary school, which was nearby, right across the stream and in the middle of the Fawo village. When looking for slags, he asekd a couple of young children, who had no idea what he was talking about. There were however slags in the tiny vegetable plots between the school grounds and the stream.

A very old couple came along, in their 80s. As far as we understood, they knew about the old mines, but had no recollection of smelting or of what ores were worked. The old gentleman's family had moven in from Xuanwei. The whole area used to be covered in slags, it used to be below the main village and called 烧场地, markets were held there.*

Teacher Geng explained that the village used to be a little way up the slope. When he was young, it was still there. [It appears that the village moved down with the motor road.]

He showed us the old main street, which was still in the original layout, although most houses had been recently rebuilt. The mining galleries used to be on the slope above, hi indicated a general direction. They would now be closed.

Back towards the main street, we met a gentleman in his 90s, who said that his family was from Jiangxi and had come 7(?) generations ago. He had no knowledge about the mines.

Teacher Geng took us to see a couple of pillar bases integrated in a wall and to the Guanyin Shrine in a small cliff on the stream just below the village. Seven schoolchildren followed and had fun observing us, kowtowing at the shrine and having their photos taken.



The plots with slags between the school and the stream.



The very old villagers.

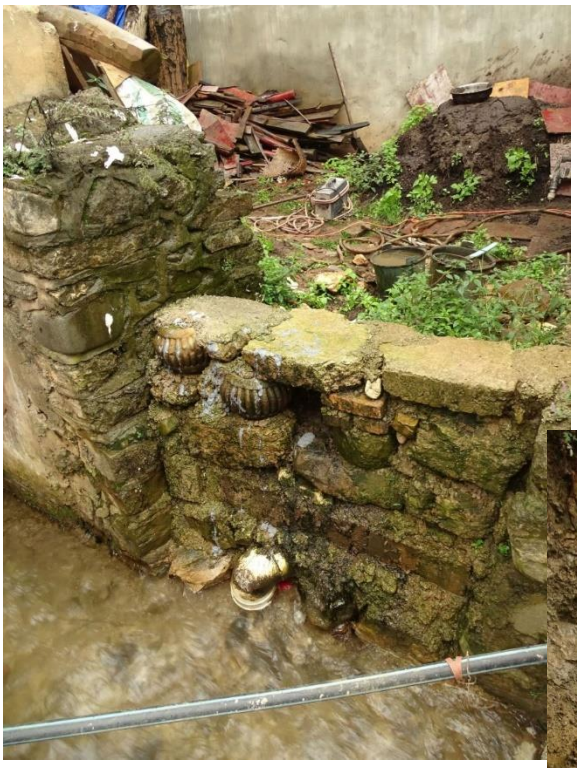




Above: In the old village main street. Insert: Pillar bases we noticed on the way down.



Left: Teacher Geng and Peifeng in conversation with informants near the school.



Left: Old pillar bases usen in a wall along the stream.

Below: Three of the boys who followed us to the shrine.

Below left: The Guanyin shrine below the village.





As it was only 4 pm, we decided to have a look at the slope above the village. We followed a largish trail in the general direction that teacher Geng had suggested. Heading around a corner not even 100 height m above the village, we hit on an extremely disturbed slope, facing east, we stumbled along increasingly mystified in the dusk, until we eventually saw a man at an apparently operating mine below.

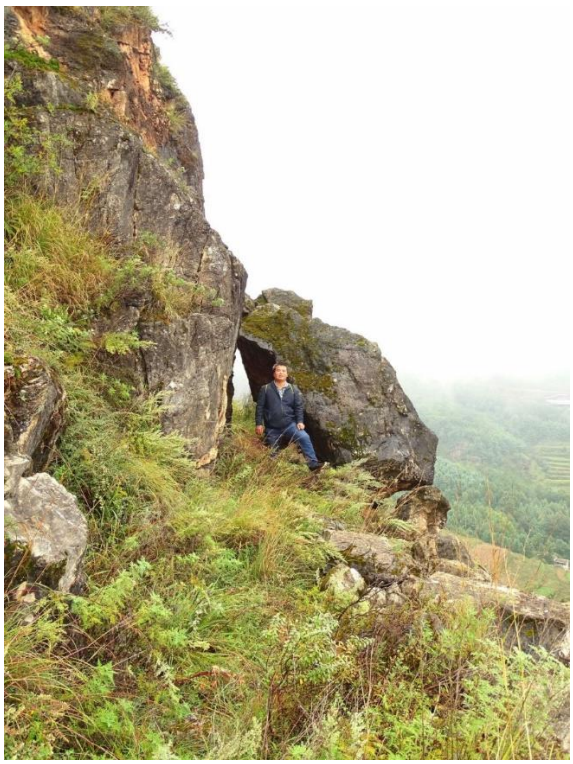
Mr. Guo Wanfa 郭万发 (aged 63) was from Huagan 火干, the next village above Fawo in the valley. Mr. Guo explained that the slope was indeed the area of the old workings and had been dug up for several decades because the soil contained lead oxide the formed visible layers on the rock surfaces. [In fact we had still seen these in places but not taken photographs]. He knew the old workings and had actually been inside, they were low and narrow and windy. The were all gone now. At present, the mines were worked for oxidized and sulphurized zinc ores. He showed us a large piece of ore that according to him was oxidized zinc with a content of 40%. The mineral was similar to the one the Zhu's had shown us in Zhujiaying, consisting of crystallized cavities and light reddish grey material. The slope was called Laoshan 老山.

There used to be a Jiangxi Temple, a Huguang Temple, and a Temple of the God of Wealth.

Oral tradition had it that there used to be many Muslim Chinese here, and they started fighting with the Han Chinese. Nowadays there is not a single Muslim family in the area. There is also a story about a mine the collapsed and apparently someone outside called out to buy fresh peaches, and those who believed there were peaches came out an were saved, while all others were buried and died.

Mr. Guo directed us the shortest way back to Fawo, a trail through the forest that came out at Huogan. We reached our hotel at 6 pm.





At the lower end of the disturbed slope, before we realized that this rockfall was not natural.



The distrubed slope.



Peifeng in the disturbed slope.





Mr. Guo Wanfa and Nanny. The piece of oxidized ore.

2017.10.16 (Mon): Dayinchang in Qianxinzhen (Daqiao), Huidong District 会东县铅锌镇大银厂, return to Kunming

The weather was still wet. We found a young driver of a small car to take us up to Dayinchang, some 15 km from Faqing and at about 2800 m. The ascent was up the slope facing west above the village, reaching the ridge at Tiechang, iron mines that may be old and are still worked. The ascent continued on the southern slope of the main massif. The iron mines are at roughly 300 height m below, on a ridge between to streams descending towards the Jinshajiang. Dayinchang is in the valley of another parallel but much higher stream. The height was mostly in the clouds in the morning.

The mine is under exploitation and Dayinchang village has been re-settled. With little orientation due to the mist, we first drove on along a large pit, following the valley down to where Saopo 扫坡 might indicate a slope covered in slags (Shaopo 烧坡). We ended up at the abandoned village, with the clouds thankfully rising. We met a gentleman about 70 year of age who was not from the area but was looking after some old buildings of former facilities in the old village. There were in fact slags there, though iron wappeared possible as well as lead.

Some way above the abandoned village a massive dam blocked off the village, preumably to capture run-off from mining and ore washing above. The buildings around were traditional ind appearance but dated to the 1990s, with mining by still relatively traditional means obviously busy by then. There were also several driving tracks and roads, partly overlying each other.

We returned to the upper end of the pit. Workings evidently extended considerably further up the valley. We drove in a short way and went exploring a bit at a tiny brook that appeared to cut into the layers the predated recent gangue dumps. We actually found a clear layer of slags some 20 cm thick.

We returned to Faqing and asked around a bit more, hoping to find former inhabitatns of Dayinchang village. We had no luck, but inquired about Laoshan 老山 (Old mountain) and the corresponding Xinshan 新山 (New Mountain). Googlemaps shows a village called Xinshan about 1 km north of Fawo. All informants however stated that the ridge above towards Dayinchang was called Xinshan.

We left Faqing at 11 am and reached Kunming at 10 pm.

Results Laoshan and Dayinchang: There is no doubt that the mine exploited silver and were important. The Laoshan near Fawo certainly predated Dayinchang, with Dayinchang probably the larger mine. The period of exploitation remains unclear. Since the place name Dayinchang appears in the Dongchuan gazetteer of 1761, however, they probably go back at least to the

early 18th century. The scope appears considerable. For quantifiable information industrial records that are probably held at Huidong could contain data on re-exploitation of old slags, as well as observations on the geology and the historic workings.





Local informant and our driver at the slag dump in the abandoned village and detail of slags.



View eastwards down the valley.



View up the slope of the abandoned village. The open pit mines are further up.



Recent gangue heaps along the brook above the pit/dam and looking for slags.





Slag layer in the banks of the brook.

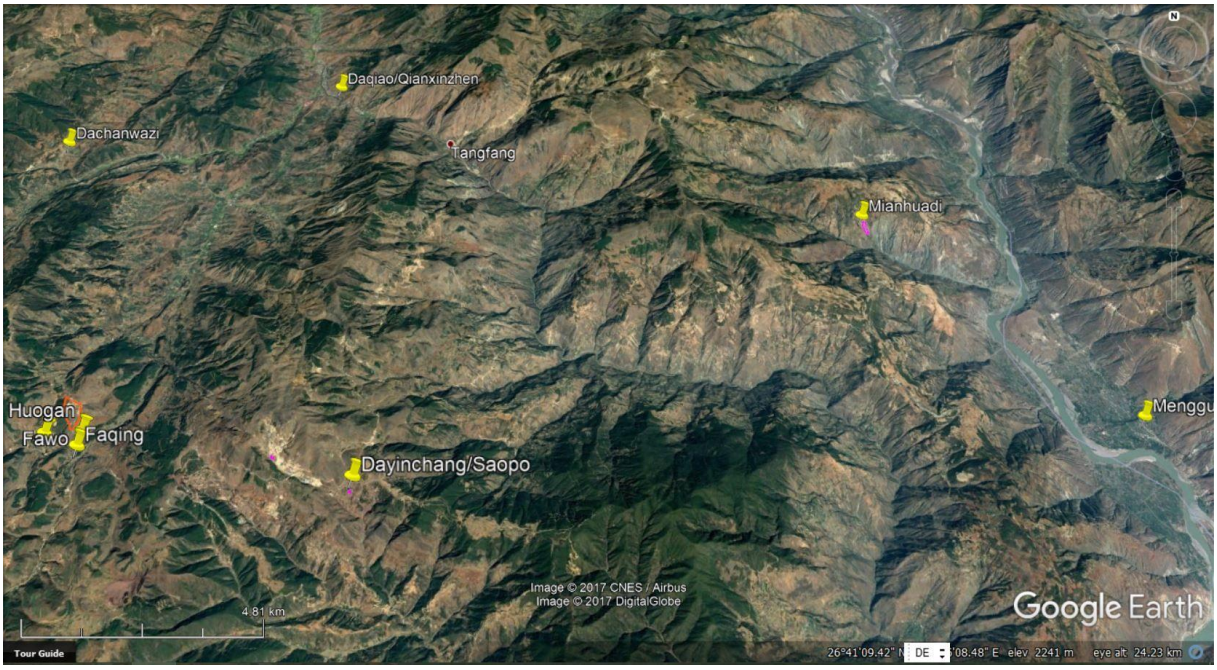


The bakery in the Faqing street of shops.

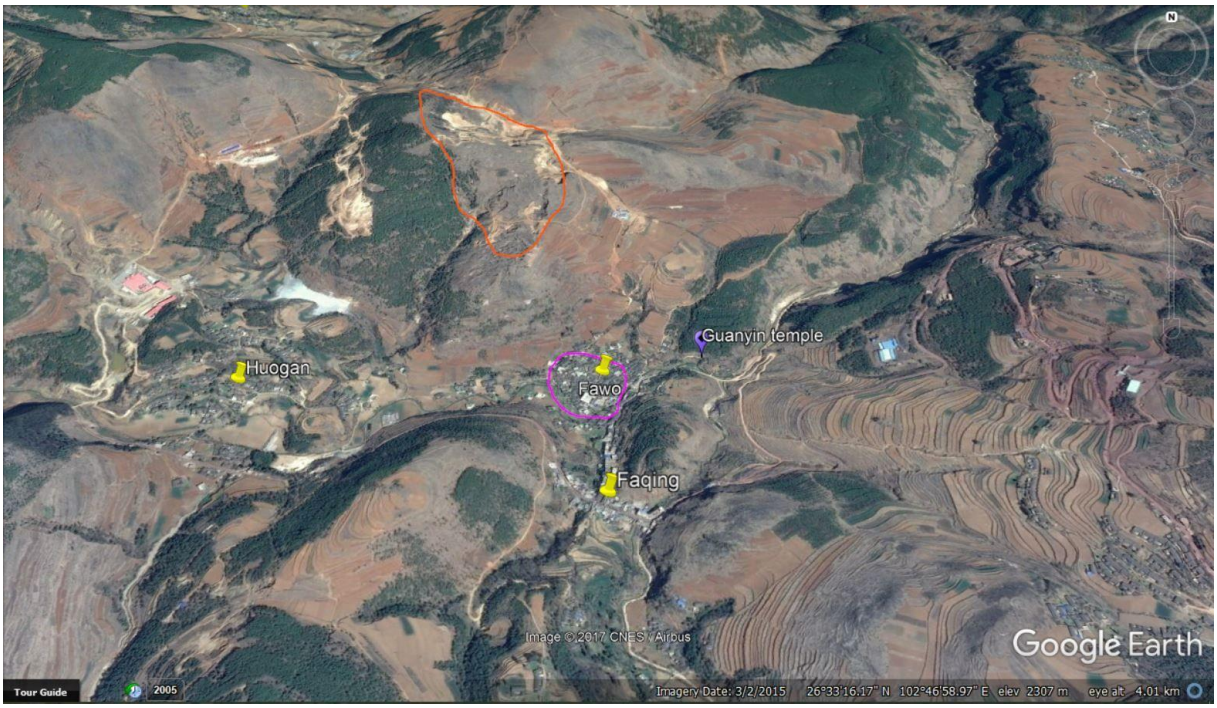




View up the gorge below Fawo and the mixed young forest.



The area of Qianxinzhen (Daqiao), with the Jinshajiang in the east, the Mianhuadi Mines, the Fawo and the Dayinchang sites, and the probable site of Xiaotongchang at Dachan wazi.



Fawo and the Laoshan mining area. Purple area: Slags, Red area: Mines.



The Dayinchang mines at the mountain of 3100 m, with the upper portion of the iron mining slope below.



View onto the Jinshajiang and Qiaojia from the Sichuan side.

Fieldwork on mines in northeastern Yunnan, 5. – 16. October 2017

滇东北古代矿业遗址考查，2017年10月5日到16日

金兰中、李晓岑、刘培峰 Nanny Kim, Li Xiaocen, Liu Peifeng

金兰中，2017年12月18日稿本

考查目标：滇东北除了乐马、矿山两个大银矿还有其他相当规模的银矿有一些线索，但地点和规模都缺少资料。

金沙银铜厂还相对清楚，据 1803 年《永善县志略》离县城 60 里，30 多口矿洞，年额收课银五千两。据《滇南矿产图略》约 1840 年代的报部税额为 1199 两。1800 年前后和 1840 年前后税额相差很大，但县收到的税和报部纳税会有很大区别，税额降低的可能性也较大。位置几乎肯定在今莲峰镇南 35 公里的金沙厂村。

彝良铜厂坡的地名在 1720 年代鄂尔泰奏折中就出现，据《滇南矿产图略》报部税额为 1199 两，和金沙厂一样。Francis Garnier 1868 年在大关听到 Co-kouy 河上有全国著名的银矿，在 Sin-cai-tsé，战争之前光抽水泵工人人数达 1200 名。近现代地图上查到彝良和奎乡附近的地方和古代矿山可能有关系，但并没有发现铜厂坡这个地名，位置不清楚。

会东大银厂本来无明确线索。《乾隆东川府志》（1761 年本）录金沙江以西大银厂、小铜厂两个地名，文献不反应任何开采活动。近代地图上两个地名还标，最新地图上查到大银厂村，并且村子以上有规模颇大的露天矿。

煜达、金兰中 2016 年 11 月 18 日对会东县铅锌镇（前大桥）的棉花地银厂进行考查，在镇上发现江西庙巨大柱足，听当地老年人说以前庙宇很多，并且规模都很大。大桥是古代会理到东川孔道上的镇，猜测贸易繁荣，但说明不了会馆规模。棉花地大概 18 世纪下半叶规模很大，但往东川或昭通的运输路线并不路过大桥，同样说明不了镇的繁荣。因此需要澄清附近是否有其他打矿，认为有必要考查大银厂和小铜厂。

金兰中，2016 年 11 约 15 日采访巧家文管所钟晓明老师，得知巧家县规模较大的铜矿遗迹在老店乡的团林堡和包谷垴乡的铜厂，距离离乐马不到 20 公里。从昭通到铅锌镇可以路过，两个考查点顺便加上。

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2017.10.05 (Thu): 昆明-昭通-彝良

早上7点半从昆明出发，1点半到昭通，与昭通博物馆馆长丁长芬会谈，经过丁老师的介绍和彝良县文管所禄汉云老师联系。

昭通朝阳区文广所的李老师提供朝阳区铜矿的情况：有几个遗址，都不大。在大寨和洒渔。问他洒渔的是否在茂林街附近，他确定是，开采应该是1990年代的。地名和铜矿相关的很多，但未能找到遗迹。

（Nanny按：2007年去的茂林街铜厂沟、鲁甸铜厂和小寨冶炼遗址的情况符合。）

下午看博物馆古代文化展，文物和展示都让人感叹佩服。

晚上到彝良。

2017.10.06 (Fri): 彝良县铜厂沟、黄木块

早上8点和禄老师见面，他已退休，身体不好，他夫人陪同。

禄老师提供的信息：宜良铜矿不少，但规模都不大，很多地名和铜开采有关，但有遗址的少。银矿遗址不是很清楚，铅锌厂下边好像有炼银炉渣。有一个地方有坟墓（未听清具体地点）。

禄老师带我们到朱仁文家，请他带我们到铜厂沟。

朱仁文（71岁，属狗，苗族，铜厂沟人）提供的信息：铜厂沟有矿洞，也有炉渣，有的是大跃进的，有民国时期的，也有古代的。庙宇没听说过。



The Tongchanggou valley. With the Luozehe on the left and Zhongzhai village well visible east of Tongchanggou, with the abandoned village on two ridges above.

安排他女婿开车，约10点出发。沿着洛泽河往南走一段，过了新场朱先生让车停一下，指出河对岸的遗迹（Nanny记不得是什么）。

过毛坪（洛泽和镇）拐进东面小支流的沟，土路陡。路上朱先生指出大跃进和民国时期的遗址，都在小溪边，没有下去考查。朱老说民国年间开采的矿洞还比较大。

约走进5公里，路中有卡，停车步行。到中寨，村子在沟底小溪两边，都是苗族，有一家是

汉族，姓杨，老太太在家，杨老到昆明去了。中寨之前在坡上，因为是滑坡，前不久迁移下来的。

继续从小路上去约1公里，从老村子下边过，沟有分叉，从北边支流再上一小段，小溪的一直小支流从北边流下的角落上是古代炉渣。深紫色，部分玻璃态，比较集中，层面厚度不清楚。路上明显，路拐弯的地方，约8米一直有，路的上边修梯田中包谷，见不到炉渣，路下边坡陡野草密，小溪里也看不到。路过小支流的地方有矿洞，高约90cm，宽80cm，进山15m左右就堵上，洞里有水。

朱老师说，以前在上边的地方工作，车路没通，从这条路走到铜厂沟。

培峰测试：N 27°32.1305， E 104°01.9326, 高1258 m。

返回，顺路到铜厂沟村，村子较大，无遗迹。

铜厂沟考查结果：朱老对大跃进和民国时期的矿洞炉渣的了解很清楚，有关所谓清代炉渣当地没有传说，当地不了解了就表明是古代遗迹，时代无法判断。矿洞和炉渣是否有关系也不清楚（Nanny觉得矿洞是现代的）。冶炼规模看来不大，但具体不清楚。如果要跟上唯一线索是中寨的杨老。





Li Xiaocen and Zhu Renwen at the copper smelting site and exposed slags in the path.





Mining gallery, entrance and interior.



View down Tongchanggou village from Zhongzhai.

Maoping town on the Luozehe.

约2点到洛泽镇（毛坪），决定下午前往铅锌厂炼银遗址，3点出发。

厂址在洛泽河东岸、公路在西岸。路边一位约60岁的人说铅锌矿以前是国营企业，近4年是弛弘公司开采。古矿洞有在老明槽，指出陡坡上的地方，不过河这边坡上也有，在黄木块，从土路上去8公里。

老明槽位置没有搞明白，但在坡度达80°陡坡上，在开采的矿洞使山坡部分滑下，决定先到黄木块。





Li Xiaocen on the slope above Zhujiaying facing the slope above the mining plant (Photo by Liu Peifeng), and the northern end of this slope identified as Laomingcao ("old open workings") by informants.

从水泥路上到二坪子，土路太陡，轿车上不去。在村里打听，有人说他们院子里就有炉渣。一看果然很像炼铅炉渣，进一步打听才明白是从黄木块拉下来的。

刘师傅（快50岁，二坪子人，铅锌矿的工人）同意开面包车带我们到黄木块。土路从陡坡爬上去，黄木块在一个坡变得稍缓，半碗形的缓坡南端。从村子出来就是一个颇大的炼锌炉渣堆。刘师傅说，他自己没有见过有人炼，因而应该至少是60年以前的。



View across the zinc smelting dump onto Huangmukuai.



Remains on the zinc smelting dump: Debris in close-up; layer of debris with retorts in the upper layer; retorts.

回到村子打听，碰上易富章（68岁，祖先从江西过来，到黄木块是第六代）。培峰补：从第五代开始炼锌。易先生确定是古代开采，炼银的炉渣也有，在朱家营的下边。朱家营是半碗形坪子北端的村子。

因时间不早，李老师继续和易先生谈，培峰和我继续跑，大概看遗址的规模。我往下走到他们指出的炼银炉渣的地方，碰上一对60多岁的夫妇收包谷，他们确定这个地方古代炼过。山上观音山有矿洞。

又上去和培峰汇合，他正在和朱快友（64岁，朱家营人）谈，和他约好明天再来访谈。

李老师和易先生从村里下来，易先生带我们到炼铅炉渣的田地，就是我已走过的包谷田那儿。老夫妇也来看，培峰取了样本先返回彝良。Xxx师傅直接送我们到彝良，5点半到。



Mr. Liu, a villager of Zhujiaying, Mr. Yin Fuzhang, Li Xiaocen and Liu Peifeng on the site of silver smelting slags below Zhujiaying.



View towards Zhujiaying from the zinc smelting dump. The track on the slope leads to Guanyinshan.





Lead/silver-smelting slags in the corn field below Zhujiaying.

易富章和李老师交谈中提供的信息：黄木块村都是汉族，有四个姓。易家先祖从江西太和过来，已经第六代，他父亲还炼锌，也炼银，他自己没有炼过。父亲炼锌赚了一些钱，在彝良买了一些田地，被判地主。以前炼锌是因为食盐很贵，他们炼出的锌带到宜宾卖，回来带盐和其他物品。以前到彝良办事去，早上天黑就出发，回来也天黑。

从黄木块看洛泽河东坡，老明槽很明显，陡坡上两条好像是从出来或塌陷的痕迹。

晚上有和禄老师见面。禄老师说不知道铜厂坡这个地名。在龙街有规模比较大的矿，大概20个矿洞，开采的是银，可能也有锌。元宝山有硫磺矿。大湾子有明代的天主教教堂（往东，约4公里）。还有铁矿。

2017.10.07 (Sat): Zinc and silver mining and smelting sites at Huangmukuai, Zhujiaying and Guanyinshan in Yiliang 彝良黄木块

早上到洛泽镇（毛坪），做客车到上二坪子的路口，走到刘师傅家，直接到朱家营，朱快友和他太太从田地回来，喊一位71岁的亲戚一起到院子访谈，还有朱老的孙女和两个青年，两个小孩。





Conversation in the Zhus' courtyard, and a piece of oxidized zinc ore of Guanyinshan.

朱快友和朱老提供的信息：朱家营约30户人，朱姓为主。朱家先祖从镇雄北冲过来，5代以前，和北冲朱家还保持联系，北冲朱家有族谱。家业炼锌，朱老炼过40年，对炼银没有印象，沙条也没有见过。听说是铅中提银。

炼锌用马槽炉，两排，每排放20到50个管子。一个管子装矿20公斤，矿石打碎，约豌豆大小，加一些配料。一个管子炼出的锌在1.2到4公斤之间。煤炭就是冶炼的地方后头的山挖的，矿石是观音山的。马槽炉地下有通风结构。以前用的管子比较小，他们用的直径指出大约40公分，以前的20公分，比较早的有平底的，装10公斤矿石。

朱快友给我们看一块矿石，不是观音山的，像加锌的方铅矿。青年小伙找出两块观音山的矿，浅灰棕色，许多长出石英的孔。

朱老确定观音山有炼银渣子。决定上去，朱快友不太愿意带我们去，大概怕我们会觉得路远。







Heading up to Guanyinshan, Liu Peifeng, Li Xiaocen and Zhu Youkuai. Guanyinshan village.

有土路到观音山，目前车走不通，高差不到400米，上来约200米已到石灰岩层，快上来转到梁子的东北面。梁子上小小的坪子是观音山天地合牧地。快到村子路上见到炉渣，第一个房子的前边比较集中。土路挖出田地的图层厚达20米，炉渣在突然分布均匀。应该是长期种地翻土分布的结果。炉渣上端基本是村子的下端，下端在田地里，不明显。大概比朱家营之下的炼铅炉渣堆大一些。

Lead/silver-smelting slags in the soil at Guanyinshan.

观音山第一家人主人是梅春银（51岁），太太、女儿、女婿和3个小孩都在家。

梅春银提供的信息：祖先从彝良过来，6代以前，大概办厂，但已不清楚。几代以前好像开采锌，没听说开采银矿。观音山以前只有两家人，和办厂有关系的另外一家姓陈。现在35户，大概160个人。听说观音山以前有38条街、72条巷。庙宇没有听说过，开采时期也不太清楚。村子后山有不少矿洞，也有鸡窝矿，矿洞现在堵住了。

有一个传说，听说办厂老板要报道给皇帝，因为想逃税，报道已经无矿了，回来果然没有了。

观音山以前也叫银炉山。

朱快友说表面上的矿石品位低，进山品味高，有氧化矿和硫化矿。

培峰测试炉渣位置：N 27°30.7735，E 103°58.7145, 高1774 m。



View NE from the ridge just below Guanyinshan, onto Guanfang and the mining slope behind the plant, with Maoping to the in the next river bend.



View south along the Luozehe valley from the same ridge.

View down the dump from the top end.

返回黄木块，晓岑继续采访，培峰和我从炼锌炉渣堆上端到下端看总规模。上端和南侧有煤矿，近来还开采过。炉渣堆填满半碗形宽沟的中部，长达200米以上，中间厚度超过10米，上端和下端层面薄，0.2 到 0.3 m。

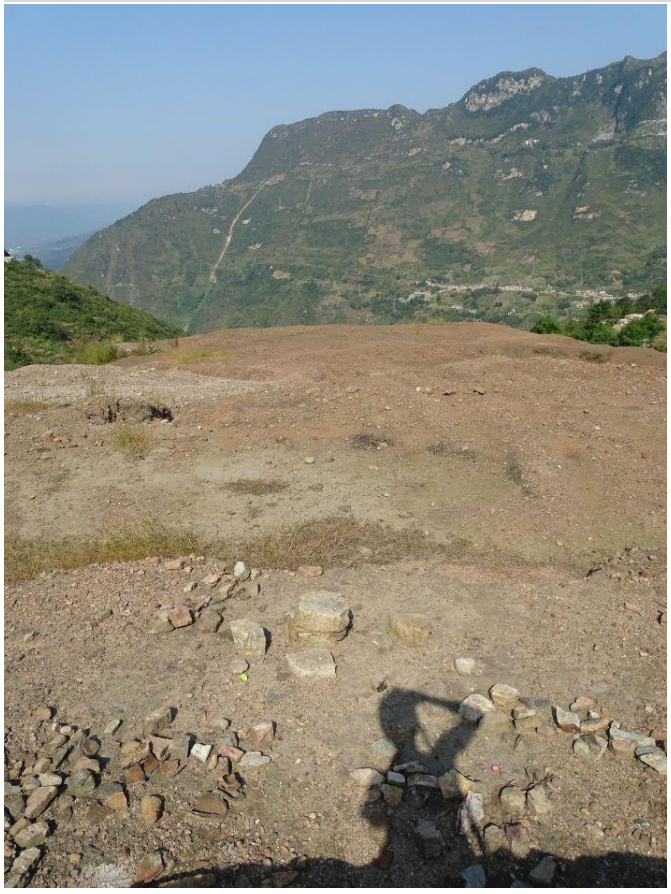
培峰测试炉渣堆上端： N 27° 30.2210，E 103° 59.0320, 高1388 m。

View NE from the ridge just below Guanyinshan, onto Guanfang and the mining slope behind the plant, with Maoping to the in the next river bend.

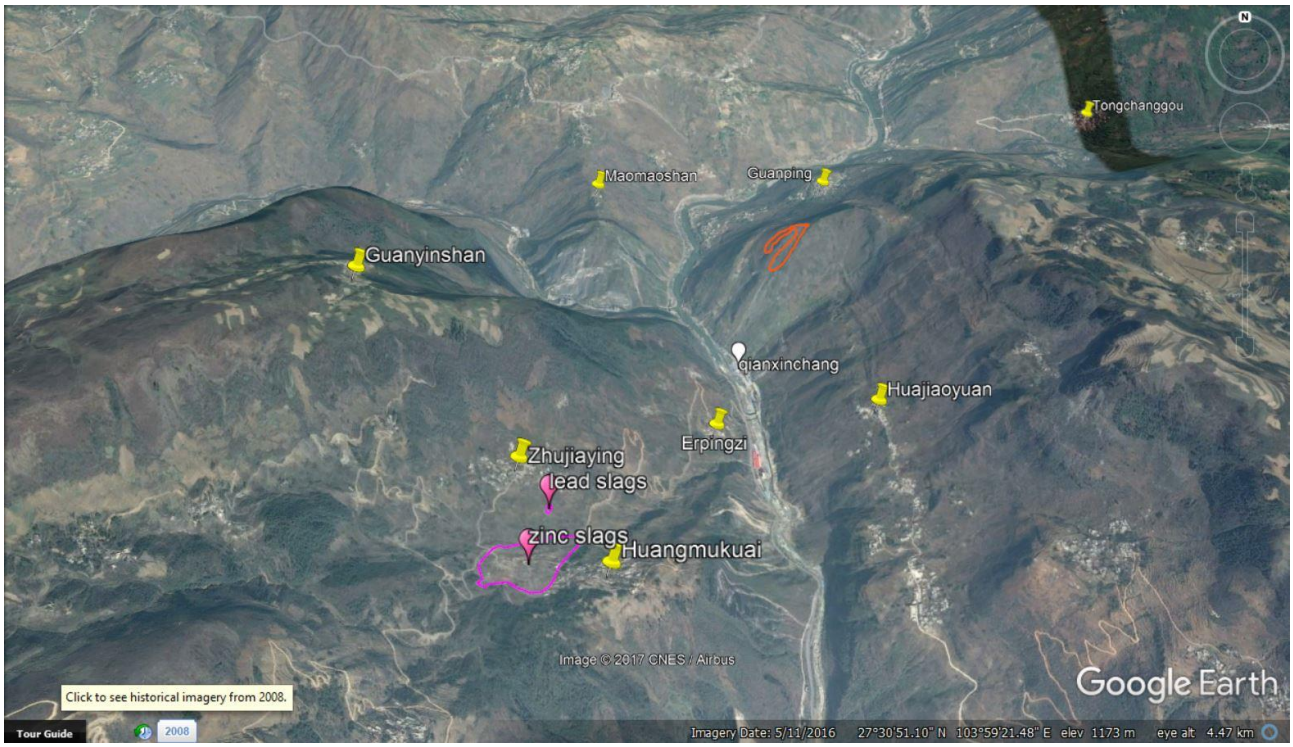
晓岑采访的60岁上下的村民提供的信息：来黄木块有6代了，上代人在矿山或炼厂工作，自己没做过。4年前从观音山搬下来。认为炼锌到40年前就停了。以前用马托东西，解放后不让用，20年前才重新学用马。

6点返回彝良。

黄木块的结果：遗址颇大，锌矿很大，银矿不太清楚。银矿重点在现在开采的东坡上可能性比较大，主要原因是lu老师说现在铅锌厂的下边以前有炉渣，位置恰好是河沟里唯一稍宽的地方，加上老明槽和民国地图上宝发洞和长发洞两个地名，梁子下面官地坪的地名（好像现在还有）。



可以跟上的线索：彝良铅锌厂的档案。和易富章进一步打听庙宇和对面坡上的情况，可以考虑到官地坪和铅锌厂以上坡上的新街村考查采访老人。



The sites around Huangmukuai. Purple areas: slag dumps. Red area: Laomingcao (historic open or collapsed mines).



The slope opposite Huangmukuai on the eastern bank of the Luozehe, which is presently exploited for zinc and lead and the most probable site of the historic silver mines of Yiliang. Red area: Laomingcao (historic open or collapsed mines).

2017.10.08 (Sun): Longjie in Yiliang 彝良 龙街

因距离较远，包一天的车到龙街乡。8点出发，沿洛泽河往南开20多公里，河谷一直非常狭窄，铅锌厂到彭家坡几乎都是峡谷，在水泥厂在一个从东（ENE）往西（WSW）走的大山梁下和一条支流汇合。在洛泽河（高桥对面）上坡，从河谷往东边高地爬。

元宝村在第一个大坡的上端，约9点半到。到村所打听，村长专门过来，建议我们找李代高。得知元宝村前几年才改名，以前叫洛泽河（Nanny 按：应该是清代洛泽汛）。



View from the slope just above Yuanbaocun over the top end of the village south, with the Luozehe valley to the right.

李代高师傅（56岁）正在车间忙着修理农具。他提供的信息：硫磺矿一直开采（大概约到1990年代），就在村子后头的坡上。以前硫磺炉有两排，冶炼技术就是传统技术。

他带我们上去，山坡反复被挖，有许多已成废墟的车间和选厂，是老铁厂，上端大概还在开采。给我们看两个炉子的遗迹，其中下边的还可以分别两面残墙，长约2.5米，残稿1.5米，四方结构，后墙有槽，比现在田地高60 cm，宽约50 cm。李师傅解释说：炼硫磺炉子里装3到4吨矿和煤炭（煤炭从贵州运来），不用通风，约烧一个星期，硫磺蒸汽从管道到上边的小房子，管道长约4到5米，小房子里有水，硫磺凝结成团。



指出硫磺矿山的位置，离冶炼遗址约1公里，往南，稍高。

培峰测试位置：N 27° 30.2659，E 103° 59.1021, 高1350 m。

返回村子的路上提到银矿，李师傅说这里也有炼银炉渣，就在老工厂房屋后头。给我们看一个很集中的炉渣堆。剖开的厚度约80厘米，从小路看约8米长，宽度因前后都有房屋无法判断。

培峰测试位置：N 27° 24.8843，E 104° 01.7629, 高 1561 m。



Mr. Li Daigao.



The wall remains of the sulphur smelter seen from the corn field; and sulphur crystals that had formed on an old dump.





The heap of silver smelting slags, and whitish cristalline formations in the protected cavities of the slag heap.



Yuanbaoshan village above the Luozehe.

12点到龙街乡，恰好赶集。打听附近相关地名，有人说有银厂湾、银厂坡、银坪村三个地方。先到最近的银厂坡村。年轻人叫我们到白房子的大爷去打听。

进院子，父子两位正在吃饭（60多岁和40多岁，大概姓张)，简单采访：来了10代了，老祖先从哪里来已不清楚，先说湖广，再想好像是福建，可能是温州。以前有过银矿，很久以前。村里以前有现水庙和观音庙。银厂坡村全是汉族，没有少数民族，大部分姓张。以前有两个管事，一个官。龙街大部分都是汉族。



Mr. Zhang.

老先生带我们去看矿洞和炉渣。从公路回到银厂坡河龙街乡之间的垭口，高差不大，周围都是卡斯特山包。在变电站停车，从小路往下爬。从野草高密的地方出来，老先生指出下边和往西一段坡上的老洞，山坡有两三个地方塌下来，其中一个说是前几年才塌下来的，是古矿洞引起的。

最近的矿洞看了一下，直径四方，像古矿洞。在石灰岩层中。西边两个开采遗迹明显的地方比较大，因时间的关系未能去看。

老先生还讲到老洞出水的一个故事，未听懂。

回到公路，往前走一小段，垃圾堆旁边下去，左手坡上对着煤炭，张老说这里以前都是炉渣。在被干扰的坡和小松树林找了半天，才找到几块炉渣。张说这边堆的煤炭不能用，终于听明白他的解释：大跃进在这个坡挖过锌矿，也炼过，是鸡窝矿，之后没有开采。大概整个坡现在看来被干扰的状态是大跃进（可能也是大跃进以来）被开采的痕迹。沟里有选厂。



Peifeng with people near the top of the ridge above the mining slope.



Old workings exposed by erosion



View along the slope, with several collapsed sections.



Part of the slope of the historic slag dump, disturbed by smelting during the Great Leap and probably recently.

回到公路到清真寺后边下坡的炉渣区。坡上是垃圾堆，近几十年打扰，找不到炉渣。老先生说以前这里到处都是，大跃进就在这里开鸡窝锌矿，当地炼锌，留下煤炭和渣子。才逐渐听明白古炉渣看不到的原因。

老先生赶集到龙街了。碰上一家人赶集来，他们说他们那儿就有炉渣。商量一下，请张国平（49岁）和张国照（52岁）带我们到后寨村去看。

后寨从变电站沿坡下去，在龙街乡的下边，有洞口和炉渣的沟上端的北坡上。

村子第一个房子前就有炉渣，玻璃态的，路上和田地里有。房子是新修的，地下是否有未听明白。剩下面积不大，比较集中。张师傅说他们听老人说附近以前还有一个炉子，他们自己没有见过，那边也有一些炉渣，什么时代炼的村里也不知道了。

培峰测试位置：N 27° 23.0302， E 104° 06.5303, 高1906 m。



View from the mining slope down the valley. Houzhai is behind the knob to the right.



At the slag dump outside the first house of Houzhai.





Mr. Zhang Guozhao. Slags and remains of a furnace at Houzhai. Photos by Peifeng.

张家祖先10代以前从江西来的，在后寨已经第八代了。

张师傅又提到他们还知道另一个有炉渣的地方，炉渣和这边的不一样。

他们决定改天赶集，带我们去看。从另一条土路回到公路，往西一小段就停车，从土路往北走一小段，地形比较平，松树林出来就是一个颇大的炼锌遗址。毫无植被，部分冲下到下边石灰岩石板露出，上端厚度约0.5到1米，下端到2米，宽20多米，长100米。有管子。

他们说在这里炼的时代不知道了，但听说煤炭是上边一点来的，矿石刚才看的地方来的，叫黑砩山，砩也就是矿。



The zinc smelting site near Longjie.





The thickness of the layer in the lower parts of the dump and large debris.



Bedrock exposed by erosion near the top end of the dump.

培峰测试位置：N 27° 21.9768， E 104° 06.7715, 高1893 m。

张师傅路上又提供信息：他们老祖先过来的时候，这个地方是空的。当时皇帝把彝族感到梁山了，这里没人。后寨大部分是汉族，有几家彝族。他们家有族谱。

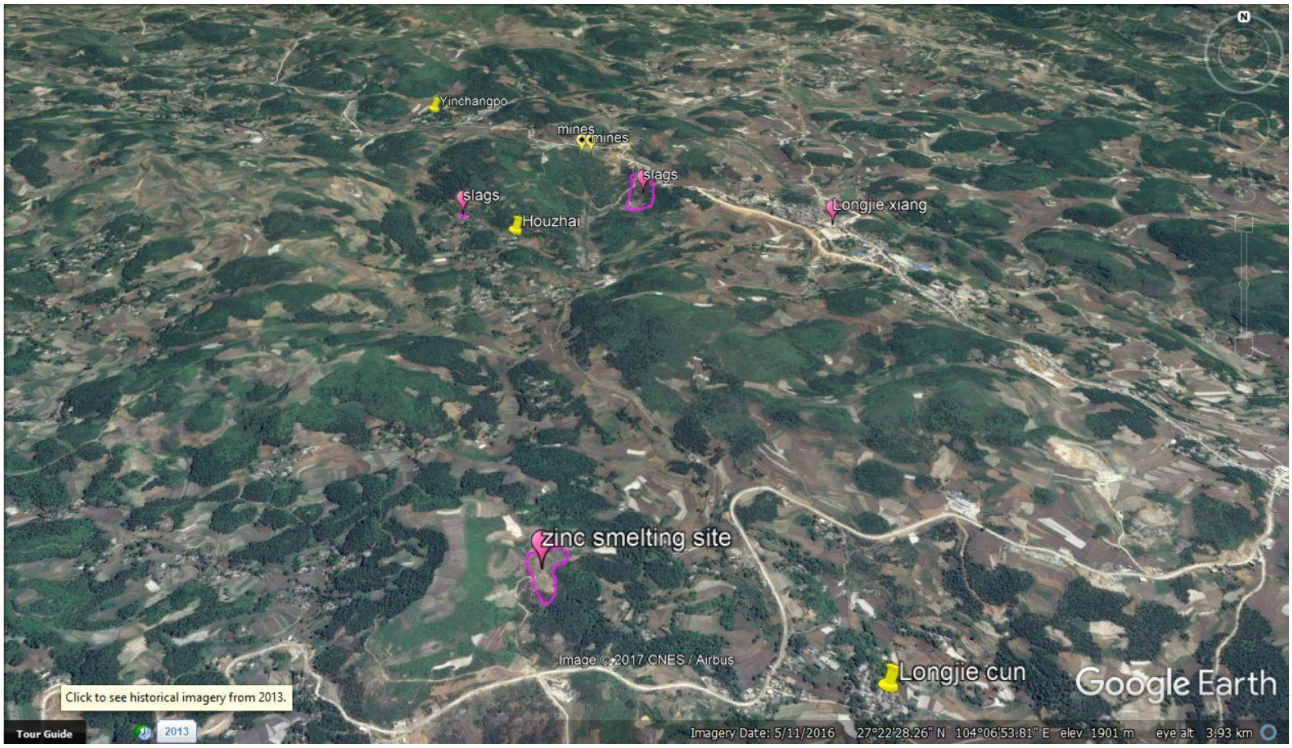
返回去看，是一个亲戚手写的。

已经下午5点，银厂坪、银厂湾和龙街村没去，返回彝良。据说，银厂湾没有东西，两个村子都离炼锌炉渣堆很近。

龙街结果：炼银炉渣留下不多，遗址应该较大，情况不太清楚。炼锌遗址非常大。开采遗址颇大，近现代是否继续土法开采不清楚，银矿和锌矿的分布也不清楚。推测是先采银，后采锌。

可以跟上的线索主要是采访银厂坪、银厂湾和龙街村老人，打听有关采矿的口述历史和关于庙宇的情况。还可以考查奎乡，以前矿区重要，交通枢纽应该也比较繁荣。

彝良和镇雄今后考查线索：彝良县西北约16公里属大关县的银厂湾村和观音庙、彝良县东北约50公里两河乡铜厂村。镇雄牛街镇西南的铜厂沟、湖广村可能是清代长发坡铜厂。镇雄县碗厂附近银槽子、官房、银厂沟（离彝良70多公里）。



Sites around Longjie.



The mining and the smelting slopes between Yinchangpo and Longjie. The blue-roofed building is the mosque.



The zinc smelting dump near Longjie.

Fieldwork on mines in northeastern Yunnan, 5. – 16. October 2017

滇东北古代矿业遗址考查，2017年10月5日到16日

金兰中、李晓岑、刘培峰 Nanny Kim, Li Xiaocen, Liu Peifeng

金兰中，2017年12月18日稿本

第二部分，10月9日到16日， 考查目标：金兰中（Nanny Kim）和刘培峰

目录：

2017.10.09 (Mon): Yiliang to Lianfeng in Yongshan 彝良县到永善县莲峰镇

早上8点李晓岑回昆明，Nanny和刘培峰9点出发，先到昭通，做11点多的班车到莲峰。

3点到。在镇上找采访老年人。



Satellite image of the .Jinshajiang valley with Lianfeng on the edge of the plateau-like ridge and the Jinshachang valley.

采访路边闲谈的5位60到70岁的人。有人说莲峰以前有20多个庙宇，现在剩下的只有一对文革时打破的狮子和更残缺不全的大像、几棵柏树。金沙厂的情况他们不太了解，开采的是锌矿、金银铜，还有锰。有一位60岁的太太说20年以前，还吃不了粮食的时候她去过，有洞子，现在都被堵住。以前迁移来的人有的做生意的，也有逃荒的。

他们带我们去看石雕，建议我们找文化站。

（小学建在老文庙里，2007年Nanny第一次来还有前边几个老建筑，现在新秀讲学楼。）



View across the new town square onto the temple cypresses and the red school gate.

到文化站找到王站长，她不了解莲峰的历史，建议我们找一位退休小学老师，指出他的房子。从老

城东西主干道从台阶走下，找到他们家。

刘本贵（72岁）和他儿子在家。刘老师说对以前庙宇也不清楚，但他的老师就住在附近。带我们到他们家。

采访徐煜（86岁）和他老伴殷代芬（83岁，结婚已61年）：从老城下边（他们家）回忆以前的庙宇说有：城隍庙、黑神庙、财神庙、娘娘庙、龙王庙、张爷庙、川祖庙、江西庙、肖姑庙、臭水庙、文庙、武庙。城隍庙建成距今（20到30年前）有183年。

有关金沙厂认为和莲峰没有多少关系，但徐老记得两个故事：开矿时有一帮人挖矿，找不到矿石，挖了很久，有一个算命的告诉他们，还没到时候了，需要挖到见到一个肩膀带旗子的人就到了时候了。他们部分人不信就走了，部分人还挖下去。一天又个人走过，他把裤子脱掉了，带在肩膀上，风一吹就像旗子似的。把这个人招来让他参加挖矿，矿石果然挖到了。

另外有一个矿洞叫雷封洞。这个洞子突然被雷封堵了，跟上矿洞塌下，原来是神打雷保住矿工的命。运铜没有听说过。





One of the repaired lions and one of the damaged elephants.





Mr. Xu Yu and Mrs. Yin Daifen (Mr. Liu Bengui did not want his photo taken). Photos by Peifeng.

2017.10.10 (Tue): The Jinsha silver mines in Yongshan District 永善县金沙厂

莲峰到金沙厂村有油路，距离35公里。包一天的车去。

公路直下到万和乡有一段稍微平缓一点，乡后大坡上种一大片松树林。万和以南从山梁绕下，从北面绕到南面，进金沙厂山谷。

金沙厂是沟里第一个村子，村所就在路边，培峰联系了值班副村书记。等他来时候和住村所对面的人（约60岁）和广场过来的（约45岁）打听。他们说金沙厂的人都是外边来的，有江西和湖广的。有矿洞，炉渣也有。以前下边沟里有两排炉。上边有村子叫官房，下边有税房。广场边两颗老树是黄葛树，有300多年。



The square and the shops at Jinshachang village.

尧信明书记（1965年生）来了，建议找一些老人。公路边正好准备打牌有三位老人，请他们到村所采访。

罗现放（80岁）、陈连收（85岁）、李光德（74岁）提供的信息：大概300年前从江西过来的人开这个厂。大跃进时土法炼铅，也炼银，当时技术就和老人打听学习。大跃进金沙厂开采的矿当地不炼，选矿后拉走的。之后劳改营也开采铅矿和锌矿，矿石用马车拉到公路。采银矿已经100多年了，没有遗迹了。

有关古炉渣是否收回再炼的问题，好像不清楚。

以前有黑神庙、观音庙、三王庙 （云贵川三省）、炎山庙。他们还见过，但解放后被毁。黑神庙最大。

其他和矿的地名还有，有炎山、猪路，在山上，专门给狂民养猪、下面有菜园。

有一个说法：“有suan打suan，有引打引，无suan无引，打xx井。”

传说还有一些，开矿的故事基本和徐老讲的一样，这次讲肩膀带旗子的人是乞丐。有卖鲜桃的故事和累封洞的故事。

老新矿洞还很多。

庙宇不存在，柱足还有。

就在广场边，我们去看，有8个，尺寸一样，四方基础宽约40厘米、上边柱子直径约28厘米。广场和下边运动场应该就是庙宇遗迹。看的时候三位老者回去了。

尧书记带我们去看矿洞，从土路上去，过小溪，在山梁西北破下端有现代矿洞，带我们去看一个老洞口，在岩石细缝。到026号洞，迟绍能（1949年生）看泵站，同意带我们进去看古洞。从现代矿洞进去约50到70米，穿过几个古洞，两个地方往上空间相当大。古矿洞见不到矿石痕迹，但岩石比较黄，有石英苗。

尧书记说，以前走路到莲峰要5个小时，早上天黑出发，晚上回来也到天黑才到家。



Meeting the informants on along the road.



Mr. Luo Xianfang and Mr. Wang Guangde in the office.

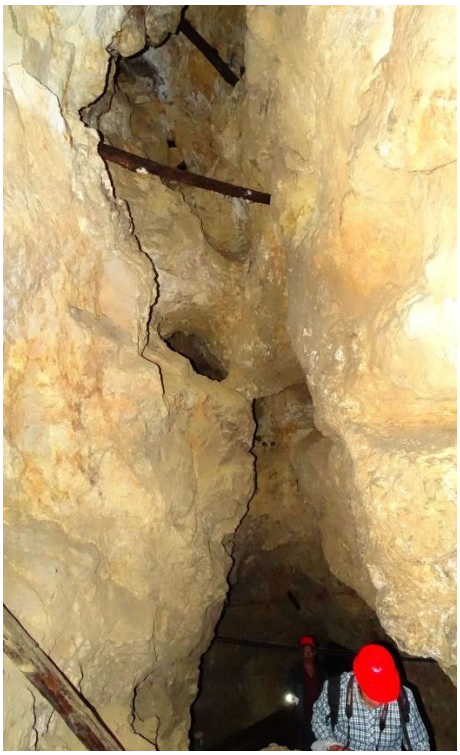


Mr. Yao Xinming at the pillar bases on the square.



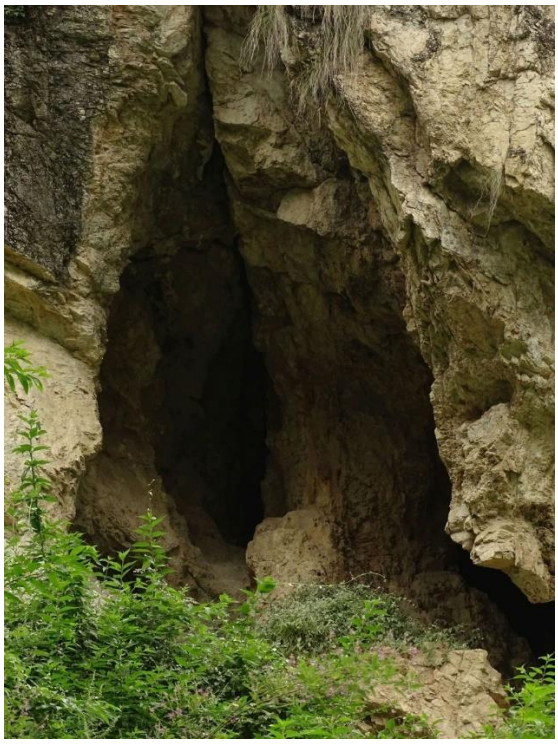
View from the square into the mining valley.





The gate of the mine and old workings inside.





Workings in the cliffs.



View from Mine 26 eastwards up the northern arm of the Jinsha Stream.

返回金沙厂村和另外两位村干部吃饭。其中宋副书记对古代矿了解的，他们家有族谱，祖先是办厂来的。

炉渣的问题问题回答一直模糊。以前有过，1990年一次大洪水将沟底从大坪子到税房冲得岩石都出来了，炉渣也冲走了。山上还会有，但地点不清楚。

宋书记同意再带我们去看。先从土路上到官房，村子颇大。再下到炎房，由8个社组成。

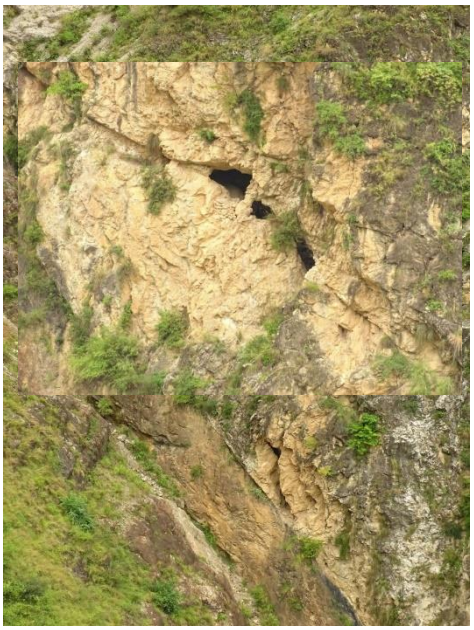
地形和分布基本清楚。金沙厂沟基本由两条溪水的山谷形成，金沙厂村在大坪子下来的溪水和一个北坡下来的小支流回合的地方，村子之下，两条较大的溪水回合。山谷北坡、东坡、和南坡都非常陡，平均大概有70%。两条溪水之间的山梁上是唯一平缓一点的地方，官房就在这个山梁最下边的小坪坝上，官房之上是豆坡，炎房在南坡上。

官房之下到一个在开采的矿洞，宋书记指出对面南坡上的古洞。炎房下有明确的山崩痕迹，宽约40米，高差至少200米，部分被冲或塌下古矿洞都在之一段里。

开车到炎房之下，断层西端的现代矿洞，坡下看到税房，现在是选厂。选厂以上确实沟里唯一稍宽的地方，古代冶炼在这个地方可能性比较大。

宋书记说，菜园还要下去，走出来就是河口。







The ruptured slope of Yanshan. Insert showing the verhanging section with exposed old workings.





Remains of the temple walls and view north across the southern arm of the Jinsha Stream.



View down to the sorting plant, with Jinshachang village partially visible on the slope onthe larger road and the school and some houses visible of Guanfang on the ridge.

根据当地干部的了解，大部分古矿洞在官房一下的西北坡，在对面金沙厂以上的南坡有一些，炎房也有一些。

到宋书记的家去看族谱。家在豆坡，从官房走小路上去。小路下端去年修了水泥路，是一个老板捐1万块钱修的，村里出劳动力。水泥路上端是一个观音祠，前几年修复，有功德碑。有古代雕塑的一只脚，岩石上刻的嘉庆年间功德碑。碑文十分简单，岩石也不平，只能确定部分内容：

永乘万古
计开
官房厂炭阁厂众姓人等
匠士侯 xx xxx

xxx
嘉庆x x 年

宋书记家谱从光绪年间起。

回到官房，宋书记说李家有黑神庙遗迹。李清龙（78岁），在官房4代了。客厅放了一个先当粗糙的石板雕塑，上颜色，看不清是什么神，高约80厘米、宽约50厘米。街上有几个柱足，尺寸和金沙厂村的相似。



View onto Guanfang and down to the Jinshajiang.

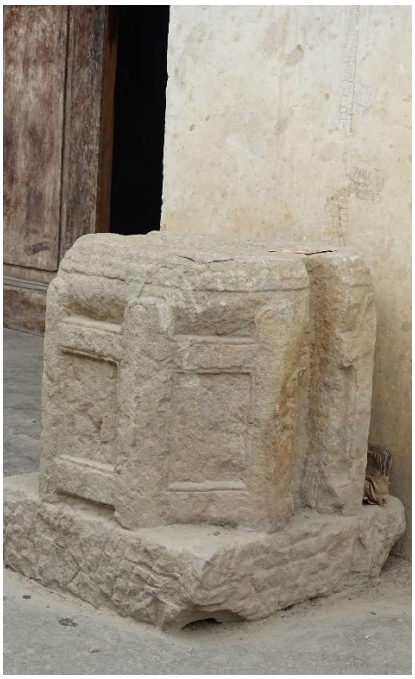


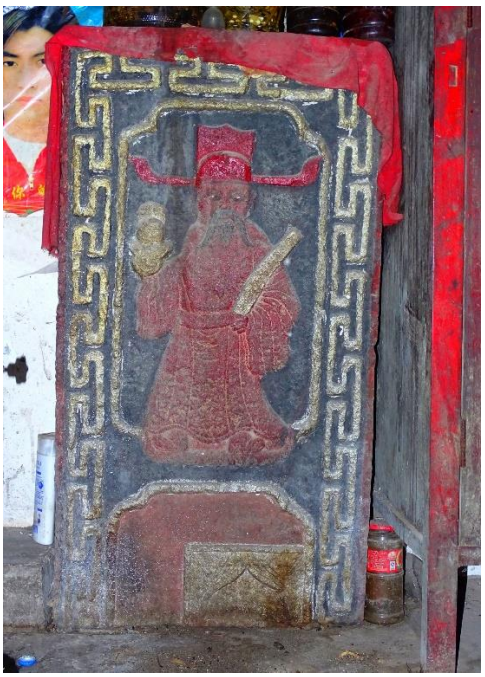


The Guanyin shrine above Guanfang and the foot of the former statur in the left coner. Nanny is trying to take photographs of the inscription in the rough frame next to the niche. Photos by Peifeng.



Mr. Song at the Guanyin shrine.





A pillar base in the main street of Guanfang and the bas-relief in the house of Mr. Li Qinglong.



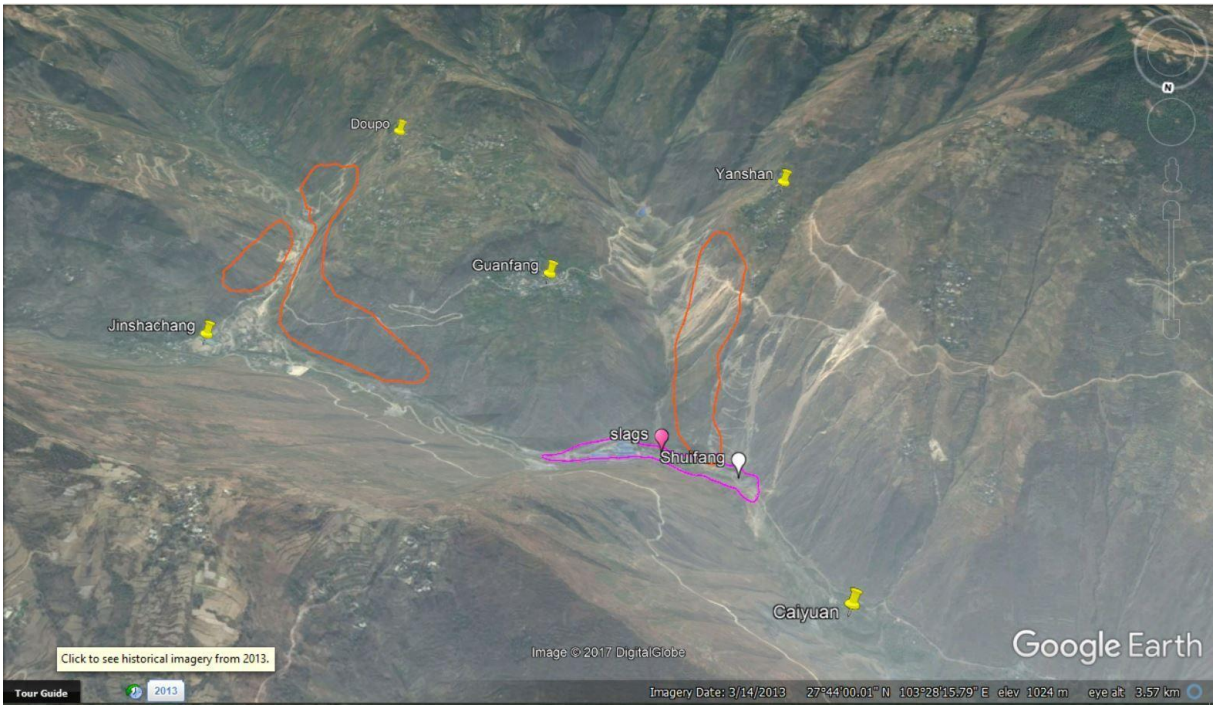
The piston bellows. Photo by Peifeng.

在金沙厂村上端又停了一下，一个铁匠家放着一个风箱。铁匠说以前用过，梧桐树做的。长140厘米外直径约30厘米内直径约25厘米，鸡毛还有一点，把手是铁管做的。

5点回到金沙厂村，6点回到莲峰。

金沙厂的结果：遗迹少，从矿洞和相关地名来说，规模应该不小。当地对古代开采的口述历史相对少。

下一步的线索：找炉渣在税放附近应该还能找到。可以进一步采访官方等地方老人，问问传说和回族的情况。



The layout of the Jinshachang mines. Purple area: main slag dump: Red areas: areas of workings.

2017.10.11 (Wed): Lianfeng to Zhaotong 莲峰镇到昭通

8点半做班车回昭通，12点半到，下午和丁老师交流。

2017.10.12 (Thu): Zhaotong to Baogunao in Qiaojia District 巧家县包谷垴

天气变阴，小雨。

和巧家文管所钟晓明老师联系，他说包谷垴铜厂沟古代炼铜遗址在准备修水库的地方，文管所立碑。

租车到包谷垴。车司机是龙头镇八宝村人。她的一个亲戚就挖出过120个东西，放在家里。他也进过老矿洞，在矿洞里找到一个神的雕塑，搬不动，应该还在里边。



The Niulanjiang gorge.

Below: The characteristic ridge to the east of the Lema Mines, seen from the ascent towards Baogunao.



到包谷垴打听铜厂沟，水泥路8公里，小路3、4公里，从西南边的山梁上去。走上去从一条溪水上去，有一段是峡谷，坡度都搞，铜厂沟村在山谷稍宽的地方。村里打听老炉渣的地方。

到朱忠运（64岁）家，他们祖先6代以前从宣威过来，先到马树，再到铜厂沟。他们到了已经没有铜矿了。坡上有40多个老洞子。1958年试采过，没有成功，10到20年前也没有成功。

溪水里就有炉渣，他们给我们看。

再走到一个已不用的宿舍，旁边炉渣就明显，有文物遗址碑。溪水有一条小支流从东坡流下，炉渣在小溪北岸。上边有3到4家人。土路旁剖开，炉渣层比较清楚，下端可能达1米，中部20到30厘米，上端在最上边一家溪水拐弯，山谷变得狭窄的地方，厚度不清，中间也许中断，也许挖土路被干扰。

培峰测试：N 26° 57.5144， E 103° 21.6229

吕光甫（42岁），最上边房子的主人。11代以前从宣威来，先到露点，7代以前到铜厂沟。古矿洞有48个。1958年开采过，矿石拉走，新开采的矿洞也有。

包谷垴铜厂沟的结果：矿洞不少，据口头历史的48个洞是一个至少在20洞以上的复数，炉渣不太多，经过水土流失。和乐马厂相关一个规模不大的铜矿的可能性较大。



The layout of the Jinshachang mines. Purple area: main slag dump: Red areas: areas of workings.



The small gorge ascending to Tongchanggou.



Zhu Zhongyun and his son with Peifeng in the bed of the lesser stream.



Zhu Zhongyun, his son and Peifeng in conversation.



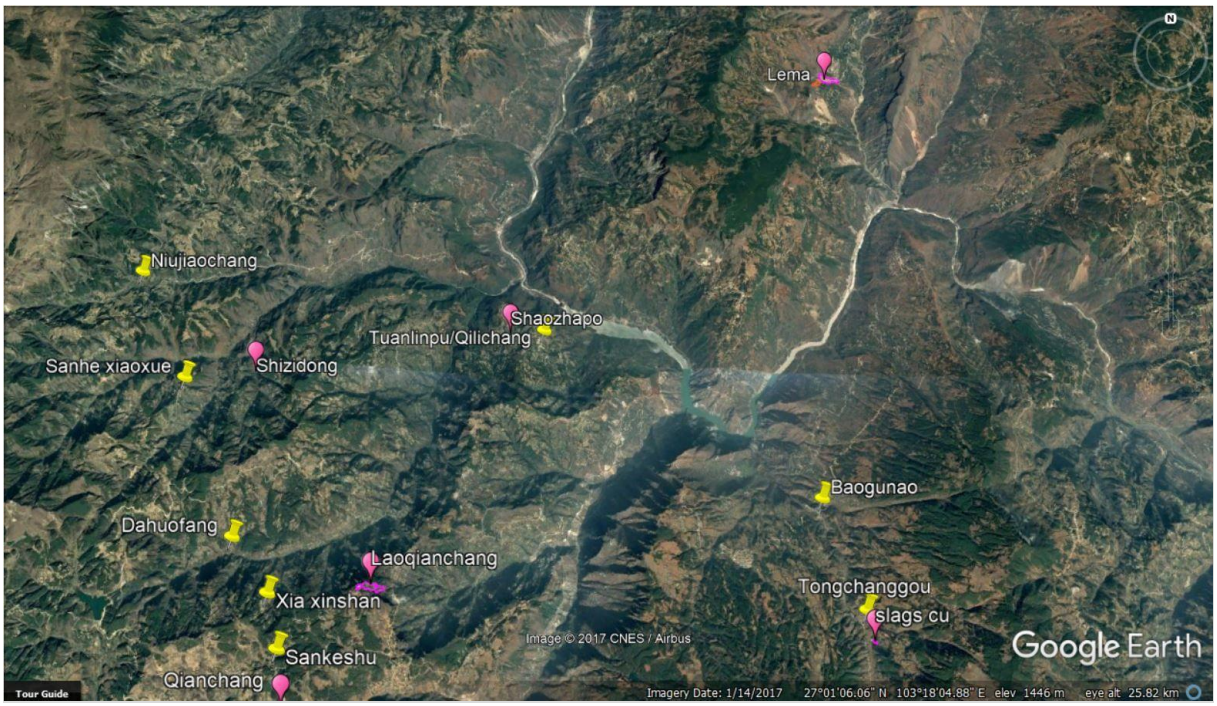
The slag area seen from below. Slags are evident in the banks of the track and in the small fields up to the houses..



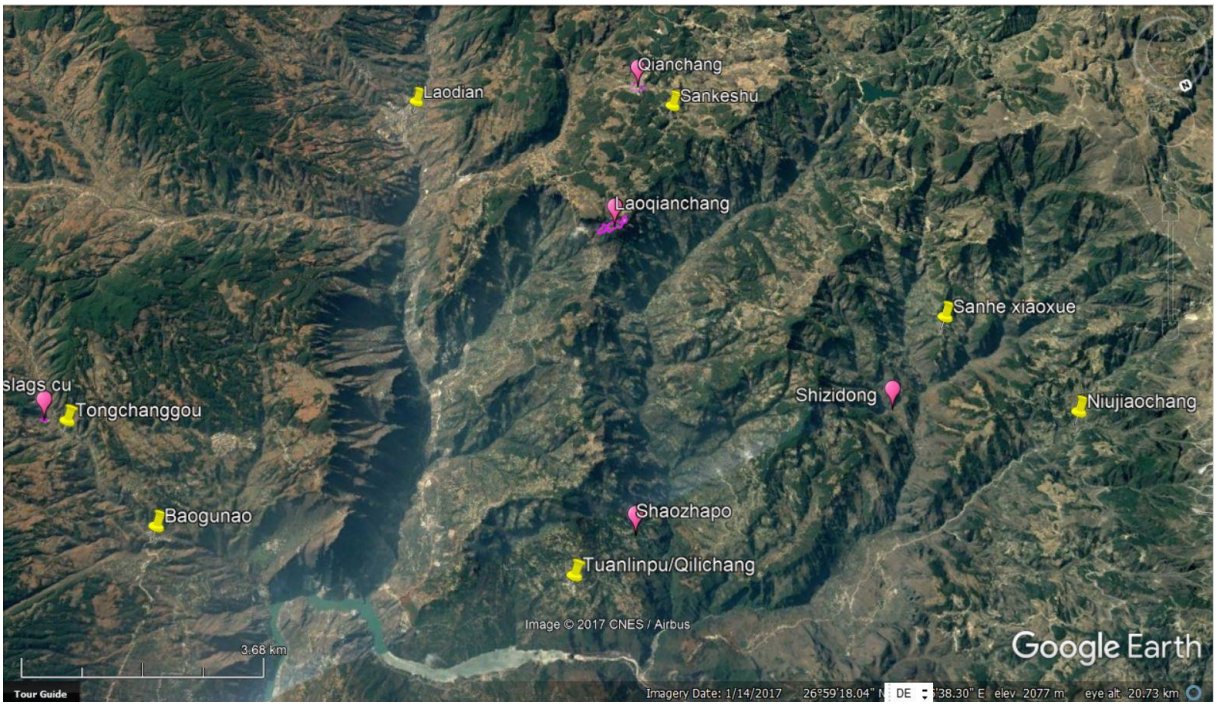
The last house in the side valley. The darker area in the dirt track are slags.



Copper slags in the soil, explosed by terrasing and erosion.



The Niulanjiang and the southern corner of Ludian with the Lema Mines and the northern parts of Qiaojia.



All sites in a perspective facing south into Qiaojia.



Tongchanggou. Purple area: Slags. The mines probably extended along the slope from the small forested area above the houses on the slag dump along to the main village.

2017.10.13 (Fri): Qilichang at Tuanlinbao and Qianchang in Laodian 巧家县老店镇、团林堡（七里厂）、铅厂

出发稍晚，快到8点，下来和旅店老板说我们到老店镇，他立即打个电话，说客车前边等。我们还没搞明白，其实是客车刚出发，他又司机的电话，让他等我们（“两个外地的”）。顺利赶上客车，9点多一点到老店。

镇政府帮我们联系文化站的，但他什么都不了解，聊起来镇书记（？）让一个年轻的干部给我们安排车。

办公室等的时候，和铅厂村书记联系：确实有冶炼遗址。

等司机时候xxx提供有关团林堡的信息：铅厂有很大的炉渣堆，但矿洞不在那儿，在三合和新店，三合离铅厂有十来公里。

做镇政府的越野车到团林堡，路不远，但一旦从昭通到巧家的大公路岔进去都爬在陡坡上，沿治乐河到牛栏江，又从牛栏江小支流往东南走。天阴多云，部分走进云彩，地形不太清楚。在团林堡和药店的 王大朝（63岁，从江西吉安过来6到7代） 打听：

团林堡村有23个自然村，人口3千多（？），汉族为主，少数民族少。有矿洞，开采过铅锌矿，矿区是七里厂，还有点距离，建议我们找 xxx。庙宇不太清楚，团林堡以前有过观音庙，在现在的村镇的上边一点。

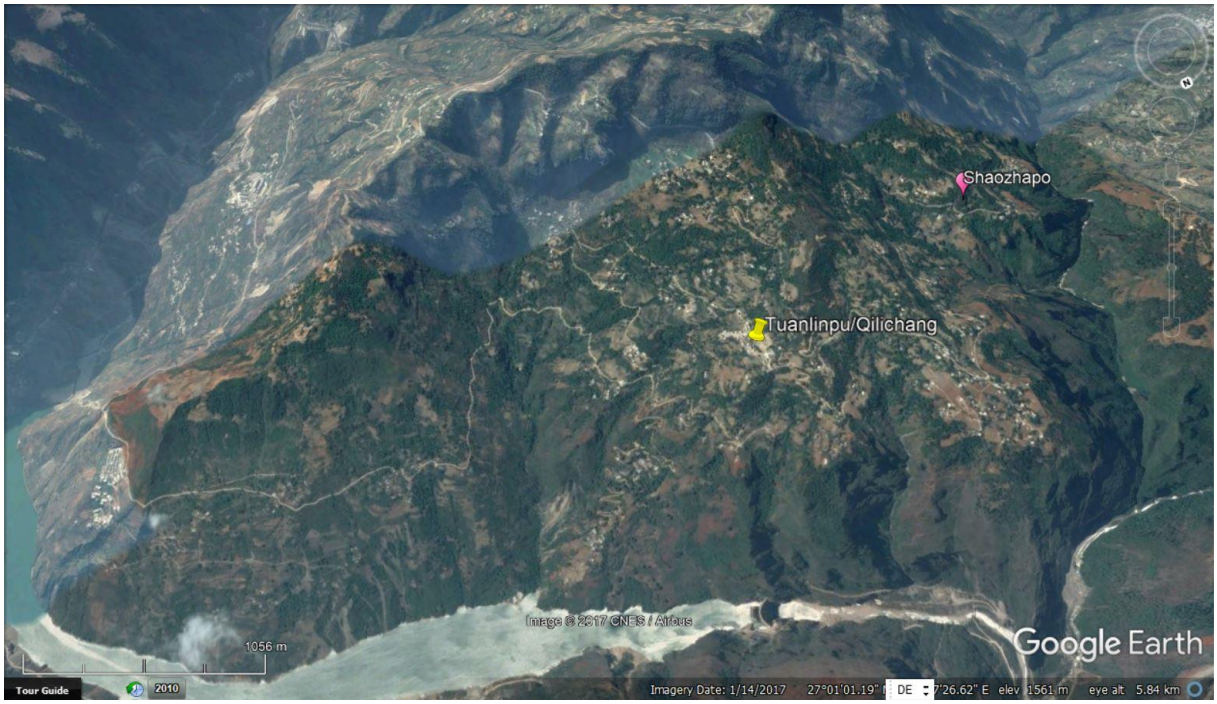
村书记来了，让一个刚到村里的人带领我们到古矿遗址。 先到他家，何庆竹 （40岁，田上社）：

古矿洞至少十来个，他进去过，很深，弯弯曲曲的。拿出一些新的和在老矿洞找到的矿样本。有贵州公司试采过铅锌矿，现在还在开采。矿洞主要在公路之下的坡上。

何师傅带我们到烧渣坡。先继续开进去，约1km，爬上一个陡坡，部分种花椒和核桃。名字是发现炉渣之后取的。炉渣像铜渣，没有明显的层面，分布在土壤，面积不大，约在20x15米之间。老洞在烧渣坡之下，分布搞不清楚。



The town of Laodian.



The Slope of Tianlinbao/Qilichang high above the Niulanjiang. The satellite image shows a dam right below Tuanlinbao, due to older height data, the river appears strangely stretched up the slopes. The location of the slag dump is uncertain.



Above: The site of historic slags. Inserts show dar grey and blish slags in the orchard floor.



Left: Momentary view of the slopes of Tuanlinbao.

位置 N27°00.9355，E 103°16.4895, 高1724 m。

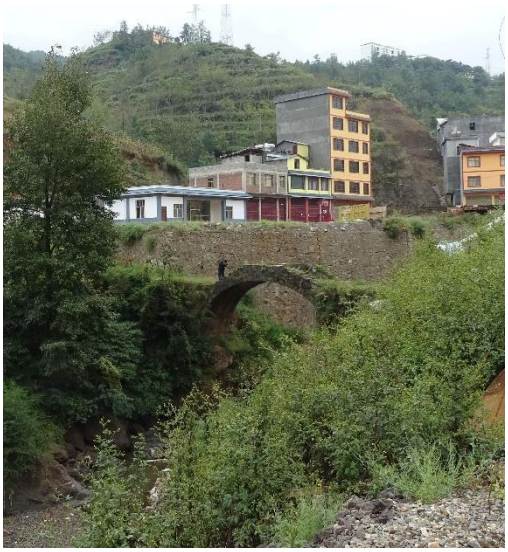
地名出了七里厂意外有豆芽坪、庙坪、官房、锅炉坪（或古炉坪？）。

所有人认为开采的是铅矿或铅锌矿，药店的王大朝说以前开采的是银矿。

中午快到1点回到老店，下午找了郑宗海师傅开面包车到铅厂。

七里厂结果：因天气和时间的关系，只能确定七里厂地名确实是古代矿山，规模和矿质都不清楚，庙坪等村名一定和矿有关，可能规模不小，需要进一步考查。此外牛栏江分流的山谷进去约5公里还有牛角厂这个地名，值得澄清。

上路之前先到钟老师提到过巧家县唯一还在的老乔，老店镇下的花桥。郑师傅知道位置，出镇就到，挤在二级公路边。桥已不用，颇高，郑师傅指出南面有小小龙头，北面有过龙尾，已废掉。





The old bridge below Laodian. The present town occupies the slope above the yellow building, with a few houses just visible.

郑宗海路上聊天提到：老店附近就有铜矿，他们以前进去过，炉渣没有见过。

一路爬在坡上，从治乐河的沟上来之后，许多地方是回复的很好的松树林，郑宗海说是飞机泼种的。大树看来约 50年了。

到铅厂村赶集，进村打听，第一位老先生就个我们指出炉渣堆。看来后边被挖过，厚度至少达5米，坡上水土流失严重，炉渣堆以上有煤炭，干扰的坡以上松林回复得相当好。

位置：N° 26 56.8429, E° 103 13.8410, 2563 m

跟村里三位老年人打听：

杜开芝（81岁），耳朵聋：炼过锌，从16岁干的，10年当师傅，1954 到1956年还是私家炼的，后来国营。

一位70多岁的老者说：炉渣堆是清代的。大跃进大炼钢铁用炉渣里的金属炼（铁？），没有炼成功。炼woyuan（倭铅）就是锌，老铅厂的炉渣更多。

傅章伦（81岁），1955年搬到铅厂村：没有见过冶炼，炉渣是清代的。现在村里的街道和房子的下边都是炉渣。庙宇没有的。58年肚子都吃不饱，没有炼出来。矿从三合和新店运来的。

到老厂有水泥路，约3、4km，过三棵树。从铅厂出来上坡就到松林，沟里是云，部分路段有雾，方向搞不清楚。

到树林里的人家，沈正富（59岁，父亲搬上来）很快答应带我们去看。快到梁子上土路太陡，车开

不上去，走一小段上来，从树林走出来看到山包，站在挖过煤炭的烧渣坡的上端。在雾中走，面积不太清楚，雾有时起一点，总共很大，层面不厚，1990年代挖煤部分扰动过。

沈正富说：他父亲搬上来，当时没有村子。炉渣的面积上下达1 km宽500 m。下面有坟墓，没有墓碑，是工人的。冶炼在清朝，和乐马一起，同时衰落的。矿石从乐马运过来。以前有人收回陶罐片，片上粘金属。（靠近下端他们堆起陶片，培峰取样。）以前矿只能从乐马买，锌也只能卖到乐马，有厂规。

约6点半回到车，7点多回到老店。



Peifeng and Mr. Zheng at the slag dump, the houses of Qianchang in the background.



Packed undisturbed debris.





Large debris and remains: Bottom ends of clay retorts and a “sand bar,” part of the grid in silve cupellation hearths.s



Qianchang. Purple area: Slag dump.



Part of the slag dump at Laoqianchang, with coal dumped or occurring naturally.

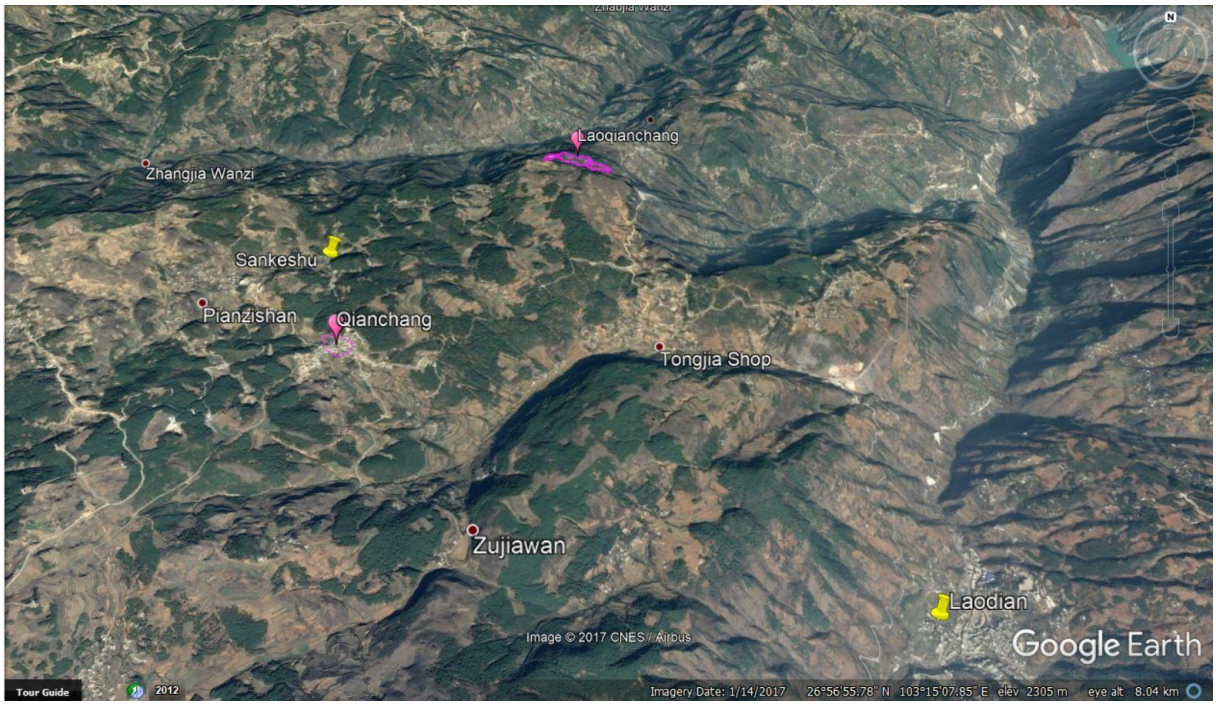




Mr. Shen Zhengu and the dump in the clouds.



The slope of Laoqianchang.



The area of Laodian and Qianchang.



Probable extent of the slag dump at Laoqianchang.

2017.10.14 (Sat): Sanhe in Qiaonjia, on to Qiaojia 巧家县三合村-巧家

老店下雨，决定还是去三合，希望山上相对晴，郑宗海同意带我们去，9点出发。

路上一直下雨有雾，先到铅厂，又往西走一段有岔路往北，大部分还是比较好的公路，部分正在扩修，往三合村下去一段是卡车压烂的土路，距离不远，大概2公里不到，但很不好走。

到了三合还在下雨，不是原来自然村，见不到几个人，走进小学的院子，学楼崭新，食堂还在施工。培峰和一位退休老师打听，他和唐光红老师联系，本地人，约30岁。

唐老师提供的信息：矿洞在下边只有小路可以走下去，约10里路，他走要40分钟。今天下雨，很不好走，坡很陡。地名叫狮子洞。他外公家就在洞口旁边，外公姓田，70多岁，耳朵比较聋。他自己进去过，矿洞很宽，也很深。是铅锌矿，肉眼看和一般的浅灰色石头差不多，但有小快快闪亮。矿

洞叫狮子洞。

唐老师的家从土路往前走约2公里，因下雨天他的面包车不能走留在学校。唐老师同意帮忙打听。

决定不冒险下去，直接到巧家，约1点进入荞麦地河的河谷时雨停，2点到巧家，阴天但看来没有下雨。

老店铅厂和三合狮子洞的结果：几个遗址很可能相关，七里厂开采银矿还是铜矿不明确，银矿的可能性大。铅厂和老铅厂可以确定是就炭炼锌，矿石开采点有些不清楚，规模非常大。

今后考查线索：再次考查三合狮子洞，考查七里厂同一个山谷上端的牛角厂，考查新店是否有古矿。进一步采访老人，搜集有关传说。





Mr. Tang and Peifeng sheltering in the building site and view down into the valley.



Sanhe, the Sanhe Primary School and the probable location of the mines.

2017.10.15 (Sun): Dayinchang in Qianxinzhen (Daqiao), Huidong District 会东县铅锌镇大银厂

9点从巧家出发，10：30就到铅锌镇（大桥）。会东的植被比巧家还好。相对低的坡上就有松林，爬上去树林比较多样化，有几种阔叶树，杉木和松树，偶尔见到50公分以上的松树。

大桥街上打听岔河打厂洼子和大银厂是否古代开采、路况等。决定直接到蛮银沟镇，因时间的关系不去会东了。

面包车先上水泥公路往岔河走，不到5公里从小水泥路往南，顺着一个小溪的沟走。偶尔看到柏树。沟变狭窄，从水泥路变土路，突然出来出来，就到了发窝街。上端下车，找旅店，就上街打听。

碰上耿武昌（48岁），小学老师，是本地人，在发窝小学已教书27年。

耿老师提供的信息：满银镇是发箐乡和发窝村合并成镇的。以前这里开采过，不知道是什么矿。有炉渣，就在现在小学的周围。他小时候玩过，有黑黑亮亮，像玻璃的，他们小时候觉得很漂亮。以前有过江西庙，小学就修在老庙宇的位置。

他带我们去看小学，帮我们找炉渣。学校和溪水之间几块小菜地果然还有。

田边走来一对老夫妇，80岁。他们说以前有过矿，没有听老人说是什么矿，也没有听老人说他们炼过。前辈是宣威过来的。炉渣的地方以前赶集用的，叫烧场地。

耿老师进一步解释以前的街子不在现在的街道边，在学校后头的坡上。他小时候还在那里。

他带我们去看几条街道，房子大部分是新修的，但街道位置没变。耿老师确定从街子一直到溪水边以前是炉渣。指出坡上就有矿洞，以前很多，现在封了。

碰上以为90岁的老先生，他说他们来了7（？）辈了，从江西来的，矿的事情不了解。

耿老师还带我们去看观音庙，溪水拐弯的岩石上，重新修了有20年左右。8个小学生一起来看。

下午4点不到，就上坡去看看能否找矿洞，顺便看发窝的地形。上了村子背后的山包，后头的山坡被干扰的十分严重，延长1公里左右。走过来看到下边小沟里好像还在开采，碰上郭万发（63岁），火干人。

郭万发提供的信息：坡上几十年挖的是表面上的沙铅，就是土层下的红粉（应该是氧化铅），后来开采硫化锌和氧化锌。古洞也就在这个坡上，被挖掉了。以前很多，他自己进去过，人要爬进去，弯弯曲曲的，也有直的进去的。古人开采的是铅，锌矿不要的。这个坡就叫老山。

郭师傅给我们看一块氧化锌的锌矿，说品味在 40%。和彝良朱家营一摸一样。

下边有豆腐沟，给厂上工人提供豆腐。火干村在上去一点。

以前有江西庙、湖广庙、财神庙。

传说有的。以前办厂回族多，和汉族打起来，现在回族一家也没有了。以前矿洞塌下来过，正好这个时候外边有人喊卖鲜桃，相信的跑出来要买，不相信的被埋在洞里。

给我们指出会去的路，6点顺利回到发箐。



Manyingou. The larger town in the forground is Fawo, the village a bit higher up is Faqing.





Teacher Geng, and with Peifeng in front of his school.



The plots with slags between the school and the stream.



The very old villagers.

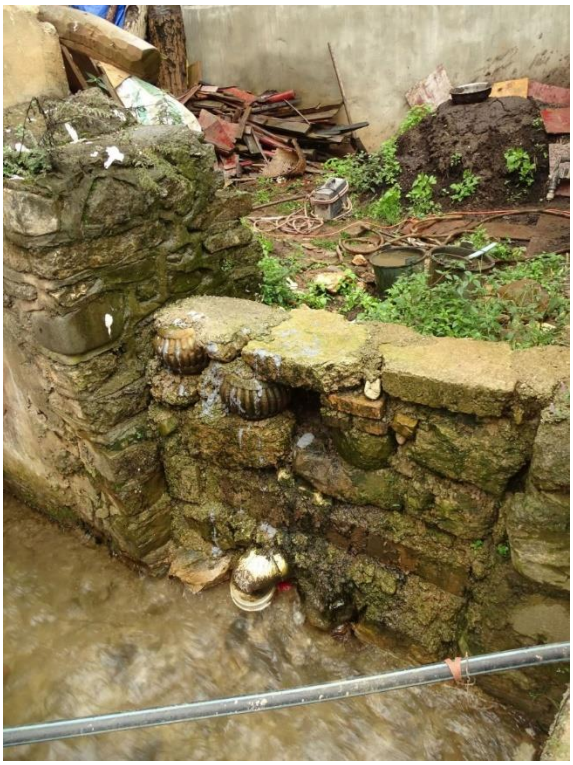






Above: In the old village main street. Insert: Pillar bases we noticed on the way down.

Left: Teacher Geng and Peifeng in conversation with informants near the school.



Left: Old pillar bases usen in a wall along the stream.

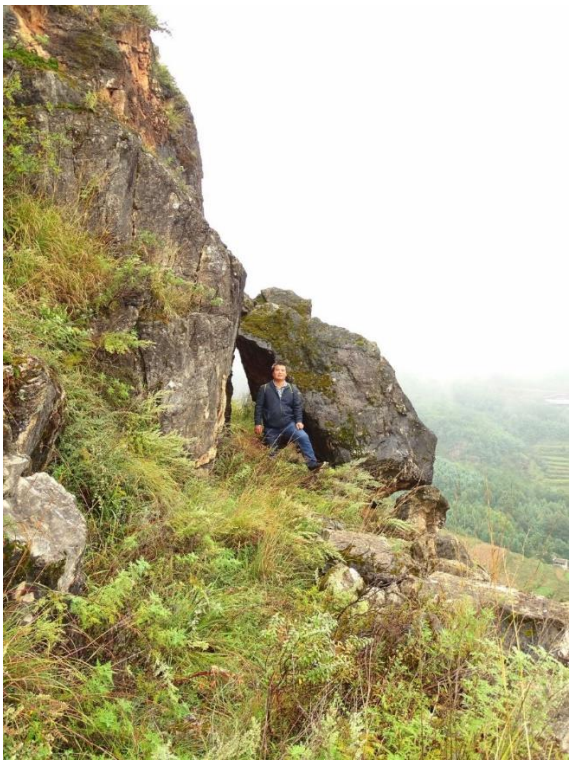
Below: Three of the boys who followed us to the shrine.

Below left: The Guanyin shrine below the village.









At the lower end of the disturbed slope, before we realized that this rockfall was not natural.



The disturbed slope.



Peifeng in the disturbed slope.





Mr. Guo Wanfa and Nanny. The piece of oxidized ore.

2017.10.16 (Mon): Dayinchang in Qianxinzhen (Daqiao), Huidong District 会东县铅锌镇大银厂, return to Kunming

早上租面包车上大银厂，有雾，地形看不清。翻过分水岭，下面东北方向下去的有好几条狭窄的山谷，山梁比较平缓是铁厂乡，在爬上大银厂的土路之下，高差至少300米。

大银厂在一个沟里，海拔约2800米，开采露天矿，据说主要开采铁矿，上边也有银矿。古洞子的位置不清楚。到现在矿区的下端是已搬迁走的大银厂村，村子附近时扫坡，大概是烧坡。和一位70多岁的老人打听，他是外地人，不太清楚，90年代开采修路。给我们看老村子下端的炉渣，看来好像是炼铁的。我估计烧坡在对面坡上，现在修大坝，恐怕难找。

又到矿区上端，云彩起来一些，地形清楚点。在消息边找到一些炉渣，也找到一段溪水冲出的剖面

中的炉渣层，后不到20厘米。其他都不清楚。

回到镇上再次打听新山和老山的地名。都同意确定老山的地名，老山附近没有新山，但大银厂上去就是新山梁子。满银沟原来是上边一个小地方，前几年发窝街和发箐村合并才改成满银沟镇。

11点离开满银沟镇，从葫芦口、巧家直接返回昆明。10点到。

大银厂的结果：老山开采比较确定比大银厂（新山）要早。发窝街修在挨着冶炼遗址的地方也表明街子晚于冶炼。老山规模不小，新山无法判断，比老山可能更大。

进一步考查线索：现代铅锌开采的档案资料最关键。尤其是回收再炼和对古矿洞的考查记录。





Local informant and our driver at the slag dump in the abandoned village and detail of slags.



View eastwards down the valley.



View up the slope of the abandoned village. The open pit mines are further up.



Recent gangue heaps along the brook above the pit/dam and looking for slags.





Slag layer in the banks of the brook.

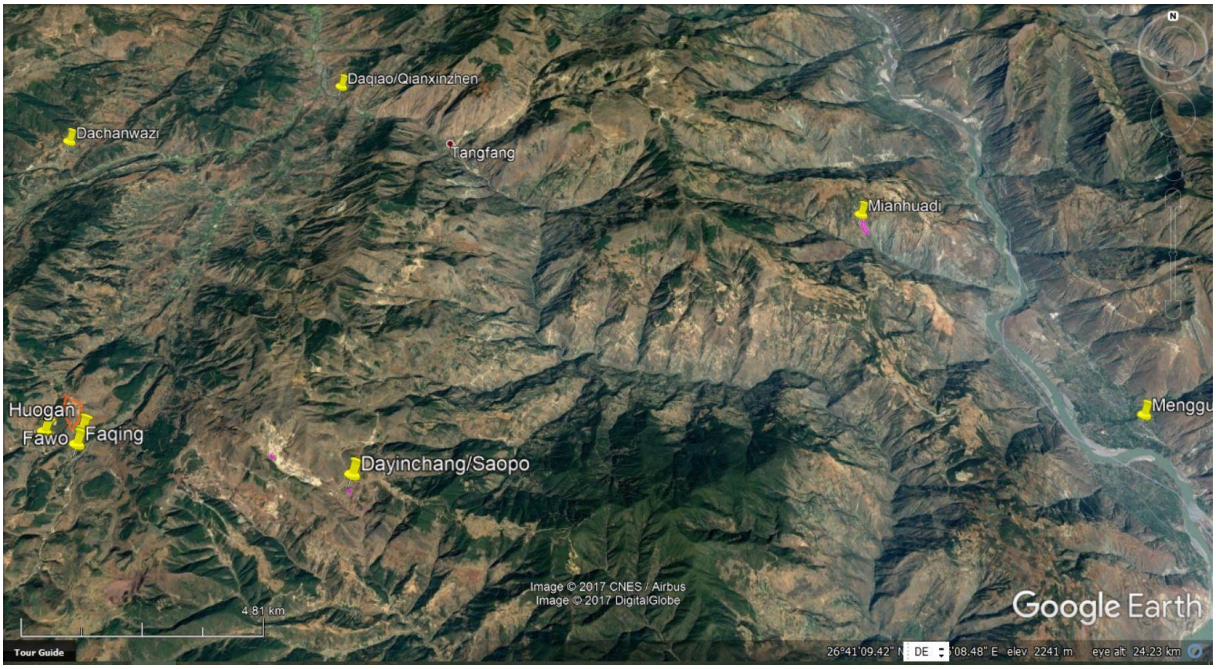


The bakery in the Faqing street of shops.

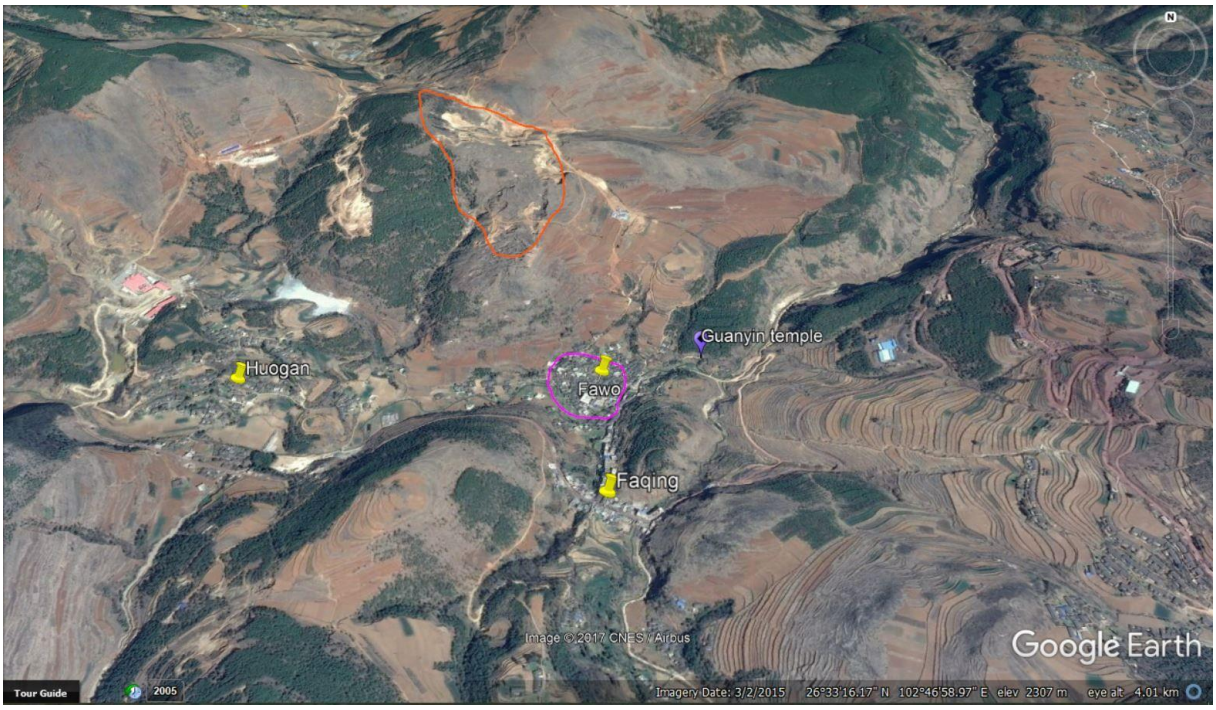




View up the gorge below Fawo and the mixed young forest.



The area of Qianxinzhen (Daqiao), with the Jinshajiang in the east, the Mianhuadi Mines, the Fawo and the Dayinchang sites, and the probable site of Xiaotongchang at Dachan wazi.



Fawo and the Laoshan mining area. Purple area: Slags, Red area: Mines.



The Dayinchang mines at the mountain of 3100 m, with the upper portion of the iron mining slope below.



View onto the Jinshajiang and Qiaojia from the Sichuan side.

Fieldtrip on silver mines in northern Vietnam, 5. – 11. November 2017

越南北部山区银矿遗址考查，2017年11月5日到11日

Nanny Kim, Yang Yuda, Vu Duong Luan

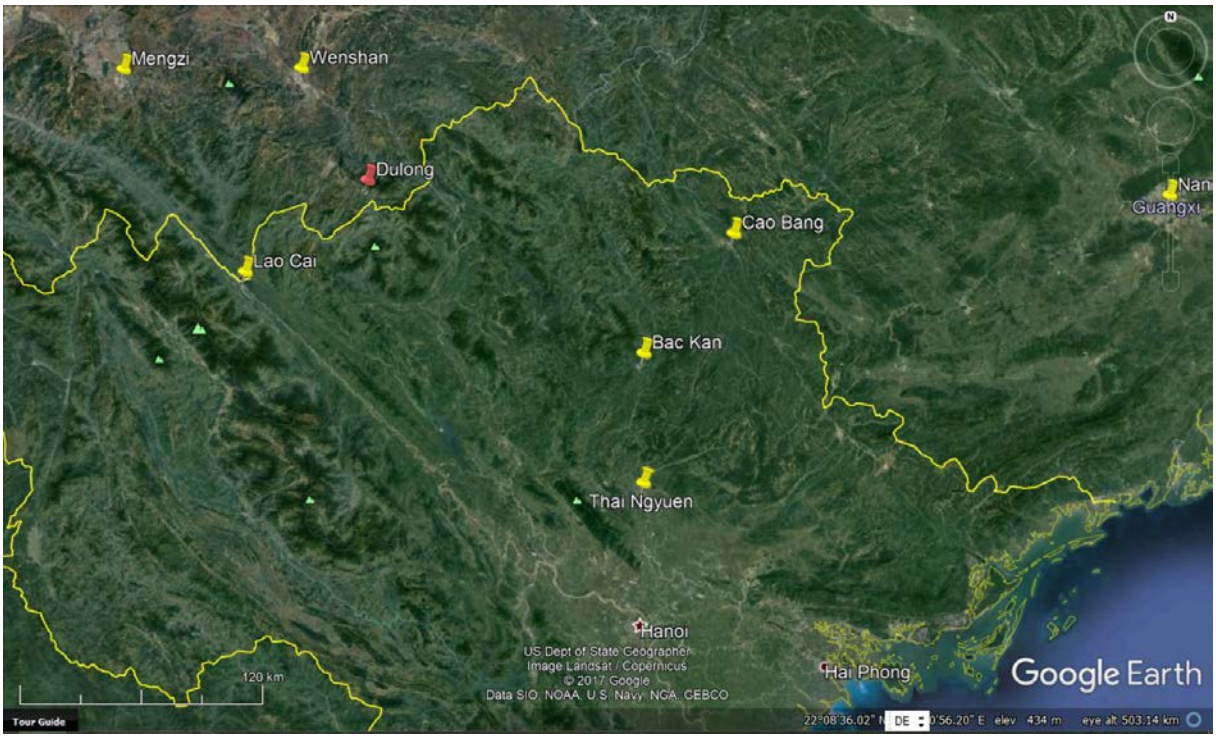
金兰中、杨煜达、武堂伦

金兰中，2017年12月19日稿本

Purpose: Chinese records of the 18th century mention three silver mines in the Vietnamese borderlands, Songxing 宋興, Boxiang 波象 and Bowei 波違. Vietnamese sources of the 18th to 19th century record Tong Ting 送興, Phok Son 福山, Ngan Son 銀山 and ten other silver mines. During the colonial period, numerous sites were exploited for zinc and other metals, with early reports frequently mentioning old Chinese workings. The materials permit the identification of送興（or 宋興） as the modern mine Tính Túc, 銀山 at Ngân Sơn and 南登（or 南當）as Nandang near Dulong, now on Chinese territory. The sites of the other historical mines are unclear.

Based on French records between the 1880s and the 1930s, we planned to visit some or all of the sites mentioned in connection with important old Chinese workings, namely Tính Túc, Ngân Sơn, Lang Hit, Chợ Dien, and Tràng Đà.

We focussed on Bác Kạn province with Ngân Sơn and Chợ Đồn, for which we had a fieldwork permit, added Tính Túc in Cao Bằng province, and for reasons of time omitted Lang Hit (location somewhat unclear, some 18 km of the provincial city) in Thái Nguên province and Tràng Đà in Tuyên Quang province, just north of the provincial city.



Northern Vietnam.

2017.11.01. Hà Nọi



Vu Duong Luan took me to see the old palace, which was abandoned after the ent of the Le Dyansty in 1802 and taken over by the Fench in 1884. The park grounds contain the secret military headquarters with an extensive tunnelling system in use during the Vienam War. Across the road from the palace grounds is an extensive excavation site of older palaces. With stone bases for wooden pillars of astonishing dimensions. The pillar bases are also surprisingly little raised from the ground, and made from a single rock.

One of the inner buildings of the old palace, probably 19th cent.





The secret headquarters and one of the tunnel entrances.





The excavation site of an early palace, the white cylinders indicating the sites of pillars. Pillar bases.

We also walked through the old centre, past the Returning-the-Arrow Lake and visited the history museum, with interesting objects from the early metal age.


HANG



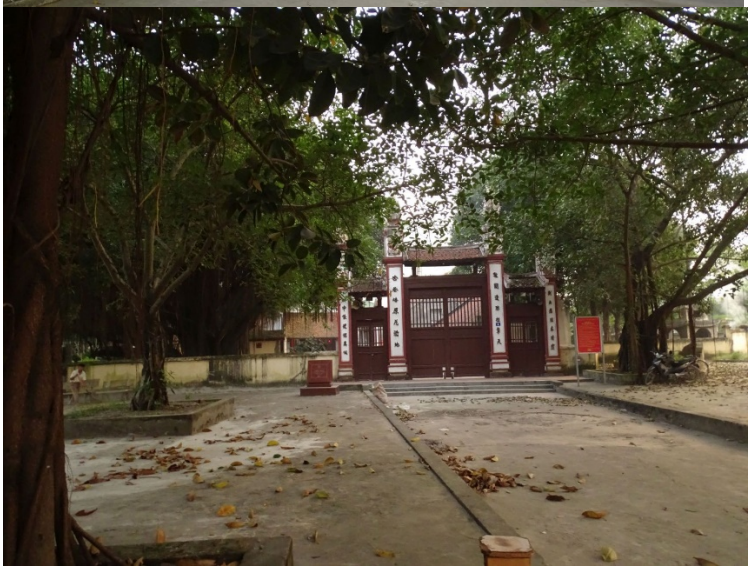


Impressions of the streets in the old centre of Ha Noi.

In the evening, Luan took me to the village of his in-laws, now a suburb. There are still several temples in the village, with the ficus trees. The largest of these was an association of learning and writing [in Chinese

characers].





Impressions of semi-village life in the suburbs of Ha Noi.

2017.11.05. (Sun) Hà Nọi to Bác Kạn

Overcast due to taiphoon in the south. Drive Hà Nọi to Bác Kạn, 9 – 12:30. Preparation of materials in the afternoon.

Went for a shortish walkabout through town with Yuda, though, everybody seems very busy and the houses are nice and playful. Much like Chinese towns and cities in the 1990s, but more colour and variation.

2017.11.06. (Mon)Bác Kạn to Chợ Đồn

This is a rather beautiful area with steep limesone cones and ranges and narrow valleys with rice paddies in between. Lush vegetation, as we get further in on the slopes. Not all that dense, but some quite large trees (probably most no older than 30 years), palms, wild banana, ficuses, and other large-leaved evergreens, occasionally lighter green deciduous or partly deciduous trees. And lots of creepers, in parts the entire forest disappears under them.

9 am went to meet the officials of the provincial Culture Office. They were a bit at a loss at our interest in premodern mines. Turned out that the site in the county of Chợ Đồn was military territory. Anyways, we drove off somewhere, passed the small town of Chợ Đồn, eventually on a very small but still asphalted road past abandoned mining facilities (factory halls and such) and into a village. A friendly butcher confirmed that there was a site not far away that "the Chinese" had exploited. There were slags on the street, which looked mixed and crumbly, much like zinc smelting slags.

We had lunch in a small wooden house and tea with some truck drivers. One of whom was wearing a heavy

silver chain, was from the area, and quite specific about slag dumps some way up the mountain.

Eventually we drove up, without great enthusiasm, some 8 km. The track kept climbing, had never imagined that these karst cones could go on and on, eventually to around 900 m, with the top cones still about 50 m higher. There was an operating mine, further up some dorms or such, then reached the ridge with karst cones. And evident traces of recently dug-up areas in the basins between the cones. We started heading out, Yuda to the nearest, me and Duong Luan to two to the set of the driving track. Turned out to be 3 pans, with slags and poor vegetation used for grazing cattle and buffaloes and therefore quite accessible. Slags and debris, much dug up in the larges basin that was a bit off the track and not directly visible, the two most reachable one least dug up, the northern one especially disturbed, hard to make out. Yuda found a similar situation in his area to the east of the track, which is even more dug up and sits right on the steep slope where mines are being operated.

Area 1 (Bán Thi 1 in the map), the pan at the western end of the area, is the largest. Remaining slags are relatively uniform greyish, the area has been dug up recently to the clay layer. Took a sample of charcoal from this layer. Area Ban Thi 2, the next to the east just below the tallest cone is simila, but the evident smelting area is smaller and slags become reddish (zinc smelting?) towards the driving track. Ban Thi 3 is very difficult to tell, due to deep holes recently excavated in several parts. A thin layer of undefined slags visible on the rim of the larger holes, a recently operated mine or trial excavation, fenced-off grazing ground in the higher part of the basin, reddish remains in the lower towards the track, presumably furnace remains.

Ban Thi 4 is very steep, descending to the lower end of the operated mines. Top layers existing covered in slags, some 20 to 30 cm thickness of a visible undisturbed layer near the top. Disturbed debris mostly reddish.

Ban Thi 5 is a small area above and behind the first house of the recent village, possibly extends under the grazing ground. Reddish.

A tiny village of 4 to 5 families is just to the north of this area. A woman coming home with he buffaloes said they had move up recently, but she had heard about a French furnace up on the cone over there. Directions were too vague and the afternoon was getting on.

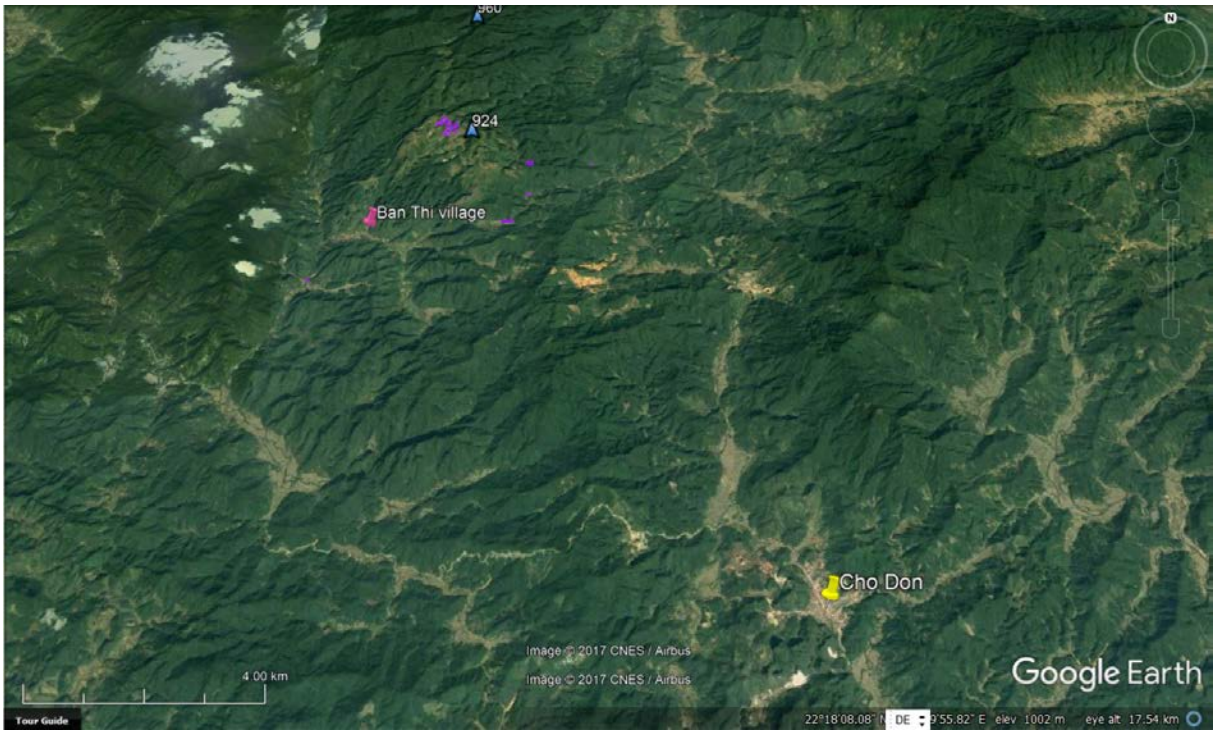
We drove down and out of the valley to another site where people in the larger village had mentioned slags. Found the site but could not establish the extent of the still visible slag dump under recently built houses and tiny vegetable gardens on the banks of a small stream. According to locals most of the slags had been dug up and sold. The administrative village is called Bán Thi.

Headed back to Chợ Đồn (about 20 km on a decent but of course windy road) and found the only hotes that boasts a car port and therefore calls itself motel.

Rooms quite nice. Upon coming back from dinner, Duong Luan asked the hotel owner whether he knew anything about mines in the vicinity of the town. He turned out to be from the mining area Bán Thi and had been some 30 years ago. He was definite that Bàn Thi is the largest old mining area, according to him exploited by the French. He specified that large French mines were further on along the ridge where we hadnt't gone, with a cablecar to transport the ore down into the valley.

Also that there were old French mines in the mountains south of the stream.

Nothing much in the immediate vicinity of Chợ Đồn. Decided to give Bán Thi another day.



The area of Cho Don





Ban Thi village and Luan in converstaion with our driver and the village butcher.







The village restaurant: A house with movable walls. And view onto the village street.



First impression of the slag areas between karst cones at about 750 m on the mountain north of Ban Thi. Slags are partly explosed in the ground used for grazing.



View across slag dump Ban Thi 2 towards the edge where the operating mine is located and the slope has been massively disturbed by recent exploitation.







Presumably historic lead smelting slags. Uncertain remains in area Ban Thi 4 (the recently worked slope): debris containing fierd clay, presumably part of a furnace wall and uncertain large pieces of slag or ore.





View over the recent village, with a pond and some who like it wet. The slag area Ban Thi 5 is to the left near the houses.



The southern slope that has been disturbed by recent exploitation (probably by earlier modern mining as well).



The flat mountain north of Ban Thi village.





The lower end of Ban Thi village: the stream and Yuda at the slag layer.



The slag dump below Ban Thi village (Ban Thi 11).

2017.11.07. (Tue) Bán Thi

Drove north towards Ba Be, smaller road in pretty valley, relatively wide with the bottom covered in rice paddies. Turnoff SW into dirt track at Bó Phia. After what seemed a long time on this dirt track gradually climbing upwards between karst cones reached a watershed and turned down a short steep descent into the valley heading for Bán Thi. At the end of the concrete descent Yuda stopped the car to look at what seemed to be slags. He was right, slags to both sides of the tracks and long the edge of the first field planted in maize to the small stream. Some astonishing large chunks, some 50 cm across. Slags continued for about 150 to 200 m along the track, petered out after another ca 300 m. None in the stream bed a little way further down.

Found a small erosion gully washed clean some 7 m high, with a clear layer of slags and large chunks washed down from above.

Dense young forest on the very steep slope (70% at least). Looked for a way up, decisded to go back to the watershed but checked the lower end first. Met two guys tending to something in the fields just below the lower end.

They said that they could take us up by motorbike. Duong Luan and me went, they took us back along the track to the first tiny village beyond the watershed (under 1 km) and showed us a different slag dump right behind their house. Walked up along a well worn track for some 1.5 km, dense and thick slags covering the lower, less steep slope, but also some visible occasionally on the path through the forest further up. Got to above the cones and the other site, but no view or impression of the slope below or along.

Back to the car drove on to Bán Thi, which was not much further on. Didn't stop but returned to Chợ Đồn for lunch and drove right back to Bó Phia to get to another site further up. The turn-off northwards was only a short way into the dirt track an not negotiable by car. Decided to go back to Bó Phia to see whether we could find people who would take us up by motorbike. The first house was a timber workshop. Three young guys quickly made themselves available. Tunred out that they had worked or tried to exploit the old mining sites and knew precisely where they were. Showed uns three sites. The first in an open spot along the track, extent unclear but probably small. The second on a small saddle between cones in the forest. Thick layer, extent unclear. The third said to be another 3 km up on a track not passable by bike. Duong Luan, myself and two guys walked up, brisk walk under half an hour through the forest, largely heading straight up the valley SW



on the northern slope. A track suitable for motorcyles was under construction, built by breaking up limestone by firesetting, earth on top, with concrete on the steepest sections.

The reason for this effort became clear when we reached a basin between cones that is almost flat, vegetation more open, and covered in slags. Extent about 100-150 m across, probably 100 m length downhill. Ends in a small gully. At the lower end is a mining shaft that has been recently worked for oxidised lead. Widened into old mine. They knew of more old shafts in the vicinity. Had abandoned this working because of the low price of the ore, but were working sulphur nearby.

Got down to join Yuda who had come down before a good hour after we had parted.

Drove back to Bac Kan, met the official of the culture office, who had prepared the introduction to the culture office of Ngân Sơn and drove straight on to Ngân Sơn. Got to Ngân Sơn about 8:30 pm.



Early morning at Cho Don.



Strangely large slag lumps: iron or lead smelting? Yuda and Luan upon coming across Ban Thi 6.



Descent into the valley of Ban Thi and upper end of slag dump Ban Thi 6.





Slag layer in the soil next to the track. (Left photo by Yuda)



And the reason why we could not establish where the slags in Ban Thi 6 eroded from. (Photo by Yuda)



View down the slope of Ban Thi 7 over the upper end of the small village.



View up the slope covered in slags.





View not quite through the forest onto the mountain shoulders above the Ban Thi valley and Ban Thi 6. And remains of furnaces and slags at the upper end of the dump Ban Thi 7.



Thick slag layer at the lower end of Ban Thi 7, at a buildinsg site next to the driving track..







The young men of Bó Phia who took up up into the forested mountain at the slag dump Ban Thi 9.



The forest.





At their lead mine, which descends into old workings. And large slag lumps (recent?) in the bamboo forest floor.





The opening of slag dump Ban Thi 10. And alags of Ban Thi 10 (presumably historic lead smelting slags).





The forest.

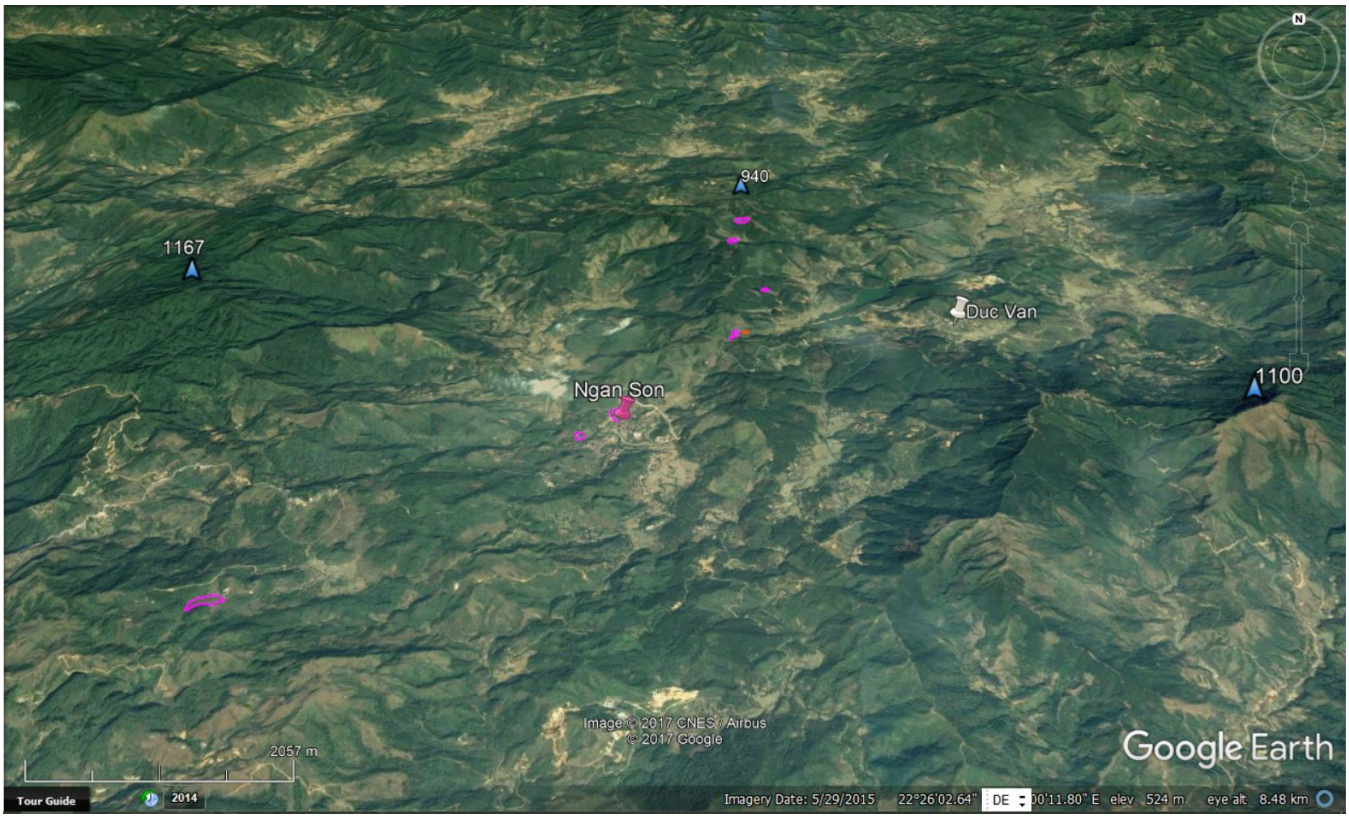


The sites Ban Thi 6 – Ban Thi 10.

2017.11.08. (Wed) Ngân Sơn

This region is higher up, the karst mountains up to 900 m, mostly recently re-afforested in pine. The trees grow quite quickly, approaching 20 m in height and over 30 cm in diameter in 15-20 years. Also some large-leaved broadleaves and some subtropical fir, which looks rather aggressive, with long spikes all around the branches.

Appearance altogether less tropical than in Chơ Đôn. The forest down there mixed with tall bamboo (easily 15 m and the tallest approaching 20) and full of creepers often has a slightly eerie appearance, with shapes that appear to be nodding, pointing or brooding. Would be scary in the dark.



Ngan Son town and surroundings, with Duc Van and Coc Lung.

The visit here was with the support of the district culture office; an official who took us to the next village Đực Vân and handed us over to locals, who in turn organized three men on their motorbikes. We went for 2 expeditions, with Nuong Vân Mac, in his 50s, as our main guide. He had been involved in mining and knew the sites in the area.

The centre of the area of Duc Van administrative is a lake formed by a dam at its northern end.

Mr Nuong first took us to the nearest site that they reckon is also the largest (Duc Van 1). Slags in about 5 rice paddies on a saddle above the Ngan Son basin and extending up the slope across a field and into a grazing area. Numerous mining shafts, often as close a 3-4 m from each other in a young pine forest, stretch on a slope that becomes very steep and forms a valley that descends towards Đực Vân. Saw over 10 shafts, our guides had not counted them.



View from the village government northwest across the lake and to the ridges with the smelting sites. Duc Van 1 is to the lift of the lake, the other sites are on the bluish ridge beyond the wooded ridge, slightly to the right of the highest point.



Duong Luan, Yuda the culture office official of Ngan Son and a coleague of Duc Van.



The site of Duc Van 1. The road in the foreground leads to Ngan Son to the left and to Duc Van to the right.



View down the slope across the slag area of Duc Van 1. The descent from the end of the fields is right above Ngan Son town.



View up the slag dump Duc Van 1.



Looking for mining shafts in the pine forest, with two shafts in the foreground and the two informants standing at two others. Duc Van 1.



A vertical shaft at Duc Van 1.

Below: View to the pine forest with the mining shafts from the edge of the fields at Duc Van 1.





View ENE down, roughly in the direction of Duc Van village.

In the afternoon. Our guides took ut to three more sites in the recently reforested mountains to the west of the lake, in fact 7 to 8 km from the central village. (Which is a longuish ride, especially for Yang Yuda who has to keep balance and hold onto his crutches).

The first site (Duc Van 2) was on the main western ridge near the highest cones. Extends over about 100 m across. According to our guides, the slags had been dug up recently and resmelted for gold [the latter appears unlikely, but the area clearly had been dug up]. They also showed us 4 mining shafts the southeastern corner of the area, which has been surrounded with a deep ditch to keep cattle out while re-afforestation is started.

Then went to to nearby site in the first valley btween the main ridge and the mountain to the SE that has a cleavage and is about the same height (around 900 m). Grazing land and some maize; a small grotto at the top end of the fields in a small limestone cliff, and very recent mining of oxidized iron, with remains of a furnace. Ore similar to ores that they had shown us from or near the old workings at the southeastern corner of Duc Van 2. They stated that there were old working here as well and slags somewhere in the nearby forest. Walking down the track we noticed a small grave with a partially legible inscription. Our guides said there were Yao graves in the area, with Chinese inscriptions.

The next site was along the way back but heading south into the forest, location on a forested slope facing SE above two small ponds. Slags well visible in the forest floor, extent and thickness of layer unclear. (Duc Van 4)

The took us back to Đực Vân village by circling the lake to the south and hitting the road under the site we had visited in the morning.

The pine forests are recent, planted only about 20 years ago. Our guides said that the mountains used to be bare before, due to the custom of burnig them off.

They stated that altogether some 10 slag dumps existed in their village area.

Got back to Ngân Sơn at 5 pm.



The sites in the ridges in the western part of Duc Van.



The slag dump and mining site Duc Van 2. The area is surrounded by deep ditches to keep out the deer and replanted in trees.





Duc Van 2: Piece of a furnace wall (?) in the area where most slags have been removed, and one of some 5 still visible mining shafts.



View northwards down from near Duc Van 2.



A grave with remains of a gravestone near Duc Van 3.



Part of the area of Duc Van 3.



The forested slope at Duc Van 4 and slags on the forest floor.



Left: The pond at the bottom end of Duc Van 4.

Below: Stop above Duc Van 4 and return to the village.





2017.11.09. (Tue) Ngân Sơn to Thính Túc

Rain.

After breakfast, Duong Luan and me went into town to look at the extent of the slags and to interview more people. Our hotel owner was very specific about the slag dump under and around his house. He indicated a depth of around 1 m for his house, which had been built fairly recently, presumably less than 10 years ago. He pointed out the area as reaching into the fields behind an to the houses along the main road, specifying that the dump got to several m deep under a recently built larger building on that road.

Duong Luan had heard that another slag dump was near the vegetable market. This appears to be the old part of the town, to the south of the stream und right under the „horse ears“ mountain, two karst cones. Walked down a narrow street, layout old but no older buildings, at the last house Duong Luan asked an elderly man about the slag dump. Di Phù Sáng, 63 years-old, almost immediately agreed to take us and came back with his gumboots on. We followed him down a small path to the stream, crossed some overflooded stepping stones and reached the dump where the ground gets slightly higher again. The major part of the dump had been dug up and sold. The lower end would have had a thickness of about 5 m. Overall width reaching into the next field and bushes towards the stream 150-200 m, length from the visible upper end to the bush area above the first fields along the stream about 70-100 m. Mr. Di had seen objects in the shape of *shatiao*, reckoned they were cores left by geological investigatiors.

We parted at the stepping stones but quickly realized that we had forgotten to specify whether he had seen any *shatiao*-shaped objects made from clay.

So we went back to his house and found Di and his wife together with Mr Hứa A Lầm, 79 years-old, and his wife, Mr. Hứa's son or a neighbour about 50. Duong Luan chatted with them for quite a while and they quickly warmed up to the topic. This part of town is mainly Chinese, Mr. Di's ancestors had come 6 generations ago, those of Mr. Hứa three generations ago, Nong from Guangxi, probably in the 1920s, when his grandfather was a young man. They speak some Chinese but most of the conversation was in Vietnamese.

Mr. Di was clear that the objects that he had seen were in fact rock and drill cores. They had not seen ceramic/burnt clay objects.

They told us that an even larger slag dumps is some 3 km away. Eventually came up with numerous locations of slag dumps.

Duong-Luan recorded the following sites:

1. The area of Toi Men (对门) [Ngan Son 2], behind the old market, approximately 15.000 m2
2. The area of Nà Đeng – Đồng Cân, in Vân Tùng commune, 3 km from Ngân Sơn town. That area is also called "Núi Bạc" ("silver mountain"), not visited.
3. The area of Cốc Lùng, in Vân Tùng commune, near Ngân Sơn town [Coc Lung]
4. The area of Lũng Viềng (Cốc Đán commune) - Nà Pán (Trung Hòa commune), Ngân Sơn district, around 10 km from Ngân Sơn town. This place was said that it is the biggest slag dump [not visited]
5. The area of Núi Tai Ngựa in Vân Tùng commune, near Ngân Sơn town. This place was exploited during the French colonial era and remained the main exploited mine (矿洞), the gallery being large enough for a big car to enter [not visited].

Being asked about the slag dumps of Đực Vân, they were vaguely aware of these sites but stated that they were small compared to the ones they had enumerated.

They did not know which ores had been exploited, but differentiated between Chinese and French mines.

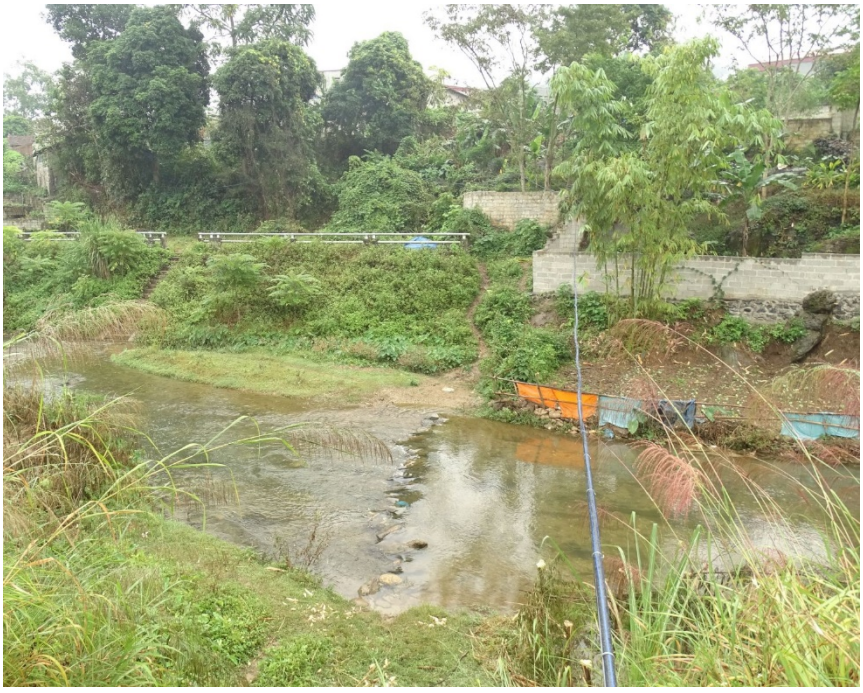
We returned to the hotel, exchanged the information, and decided to drive on to Tính Túc in the hope of better weather there.

Cốc Lùng appears to be the area of the largest slag dumps but is not reachable by car. Walking in some 3 km appeared to difficult on the clayey and very slippery ground.





The tea corner in the entrance of our hotel at Ngan Son and the courtyard 4 stories below with slags in the flower beds.



The flushed stepping stones in the stream of Ngan Son.



Duong Luan and Mr. Di on the dug-up slag dump Ngan Son 2.





The side street behind the market formerly leading to 2 temples and a relative in the entrance of Mr. Di's house.



The piece of ore that Mr. Di showed us in his house, origin unclear.

Below: The two slag dumps near Ngan Son town.



We left for Tinh Tuc about 11 am. Pine forests ended soon after leaving Ngân Sơn District.

We reached Tính Túc about 3 pm but decided to stay at the hotel 6 km south. Asked around a bit when we went back into the small town for dinner, without finding out anything. The town mainly stretches out along the main road, much of it consisting of accomodation for mine workers. The mine has almost ceased operations lately, leaving the economy accordingly depressed.

Continuing light rain and mist with visibility around 50 m.

2017.11.10. (Fri): Tinh Tuc/Thông Thinh, around Pia Ouác

Still rain and mist.



Duong Luan at a village shop in Binh Duong.

Drove in early to Bình Đường, the village that Duong Luan had identified as the new name of Thông Thinh. Passed through Tính Túc again, then along the northern rim of the open pit mine, climbing up before heading south on a drivign track that had lost most of its concrete seal.

Started asking as we got into scattered houses in the valley between the slopes of Pia Oác and a narrow limestone rige and were soon directed further along. Lý Pao Phúc (ca 30 years old) acted as our guide. He got his motorbike and led us along the driving track up the lower foothills of the Pia Oác massif. Re-afforested in pine. Stopped at a bamboo logging station and told us it was 1 km walk from here. Still drizzle and mist. The upper end of the track was rather slippery, so Yuda and Duong Luan stayed behind. The track descended in the forst for about 300 m, hugging the slope, then entered a cultivated side valley, houses dispersed. We descended for about 1 km, a clot of houses, then entering the widest part of the basin, crossing a small brook and just before reaching another small brook coming upon a large pile of slags.

Slags in the track all the way from the lower edge of the forest, but possibly used for improving the surface. Lý actually speaks a little Chinese. He pointed out that there were some slags (or had been) just below the village, and that the main area was the bottom of the basin and the northern slopes. He also indicated that the mines were on that slope, while none were on the southern slope. The position on the slope remained unclear due to the mist.

Much of the slags had been dug up and sold. Next to the dump was a small facility presumably for loading smeall tractors or mini trucks, now abandoned. Information unclear, but the pile was probably recently assembled material for loading. Looked for *shatio* but found none.

As we headed back up along the same path and motorcycle track, the coulds began to rise, even briefly allowing the sun to almost appear as we were back up and joining the others.

Back at the timber station, Duong Luan had collected more information about the Chinese company that had dug up and smelted the slags for two years. It had to stop because the permit had run out.

All informants confirmed that this was the one major slag dump in the area. And that there used to be numerous workings, up to 40 m deep, presumably shafts, very densely set.

The fellow in the timbering station, around 50 years old, had confirmed that he had seen *shatiao* and again confirmed upon seeing the specimen from Yiliang.

They knew about a temple in the village, we had walked right past but lacking communication I hadn't noticed.

The local pronunciation of the village name is Thông Xinh, the old official name Thông Thinh, the new name Bình Đường.

The pine forest, with trees about 20 m high and up to 50 cm trunks, has been planted about 20 years ago.

Mr Lý set us on the small road that circles the Pia Ouác to the south. We got a brief view of the mountain near the jucture and near the watershed of the southern spur. As soon as we had crossed the watershed the forest changed back to mixed broadleaf. The eastern flank was still largely in the clouds.

We headed onto Cao Bằg, got there past 2 pm.

Went to visit a Guandi temple. A new structure presumably on part of the old grounds. There are 4 or 5 some donation stele still in existence (Duong Luan has rubbings), and two cast iron bells, of QL xx and JQ 4, the Jiaqing bell inscription specifies that the casters were from Foshan.





The timbering station stop above the Tong Thinh valley, and my guide Mr. Ly.



Some inhabitants of the village, who enjoy the mist and the rain.



And large slag lumps in walls between the paddy fields.



Mr. Ly on the slag heap.



View up the center of Tong Thinh valley.





Slag layers above and below the stream under the bamboo stand in the photo above..

The kindergarten of Thong Thinh.



The kindergarten of Thong Thinh.



The forest below the timbering station



The view from the timbering station to the karst cones that border Tong Thinh valley beyond.



Pia ouac (1900 m) momentarily visible, With Yuda, myself, and Duong Luan .



Karst ranges between Tinh Tuc and Cao Bang.





The Guandi Temple in Cao Bang (photo by Yuda) and its ferocious guardian.







The historic bells and their inscriptions that identify the bellmakers of Foshan.





Our hotel in Cao Bang and view across the river.

2017.11.11. (Sat): Ngân Sơn, return to Hà Nọi

Left for Ngân Sơn and Hà Nọi just after 7 am. Still cloud and fog on the firest 60 km. Reached Ngân Sơn 8:20 and stopped at the hotel on the edge of town that we had been staying at before, the clouds rising.

Duong Luan asked the landlady and two guys who came donw the track on their motorbikes, after some deliberation Yuda was left behind on account of the wet ground, and the two guys took the two of us to an unknown destination. My driver stopped to fill his tank and to leave a message at a haircutting place in the old town and carreered down the main road heading south. Up on the first ridge took a turn left, continuing due south on a track and stopped at the first house.

The elderly lady with a bad back, Phan Thi Huến (55 years old) agreed to show us the site and shortly afterwards we were trudging off behind her. She is Nong and her grandfarther still was involved in smelting. He had died while she was still very young, and she didn't know what metals he worked or which were worked in the past.

We headed down the mostorcycle track and kept rights at a turnoff, then turned into a walking track at the second bend. Headed gently up for a while and came out at pan of fields, sloping SE. These were her fields and she stated that there were slags throughout. Easily visible on the track, the upper edge clean limestone, thickness unclear. At the southern end of the pan there were some heaps, probably left from digging up slags. They had sold them for a while.

Thinning out on the track above the fields. A guy coming down on his motorcycle said there were more further up, but we could not find any to the top of the ridge between karst cones.

We walked back on the motorcycle track around the western base of a karst cone (where the walking track clings to the eastern slope), back to Mrs. Phan's house. Met the same informat we had met on the trail because he had trouble with his bike, the information seemed to be that the next slag dump was a few km further along.

Walked up to the main road and had ourselves picked up.

Had another look at Ngân Sơn 1 and established that it does not extend further up the hill.

Due to general tiredness returned straigth to Hà Nọi, getting in about 5 pm.

2017.11.12. (Sun) Hanoi

Dep. Nanny 23:45. Departure Yuda 14 November.



Coc Lung south of Ngan Son.





Mrs. Phan’s house. And motorcycle road descending from her house towards the main village.



The slag dump south of Coc Lung under Mrs. Phan’s fields.







Mrs. Phan’s patiently waiting for us to have an extended look around slags and a small rosacea flwoer.



View across Coc Lung.



The horse-ear cones of Ngan Son. The slag dump Ngan Son 2 begins on the bank of the stream to the right.



View down the slag dump Ngan Son 2.



View from the Ngan Son hotel across the upper end of the slag dump Ngan Son 1.



View down the slag dump Ngan Son 2.

Presentations of the project and important research results (selection)

Projektvorstellung
Center for East Asian Studies, University of Heidelberg (16 December 2015)

Presentation

(Premodern silver mining in the Southwest and the borderlands: An investigation of mobile miners, recruitment structures and the organization of the mining sector in the High Qing
History Department, Yunnan University, 4 November 2015

Presentation

Perceiving mining landscapes: Dongchuan prefecture in Qing China,
Seminar at SOAS, London, 20 October 2016

Presentation

明清时期西南和边疆地区的银矿 - GIS分析和冶炼技术探讨 (Silver mines in the southwestern borderlands of Ming and Qing China: GIS analysis and explorations of smelting technologies)
Academy of Sciences, Beijing, 10 November 2016

Presentation

The awkwardness of silver mining and the realities on site Annual Meeting of the Association of Asian Studies, Toronto, 16 – 19 March 2017

Presentation

明清时期西南和边疆地区的银矿和冶炼技术研究 (Silver mining in the Southwest and the borderlands of Ming and Qing China and explorations on metallurgical technologies)
Institute of the History of Technology, Nanjing University of Information, Science and Technology (24 October 2017)

Presentation

The murkiness of mining: Specialists in silver metallurgy in the Far Southwest of late imperial China
Workshop “Unlocking Skills: Gaining and Performing Expertise in Pre-1911 China,” International Consortium for Research in the Humanities (IKGF): Fate, Freedom and Prognostication Strategies for Coping with the Future in East Asia and Europe, Erlangen, 21-22 November 2017

Presentation

Silver mines in the Far Southwest, 1400 to 1850: Historical geography and landscape change

Workshop “Centring the Margin: Environmental Histories of Yunnan and China’s Southwestern Frontiers),” jointly organized by Fudan University and SOAS, Shanghai, 25 – 27 May 2018

Talk

Paper

明清时期西南边疆地区的银矿：史料、田野考察、地理分布分析与环境变迁 (Silver mines in the southwestern borderlands during the Ming and Qing: Historical records, fieldwork on site, geographic analysis and findings on environmental change)
Institute of the History of Technology, Nanjing University of Information, Science and Technology, 31 May 2018

Talk

Paper

Silver mining in late imperial China: Confucian obfuscation and remains on site
World Economic History Congress, Boston, 3 August 2018

Presentation

Umwelt, Menschen und Bergbau im fernen Südwesten Chinas seit 1500:

Interdiziplinäre Untersuchungen

Nanny Kim

Heidelberg, Dezember 2015


Kennen Sie diesen Berg?



Dieser Kupferstich von Theodor de Bry , ca. 1590 zeigt denselben Berg in Bolivien.



Es ist der
Cerro Rico, der
Silberberg von
Potosi, Bolivien

Diesen Berg kennen Sie sicher nicht, selbst wenn Sie Südwestchina kennen:

湖广大山
云南省沧源县滇缅边界





Potosi

Hochintensiver Abbau ca. 1570–1620,
Bergbau bis heute

Historische Silberproduktion:
ca. **62,000 t**

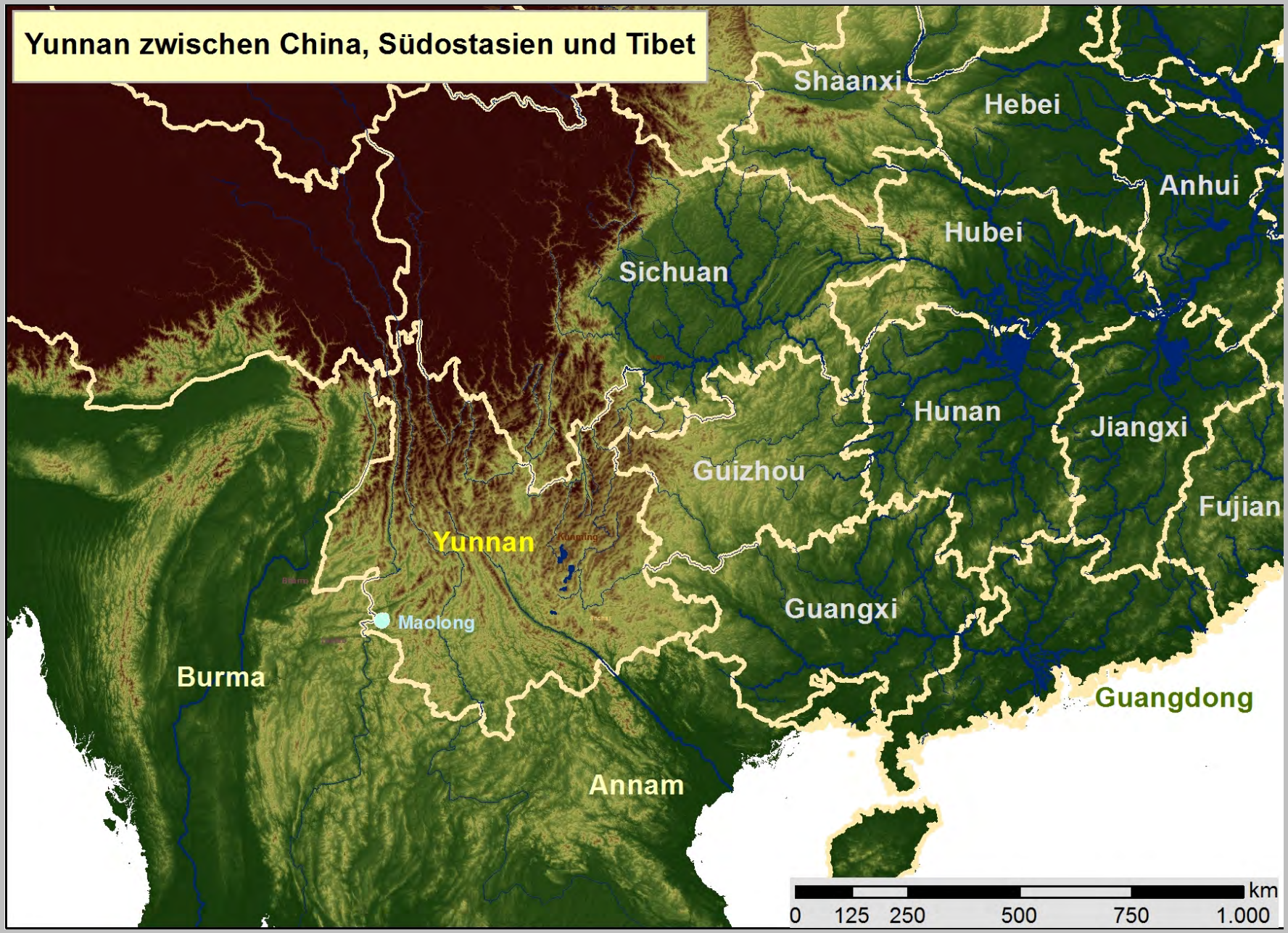
Maolong 茂隆

Hochintensiver Abbau
vermutlich ca. 1750–1800,
Ende spätestens 1850

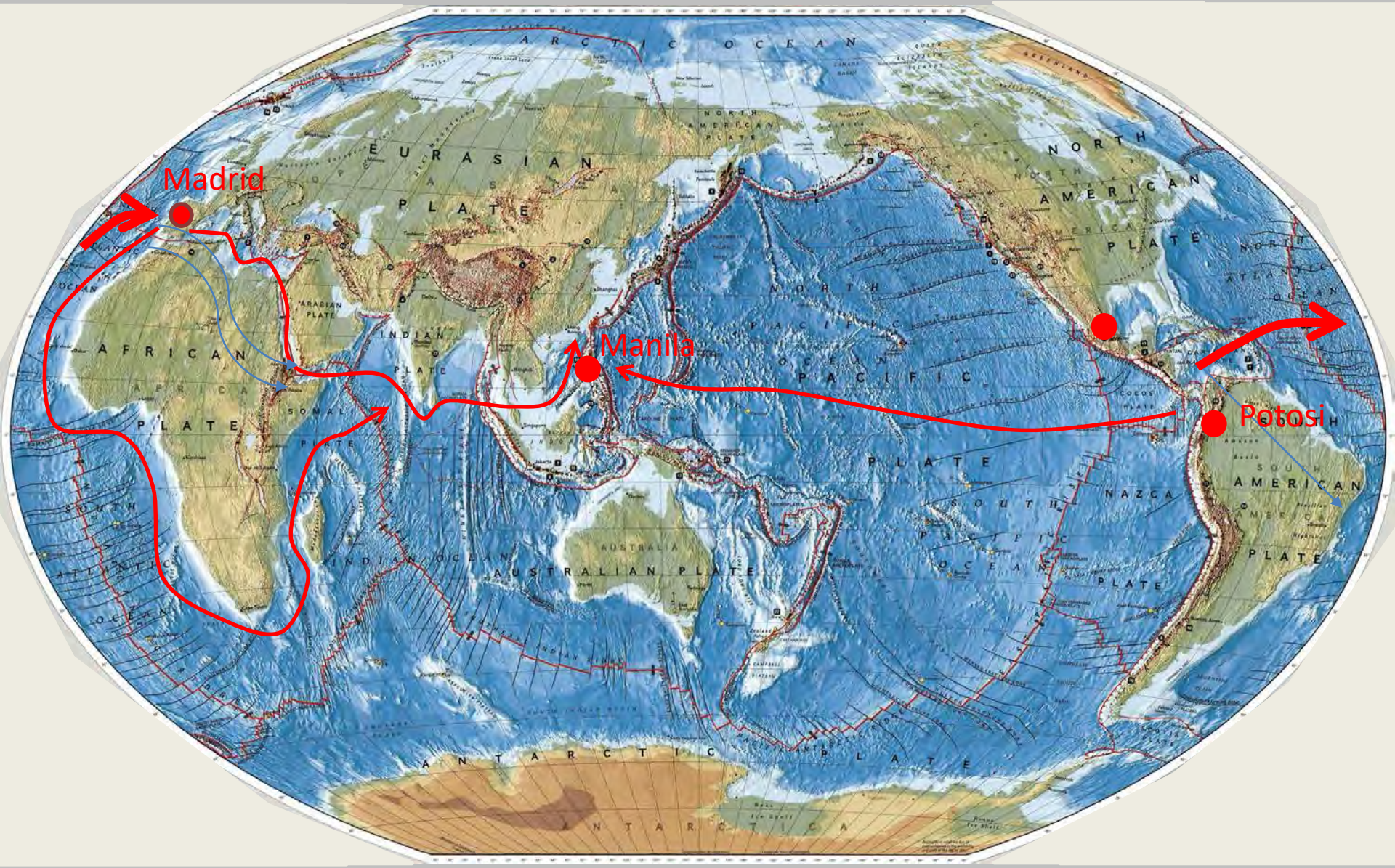
Historische
Silberproduktion:
Vermutlich bis 3000 t



Wo liegt Maolong?



Warum hängen Potosi und Maolong zusammen?
Silber und die frühe Globalisierung, 1570er–1830er



China, the global sink of silver



(银锭, Einheit 两 = ca. 37

Rätsel 1

1436: Steuern werden im Zentrum des Ming-Reichs in Silber erhoben = Monetarisierung ist perfekt

1567: Silberimporte aus Japan und Amerika beginnen

Was ist mit dem Jahrhundert dazwischen?

China, the global sink of silver



(银锭, Einheit 两 = ca. 37

Rätsel 2

1100er–1200er: Massive Intensivierung des Silberbergbaus im Osten des Song-Reichs

1300er: Erholung des Silberbergaus unter den Yuan, Verlagerung nach SW

1430er–1850: Offiziell nur geringer Silberbergbau in China

Aber:

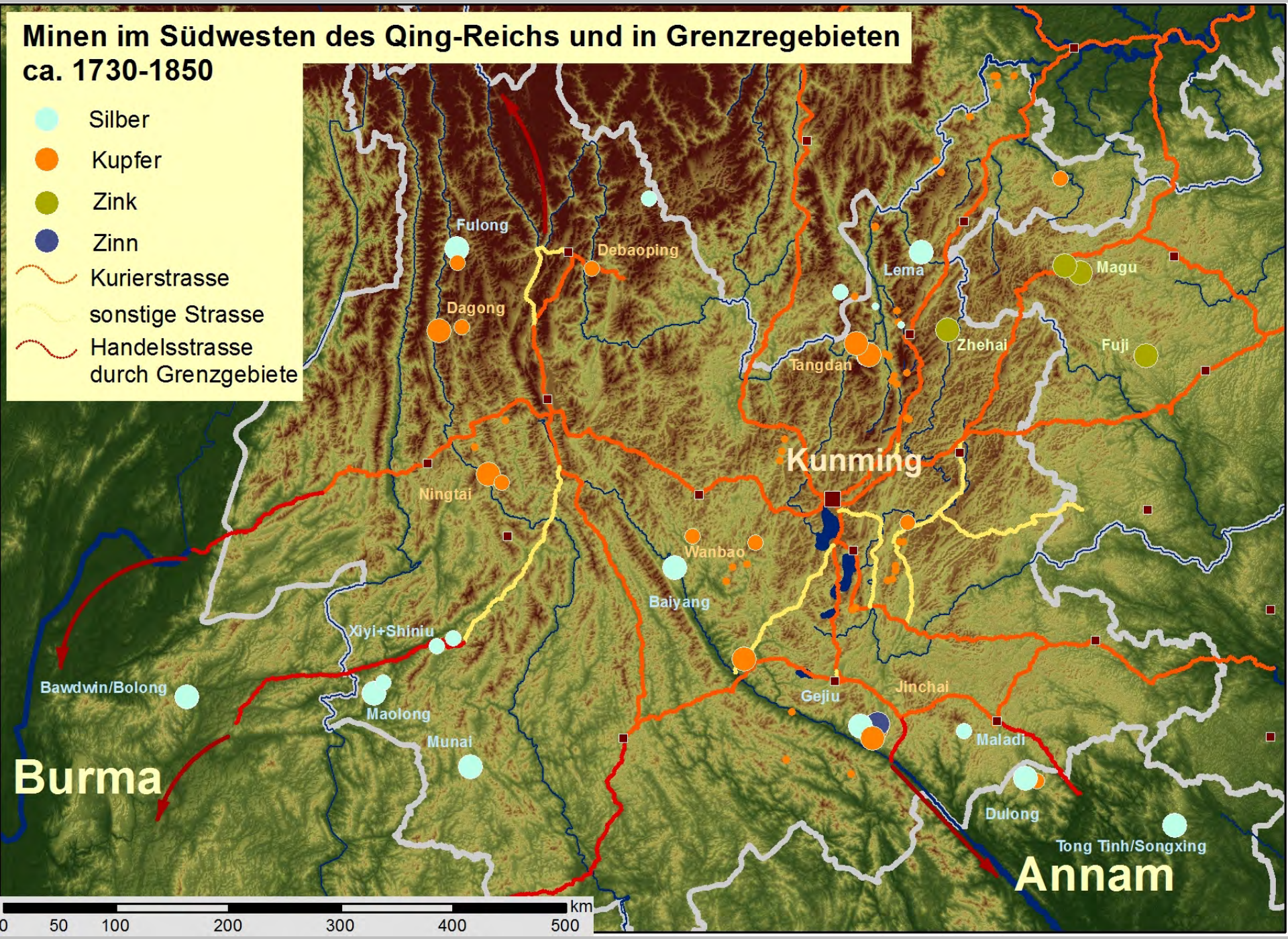
1570er–1830er: Silber aus Übersee fließt bei konstant hohen Preisen nach China

Wie kann eine erfolgreiche Bergbautradition zum Erliegen kommen, wenn der Abbau lukrativ wäre?

杨煜达‘s Suche nach den Silberminen

Yang Yuda 杨煜达. 2008. "Qiandai zhongqi Dianbian yinkuang de kuangmin jituan yu bianjiang zhixu" 清代中期滇边银矿的矿民集团与边疆秩序：以茂隆银厂吴尚贤为中心 (Miners' organizations in silver mines of the Yunnan borderlands in the mid-Qing period and social order in the frontier region: The exemplary case of Wu Shangxian and the Maolong Mines). 中国边疆史地研究 (China's Borderland History and Geography Studies) 2: 43-55.

Yang Yuda. 2013. "Silver mines in frontier zones: Chinese mining communities along the southwestern borders of the Qing empire" *Mining, Monies and Culture in Early Modern Societies: East Asian and Global Perspectives*, ed. Nanny Kim and Keiko Nagase-Reimer, 87-114. Leiden: Brill. (Monies, Markets and Finance in China and East Asia, 1600-1900, vol. 2)


Minen im Südwesten des Qing-Reichs und in Grenzregebieten
ca. 1730-1850
Silber
Kupfer
Zink
Zinn
Kurierstrasse
sonstige Strasse
Handelsstrasse
durch Grenzgebiete
Fulong
Debaoping
Dagong
Lema
Magu
Zhehai
Fuji
Tangdan
Kunming
Ningtai
Wanbao
Baiyang
Xiyi+Shiniu
Bawdwin/Bolong
Maolong
Munai
Gejiu
Jinchai
Maladi
Dulong
Tong Tinh/Songxing
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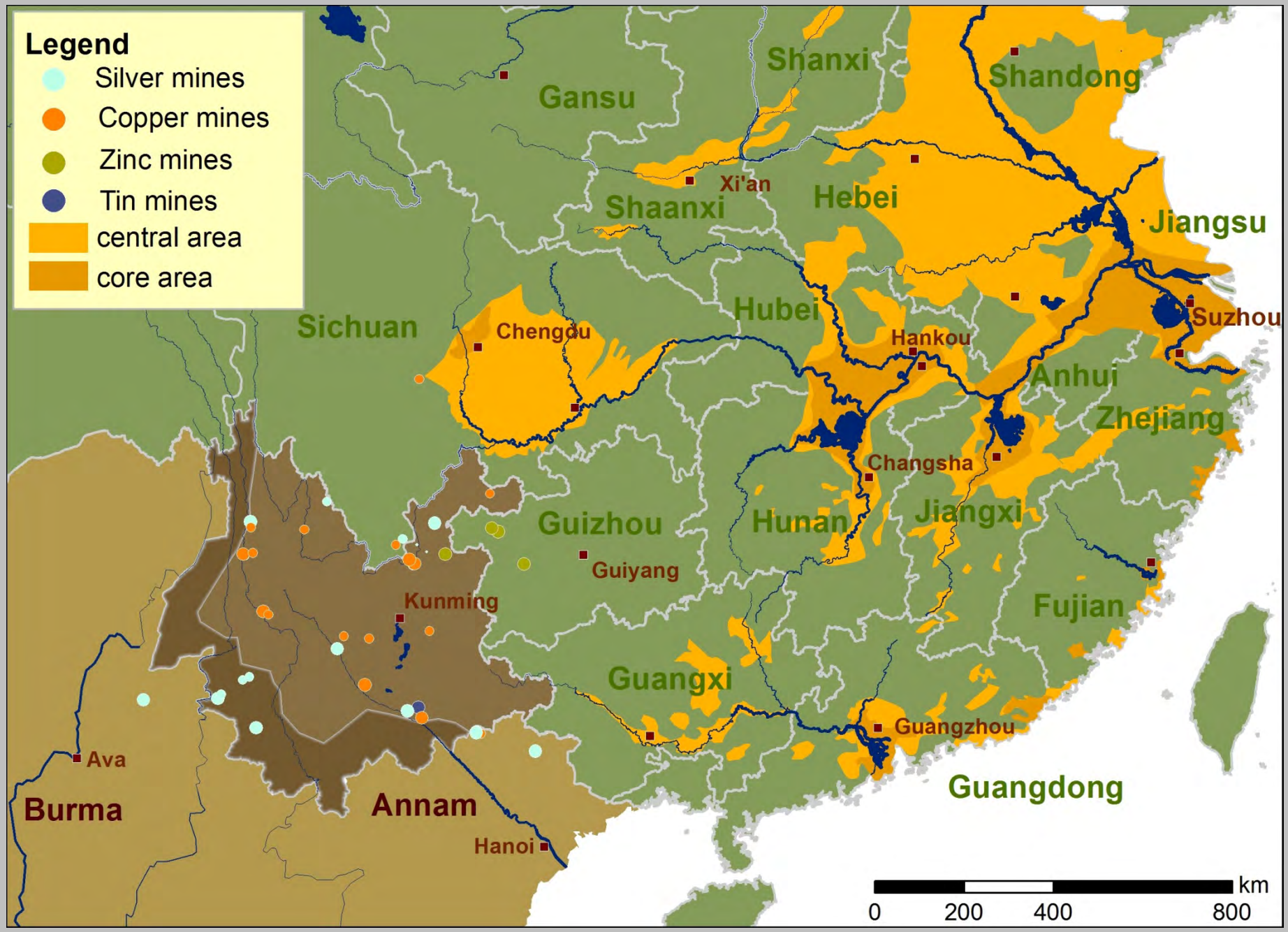


Die Entfernung der südwestlichen Grenzregionen vom chinesischen Kernland

Bergbau auf Silber, Kupfer, Zinn, Zink und Eisen war bedeutend

erscheint aber in unseren üblichen Schriftquellen kaum



《滇南矿产图略》1844年版本

Warum nicht?

Konfuzianische Einstellungen:

人睹其利，予睹其害。
夫矿开则人聚，人聚则食广。
云南有限之谷，其能饲此不耕之人乎！

Andere sehen Profit, ich sehe Unheil.
Denn wo Bergwerke eröffnet warden, versammeln Menschen in großer Zahl, und diese verbrauchen Nahrungsmittel auf großer Fläche.
Yunnan aber hat nur begrenzt Getreide, wie soll es diese Menschen ernähren, die keine Äcker bebauen!?

Qing-zeitliches Zitat eines Ming-zeitlichen Beamten, der gegen die Wiedereröffnung von Bergwerken in Yunnan plädierte.
(倪蜕 Ni Shui, frühes 18. Jh)

Wo wir wenig wissen, vermuten wir viel

- Die heutige Entwaldung ist ein Folge des Kupferbergbaus in der Qing-Zeit.
- Der Bergbau führte zur Verarmung der Region.
- Der Bergbau führte zu ethnischen Konflikten mit den ansässigen Gesellschaften („Minoritäten“).

Um mehr über Umwelt, Menschen und Bergbau im fernen Südwesten Chinas seit 1500: herauszufinden,

brauchen wir neue Quellen und neue Ansätze

Quellen:

- **Überreste, v.a. Schlackenhalden als Untersuchungsgegenstand zur vergleichenden Einschätzung von Größenordnungen**
- **Oralgeschichte, lokale Traditionen und Genalogien**

Methodik

- **Kartographierung und Raumanalyse zur Überprüfung und Erweiterung historischer Daten**
- **Landschaftsmodellierung zur Klärung von Wahrscheinlichkeit oder Unwahrscheinlichkeit von Szenarien und Interpretationen**

Ziele:

1

Bergwerke

- finden
- ihre Geschichte soweit wie möglich rekonstruieren
- ihre Produktivität abschätzen

2

Auswirkungen auf die Umwelt modellieren

Hauptfaktor: Waldverbrauch verursacht durch hohen Brennstoffverbrauch (zumeist Holzkohle) der Verhüttung



Bergbau und Entwaldung

Wie können wir angesichts der dünnen Quellenlage über spekulative Vermutungen hinauskommen?

Entwaldete Bergflanke and den Ningtai-Kupferminen in West-Yunnan (Foto Kim 2011)

Feldarbeit

- Löcher angucken



鹞嘉白羊厂的硐口
2011年金兰中摄影

Schlackenhalden



石羊厂, Chuxiong



Kollegen auf einer Halde bei Dulong

Oralgeschichten sammeln



Yang Yuda an den Ningtai-Minen

Lokale Traditionen und Überreste

z.B. Kulte und Reste von Tempelanlagen

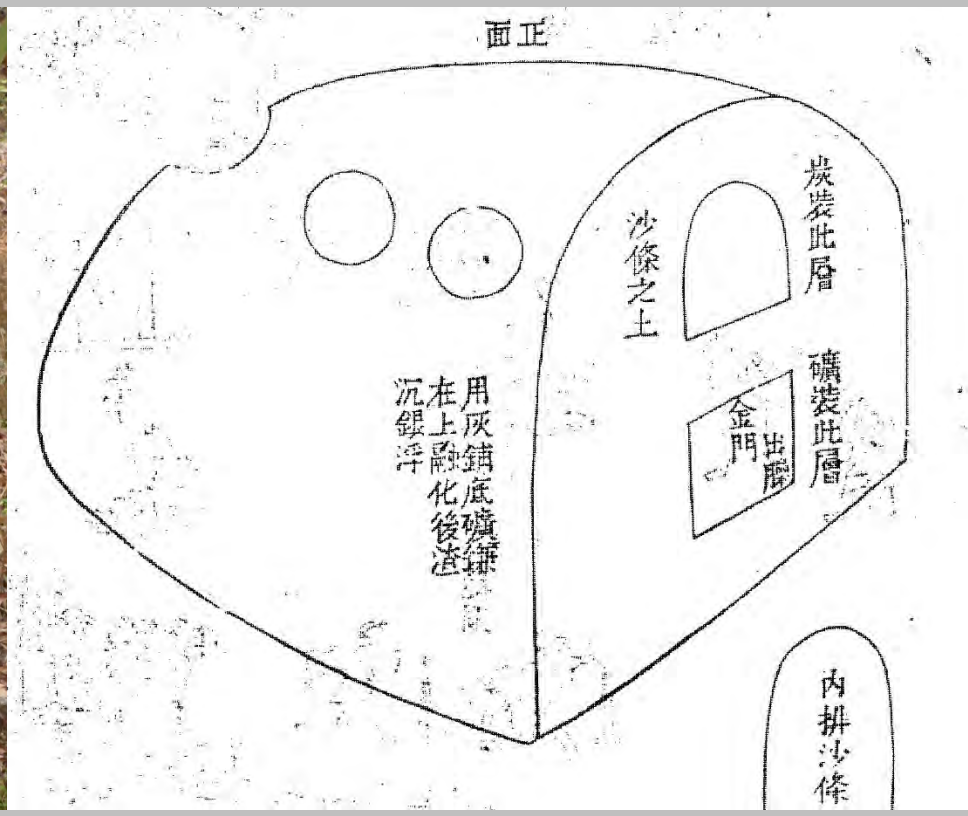




Fulongchang 福隆厂: Ziegel in den Kartoffeläckern und Standort der Tempelhaupthalle, ehemals mit Opernbühne!

Überreste: Ein Kupellationsofen 分银罩子





石羊厂，2011年杨煜达和金兰中考查

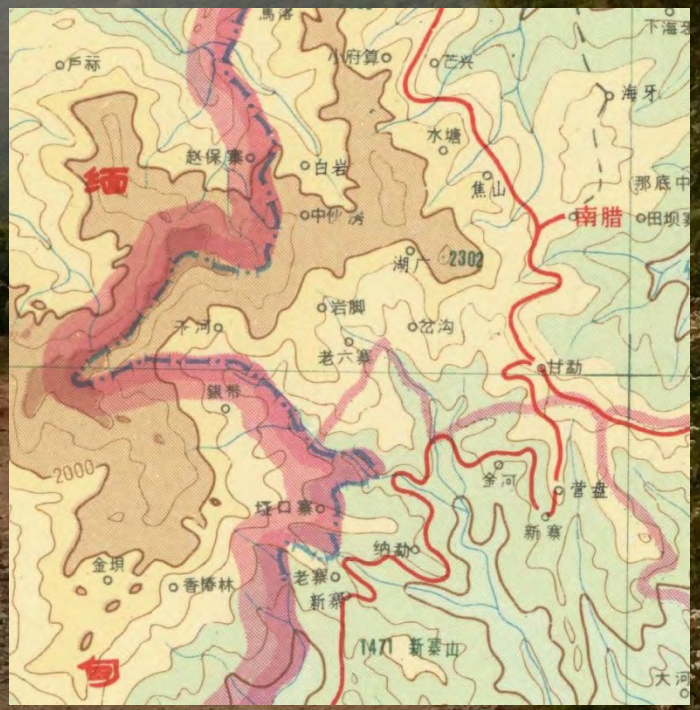
七星罩
《滇南礦廠圖略》(1844)



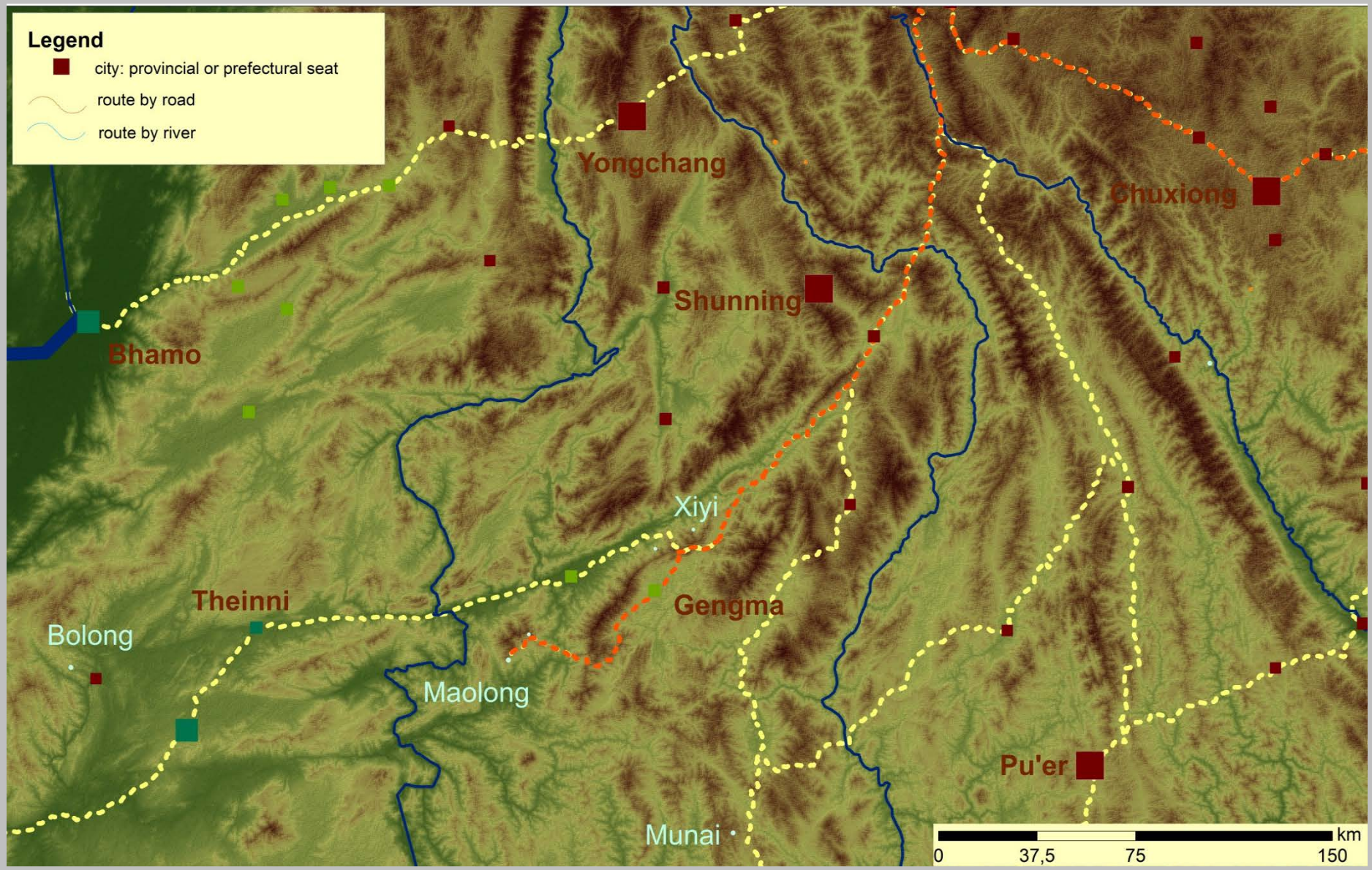
Gräber

耿马县悉宜厂刘氏合葬墓碑

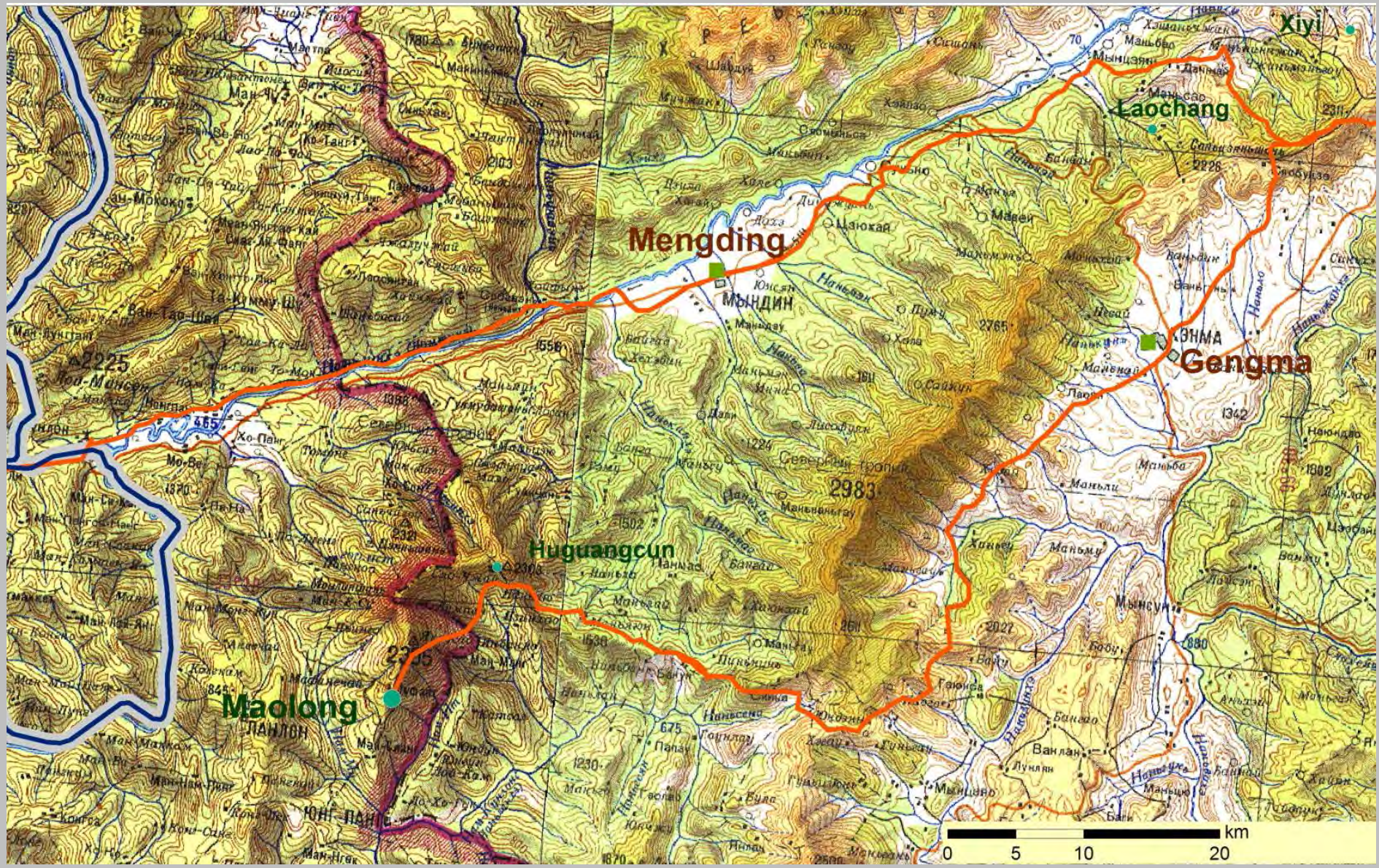
Raumanalyse: Zusammenhänge untersuchen



Maolong 茂隆



Die Grenzregion um die Maolong Minen, weitere wichtige Bergwerke und historische Fernstraßen



Die Maolong-Region auf einer sowjetischen topographischen Karte, ca. 1970

(Sowjetische Generalstabskarten 1:500.000)



Derselbe Ausschnitt auf einer US-Militärkarte, ca. 1950, die Waldflächen aus Luftaufnahmen anzeigt
(bereitgestellt von Canstaneda Library, Univ. of Texas)

Die folgende Serie von 4 Karten zeigt

1) die offizielle politisch-administrative Karte mit Präfekturen und Sub-Präfekturen

2) zusätzlich mit den Kurierstraßen

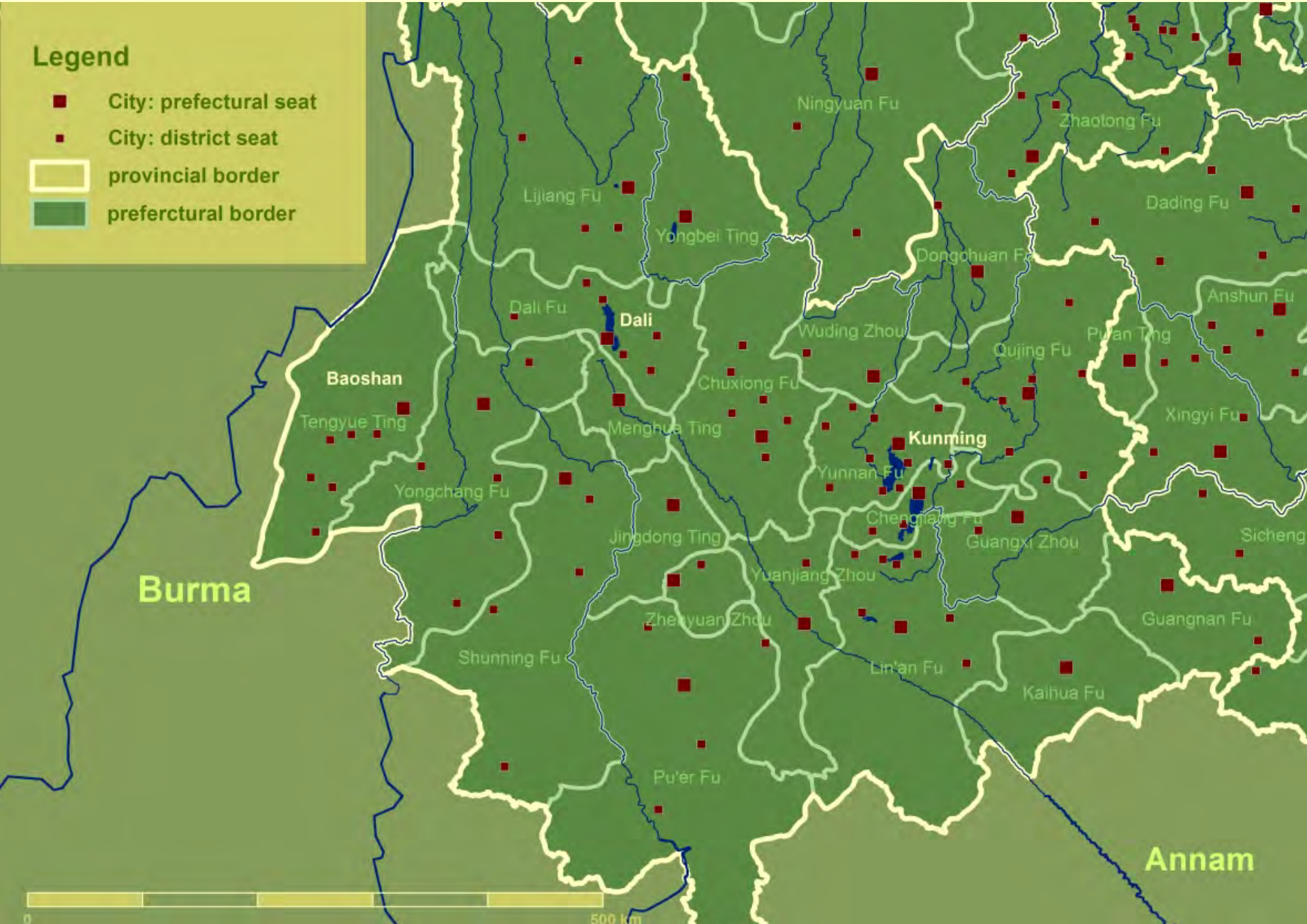
Ein wohlgeordnetes, zentral auf die Provinzhauptstadt ausgerichtetes System

3) Mit den Bergbaustandorten

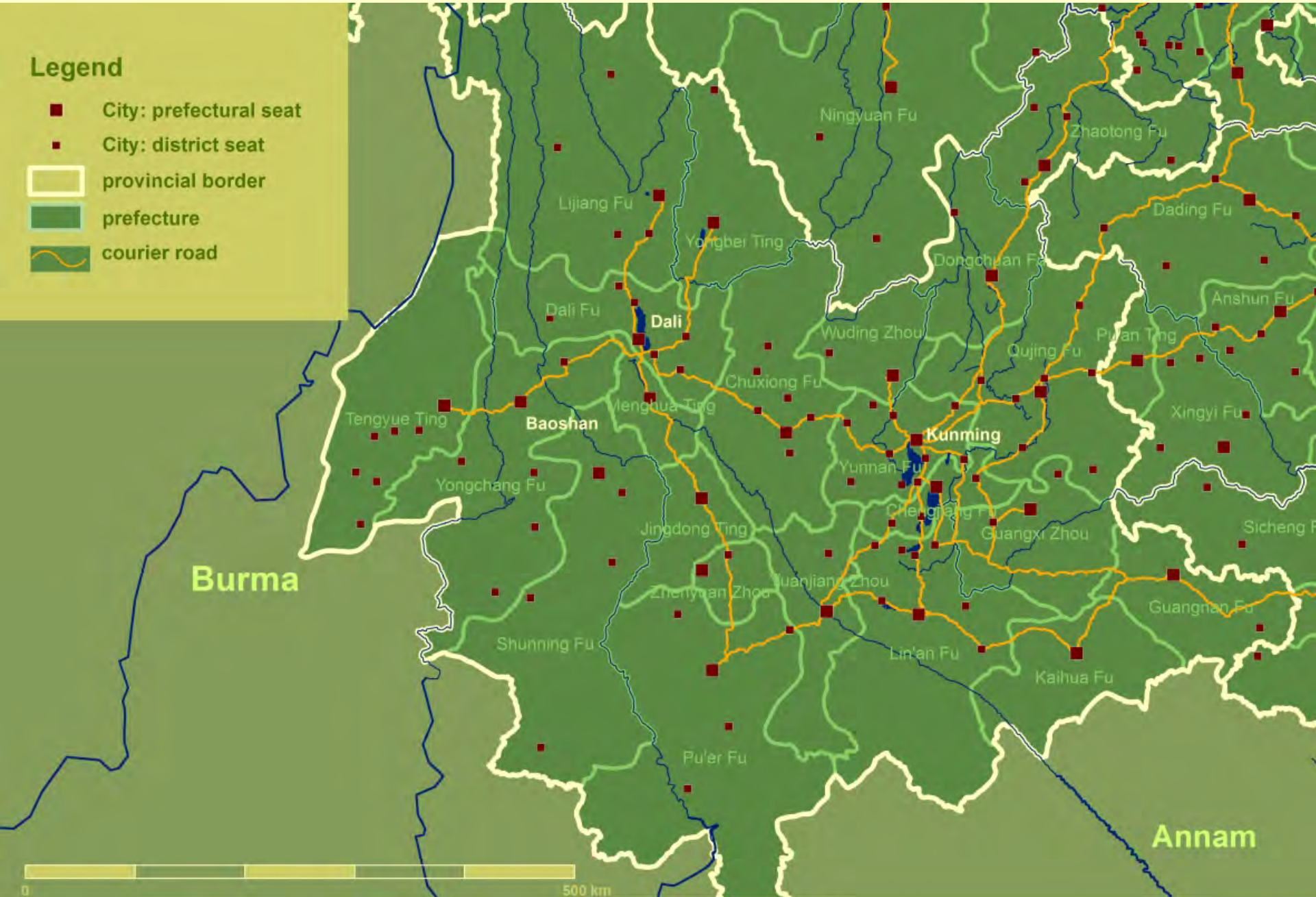
4) Mit den Plateaus (bazi) und den offiziellen und inoffiziellen Städten gewichtet nach geschätzen Bevölkerungszahlen um 1800

Ein multipolares System mit verschiedenen Zentren

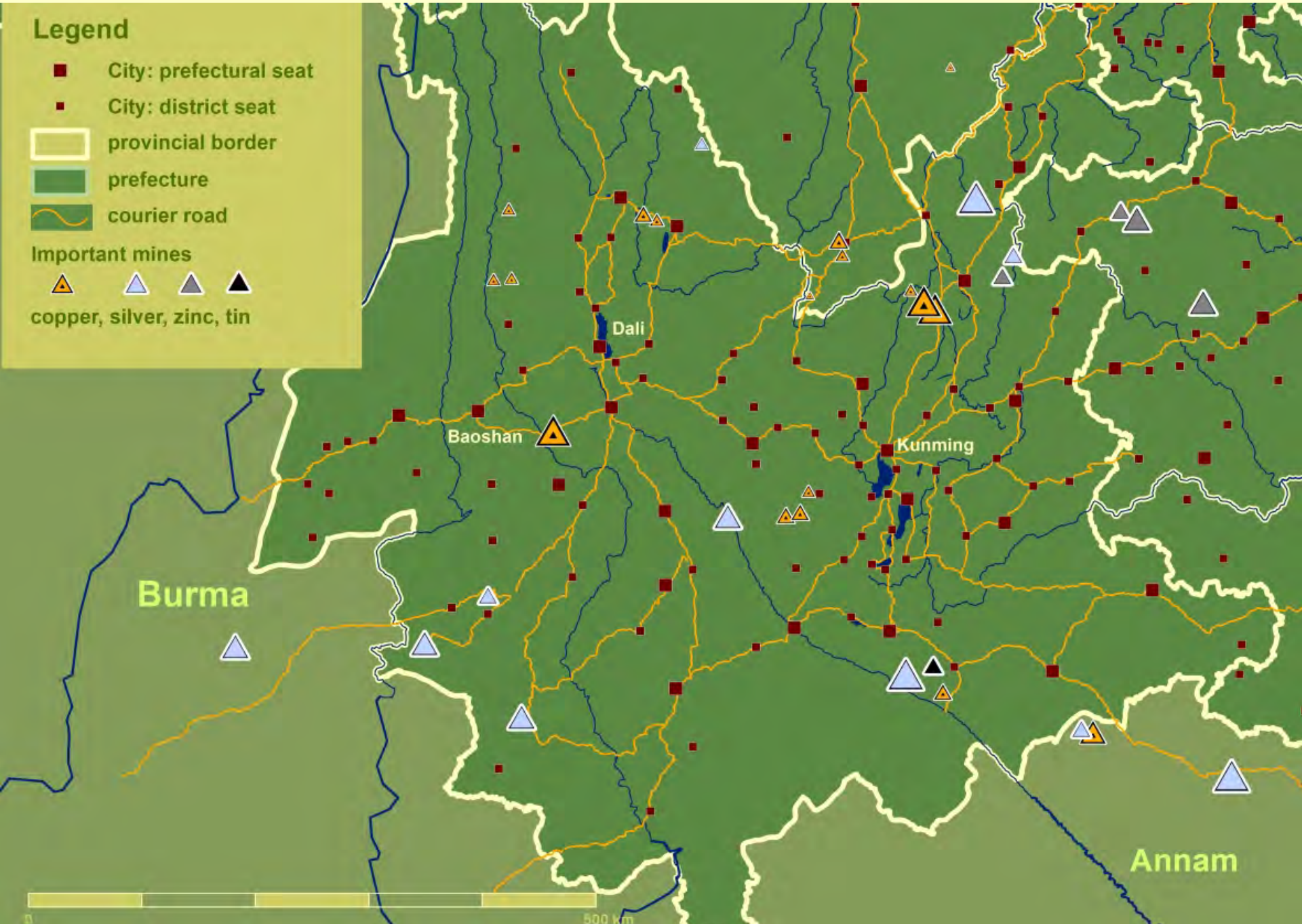
The political map of the Qing Southwest



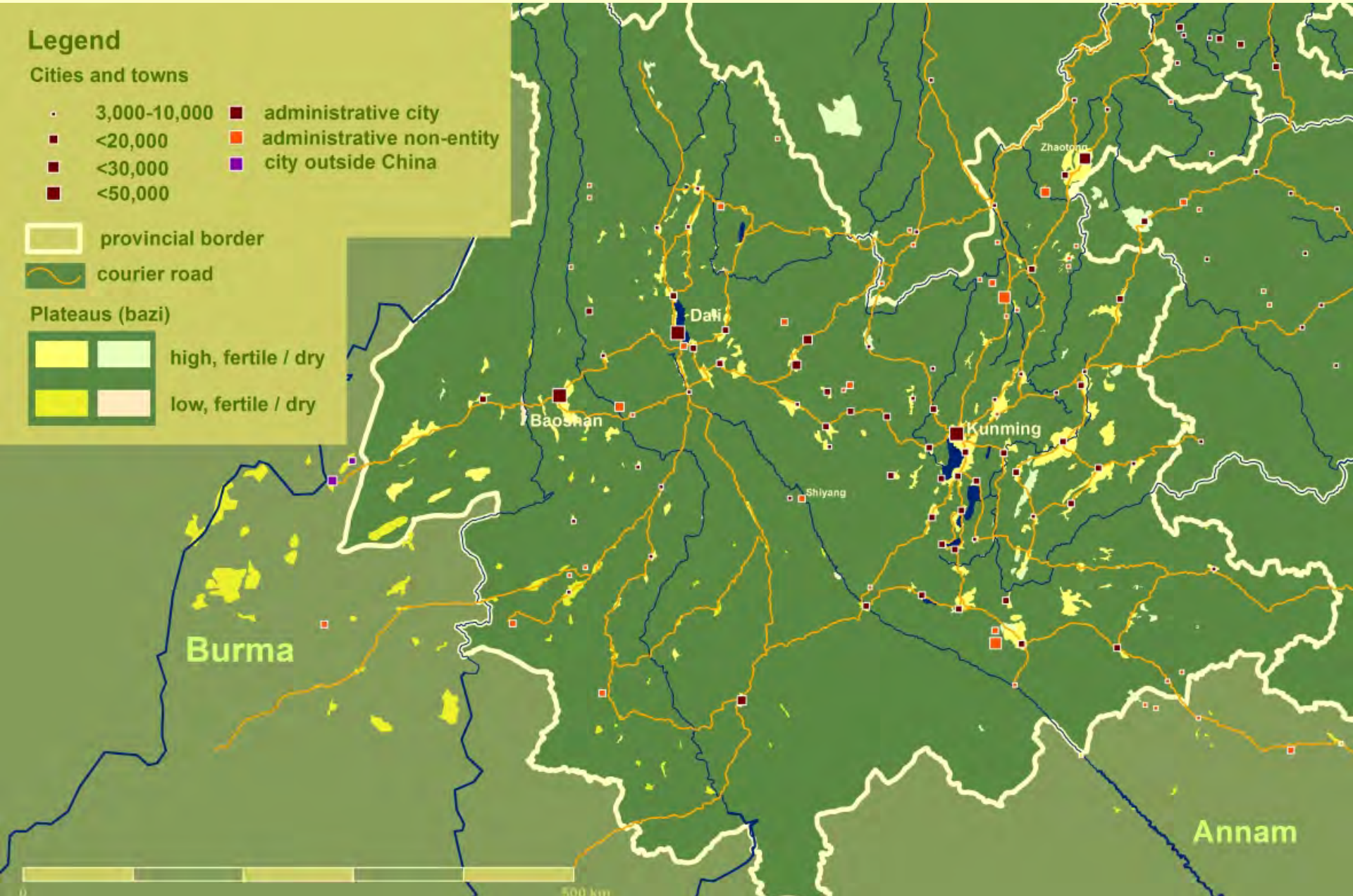
The political map of the Qing Southwest



The Qing Southwest, administrative cities, mines, and roads



The Qing Southwest, urban centers graded according to size, ca. 1800

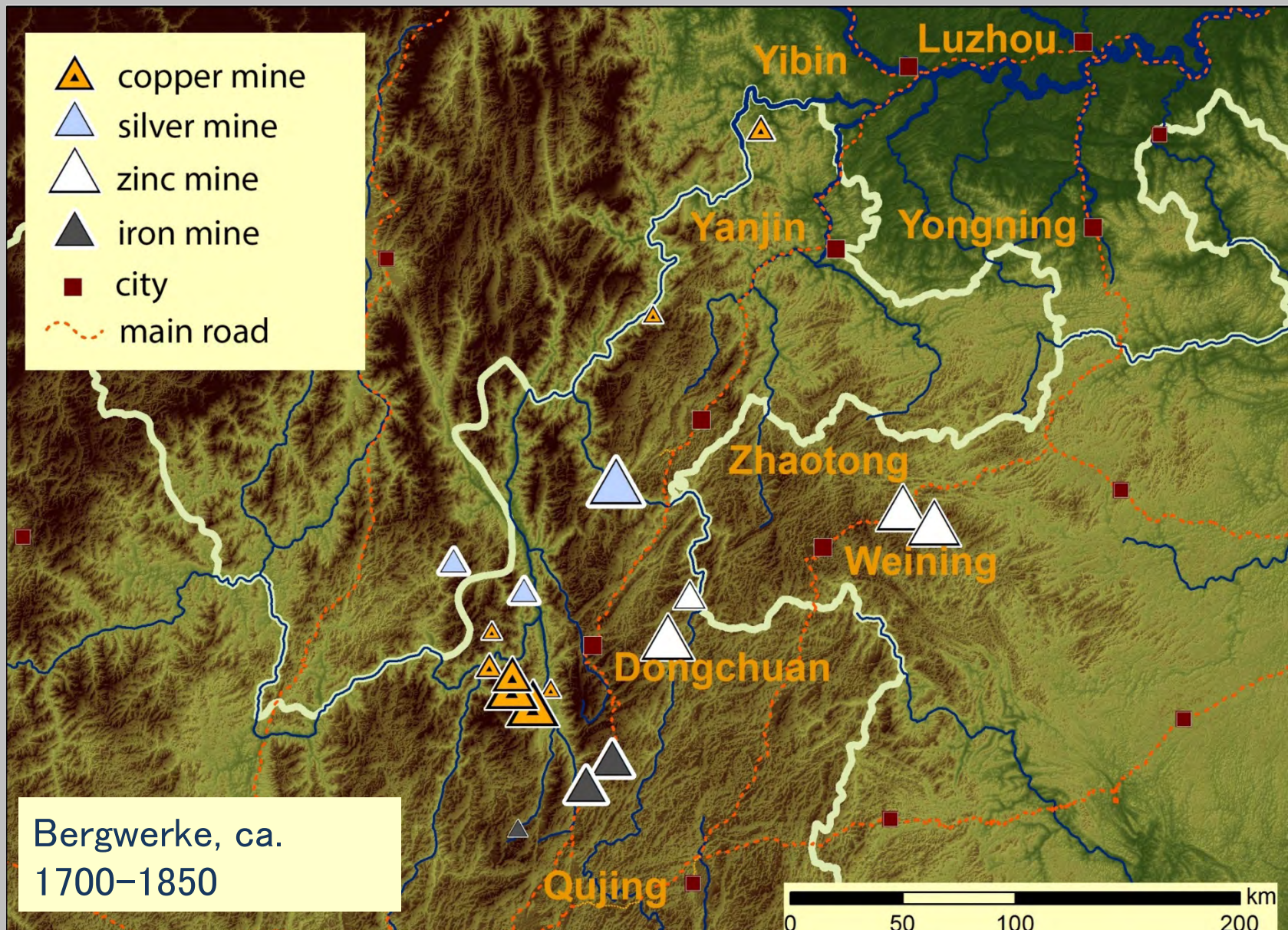




乾隆后期那姑巧家绅士刘汉
鼎捐修的运铜道路

Bergbau und Entwaldung

Untersuchung per Modellierung am Beispiel Nordost-Yunnan



Entwaldung: z.B. das Tal des Jinshajiang, 2007



The valley of the Jinshajiang near Maolu, Northeastern Yunnan, valley at ca. 700 m

Entwaldung: z.B. ein Tal zwischen Huize und der Kupferbergbauregion am Hongwangshan



Jianshan, on old route from the Tangdan Mines to Dongchuan, valley at ca. 1500 m

Modell zur Rekonstruktion von Entwaldung als direkte Folge des Holzverbrauchs durch den Bergbau

Voraussetzung 1) Sonstiger Holzverbrauch wird ausgeschlossen.
Voraussetzung 2) Ausgangsannahme: Die gesamte Region ist bewaldet mit Ausnahme der Flächen, die für Weiden und Landwirtschaft besonders geeignet sind oder wegen ihrer Höhe oder Gradienten nie bewaldet waren.

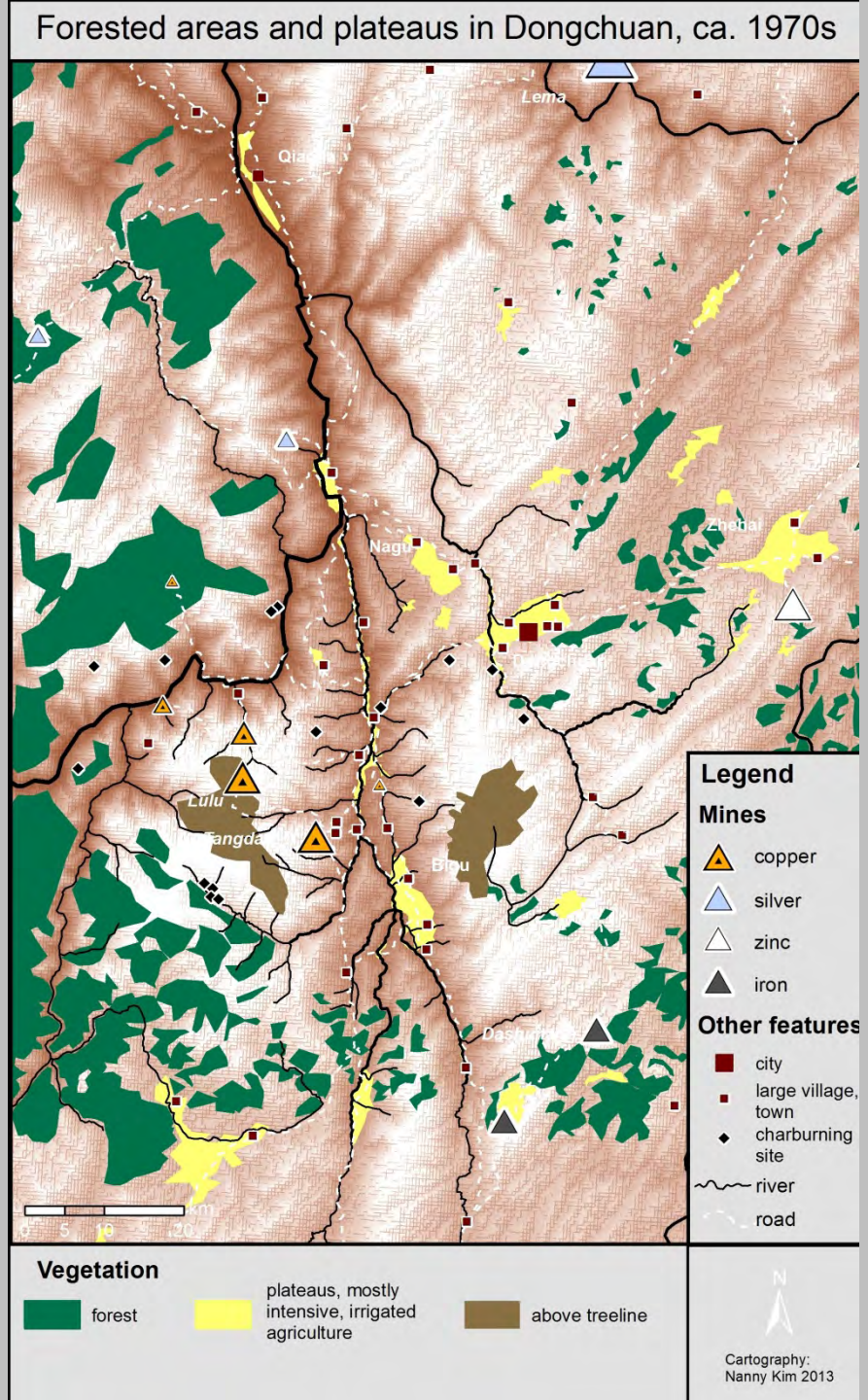
Schritt 1) Geschätzte Kupferproduktion
Ankaufquote + legaler und illegaler Handel
Schritt 2) Rekonstruktion des Waldverbrauchs
aufgrund rekonstruierter Verhüttungstechnologie, deren Holzkohlebedarf, dem Verhältnis von Frischholz/Holzkohle in der Köhlerei, dem nutzbaren Holzbestand pro Hektar Wald
Schritt 3) Modellierter Waldverbrauch und Regeneration in 10-Jahresschritten

Die folgende Serie von 10 Karten zeigt Ein Testmodell für das Kupferrevier am Hongwanshan von 1700-1780

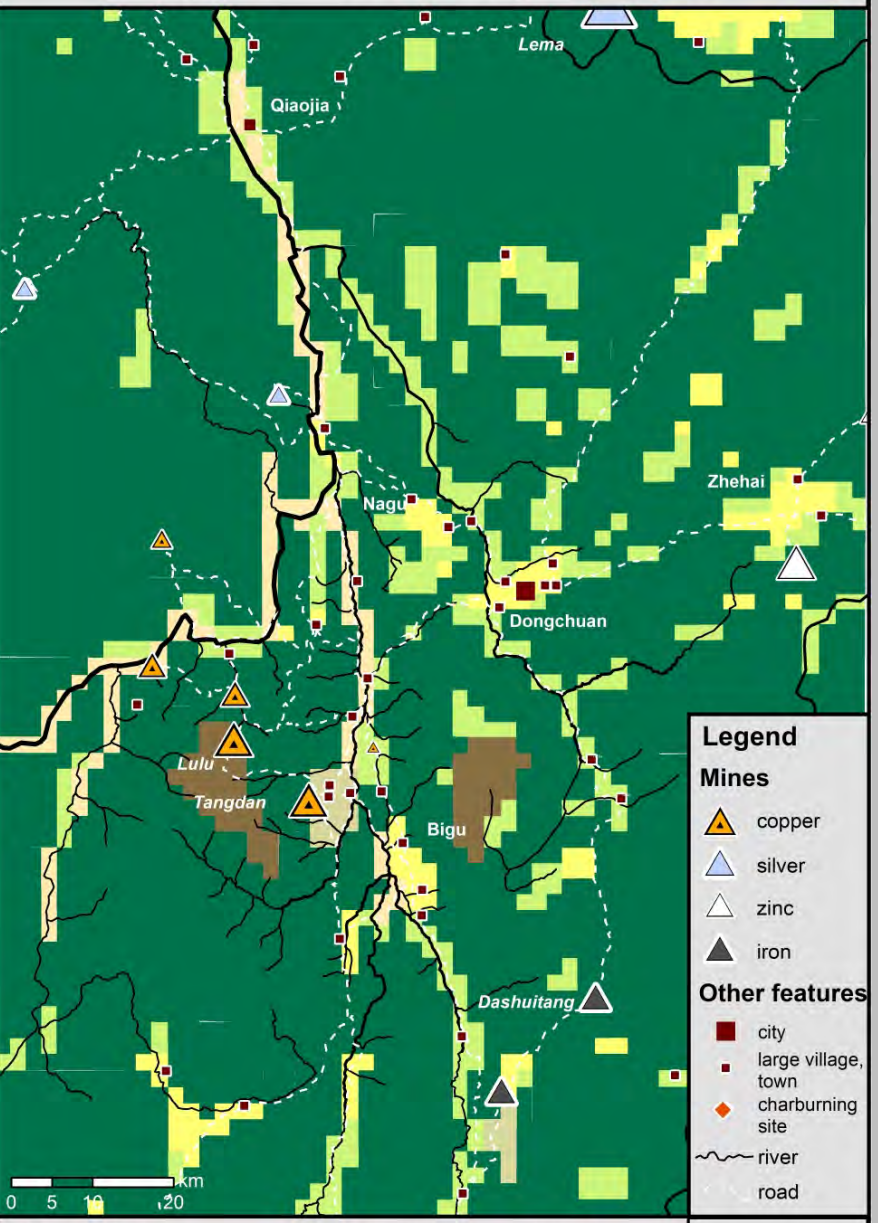
Das Modell reicht bis 1840, allerdings nimmt die Entwaldete Fläche nach 1780 nicht weiter zu, daher wurden die folgenden Karten weggelassen

Die Vergleichskarte zeigt den Zustand von ca. 1970 zum Vergleich

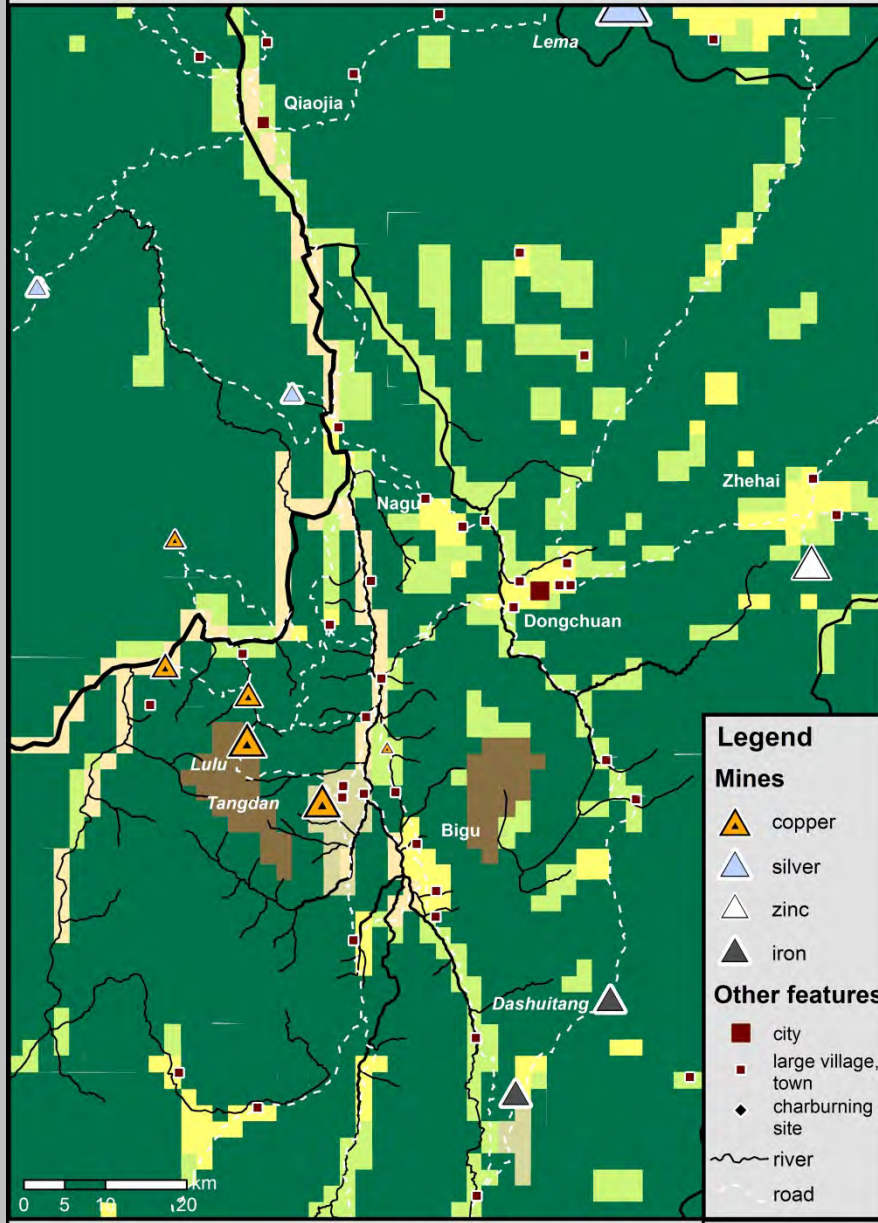
Die dunkelgrünen Areale zeigen bewaldete Flächen
In der Periode weitreichendster Entwaldung ca. 1970.
Daten aufgrund sovietischer Generalstabskarten aufgrund von Satellitenfotos



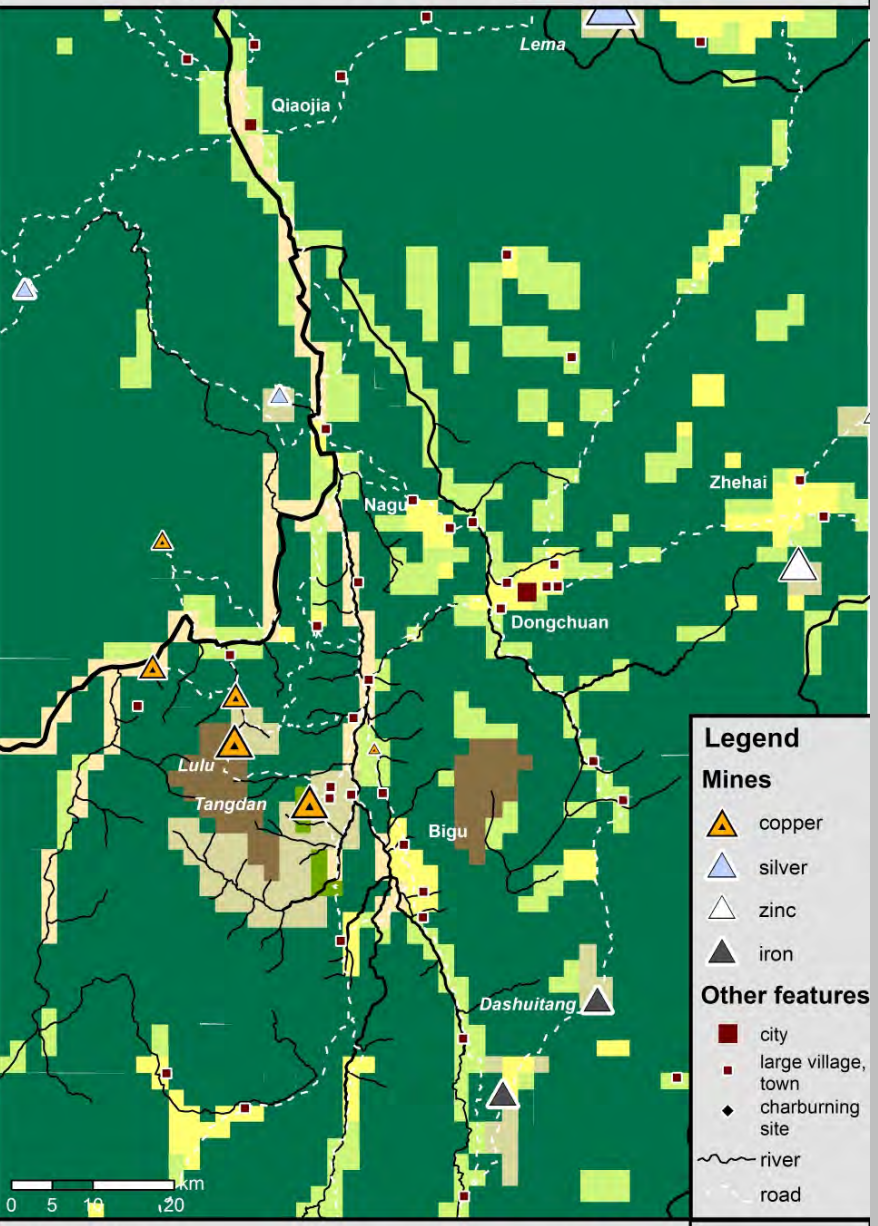
Vegetation model of Dongchuan: 1700



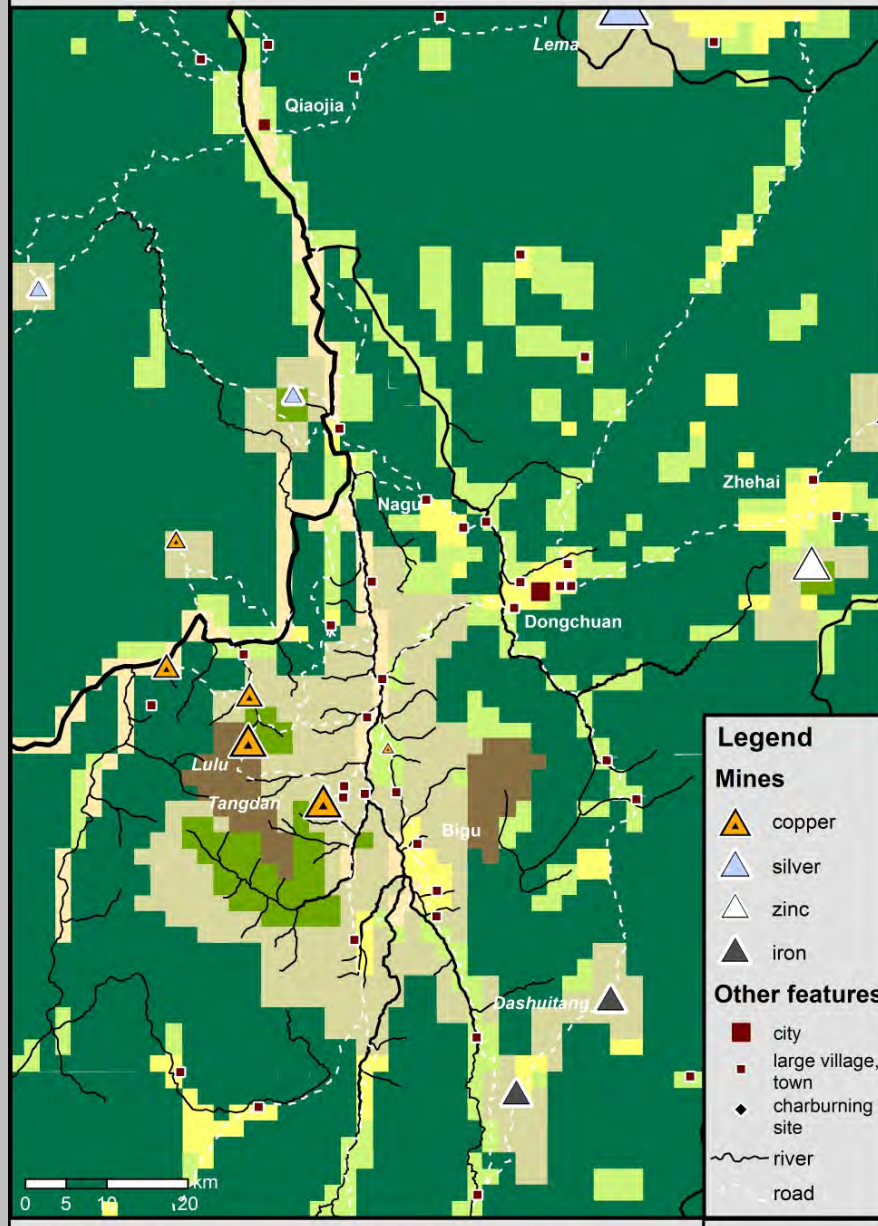
Vegetation model of Dongchuan: 1720

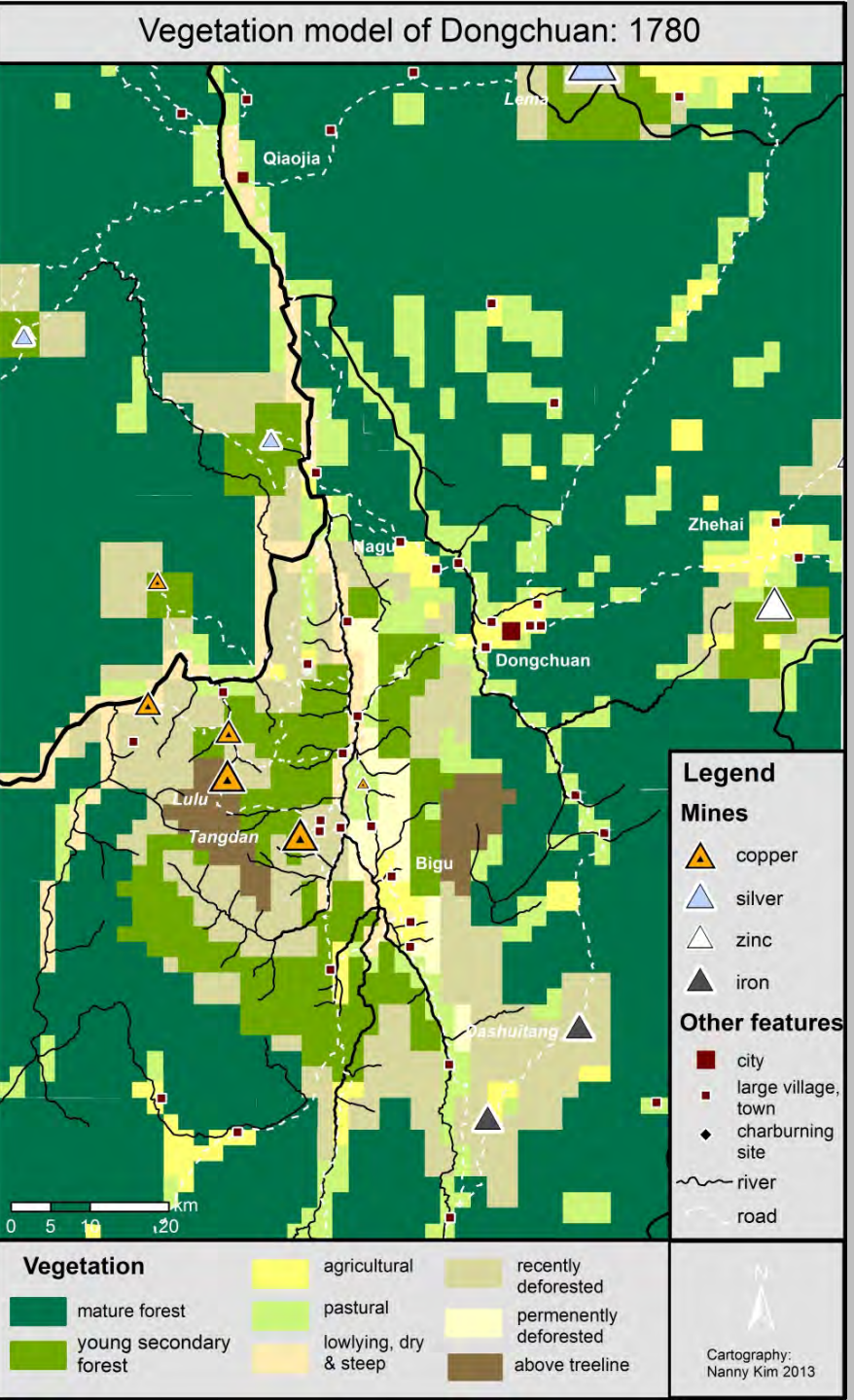


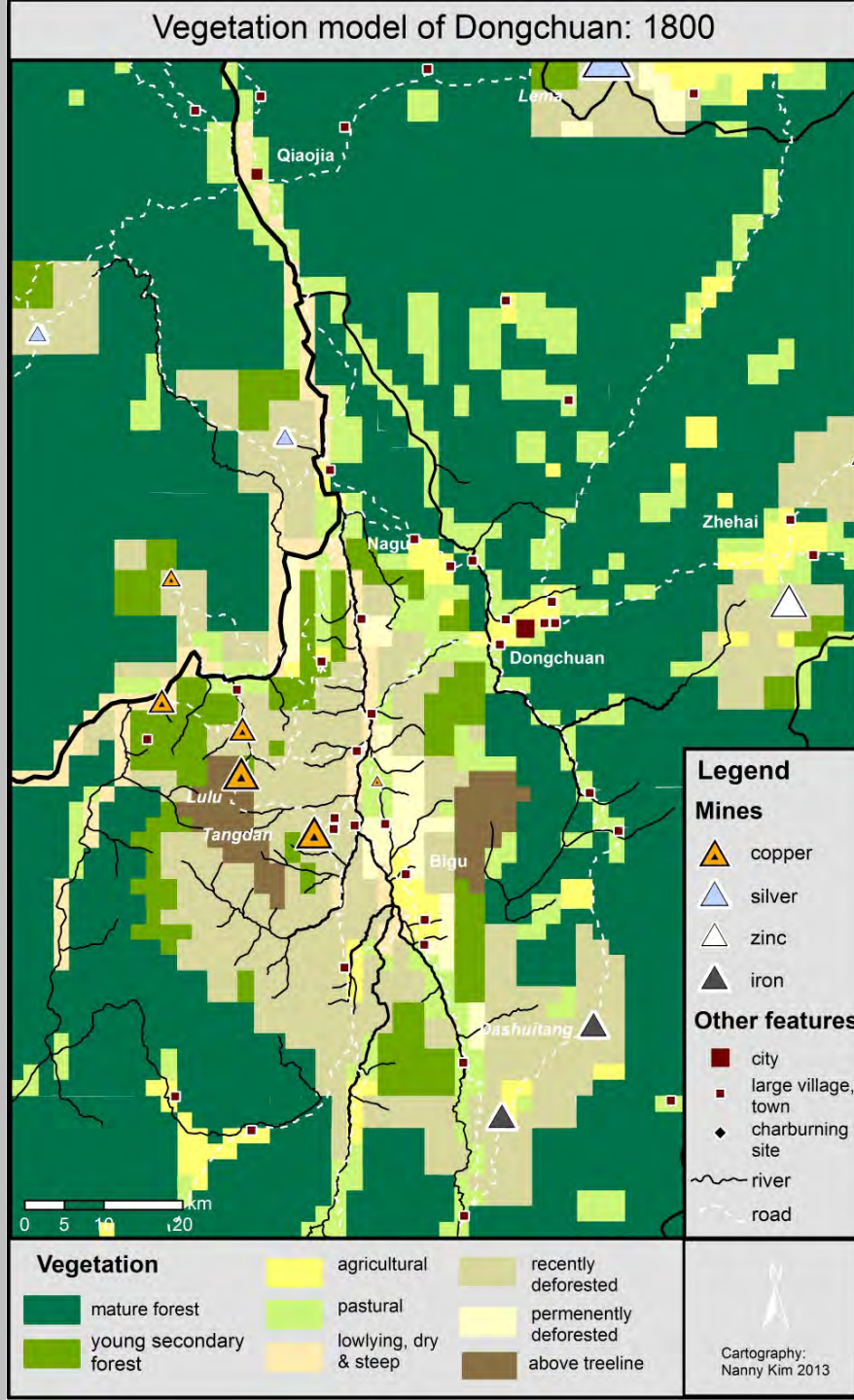
Vegetation model of Dongchuan: 1740



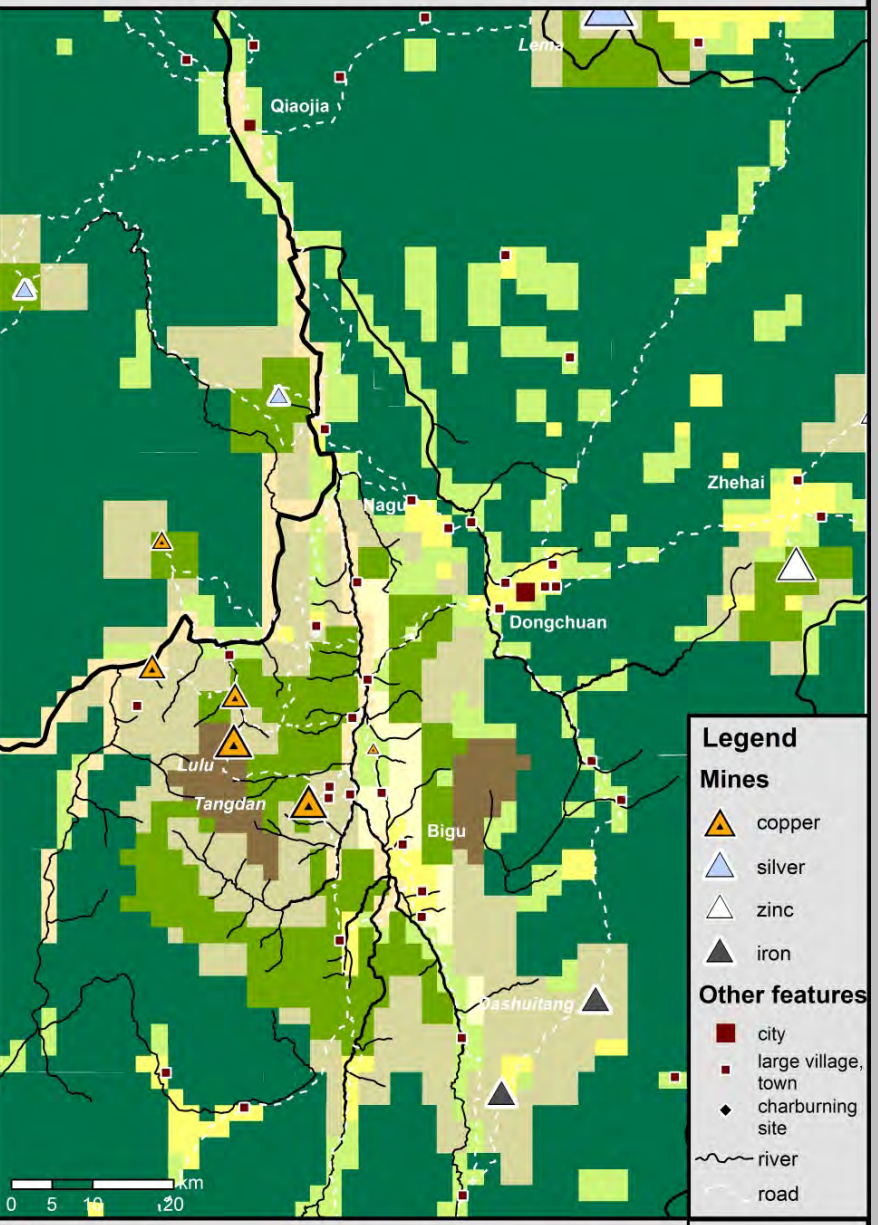
Vegetation model of Dongchuan: 1760




Vegetation model of Dongchuan: 1780
Qiaojia
Zhehai
Nagu
Dongchuan
Lulu
Tangdan
Bigu
Dashuitang
0 5 10 20 km
Legend
Mines
copper
silver
zinc
iron
Other features
city
large village, town
charburning site
river
road
Vegetation
mature forest
young secondary forest
agricultural
pastural
lowlying, dry & steep
recently deforested
permenently deforested
above treeline
N
Cartography: Nanny Kim 2013


Vegetation model of Dongchuan: 1800
Qiaojia
Zhehai
Nagu
Dongchuan
Lulu
Tangdan
Bigu
Dashuitang
0 5 10 20 km
Legend
Mines
copper
silver
zinc
iron
Other features
city
large village, town
charburning site
river
road
Vegetation
mature forest
young secondary forest
agricultural
pastural
lowlying, dry & steep
recently deforested
permenently deforested
above treeline
N
Cartography: Nanny Kim 2013

Vegetation model of Dongchuan: 1780



Legend

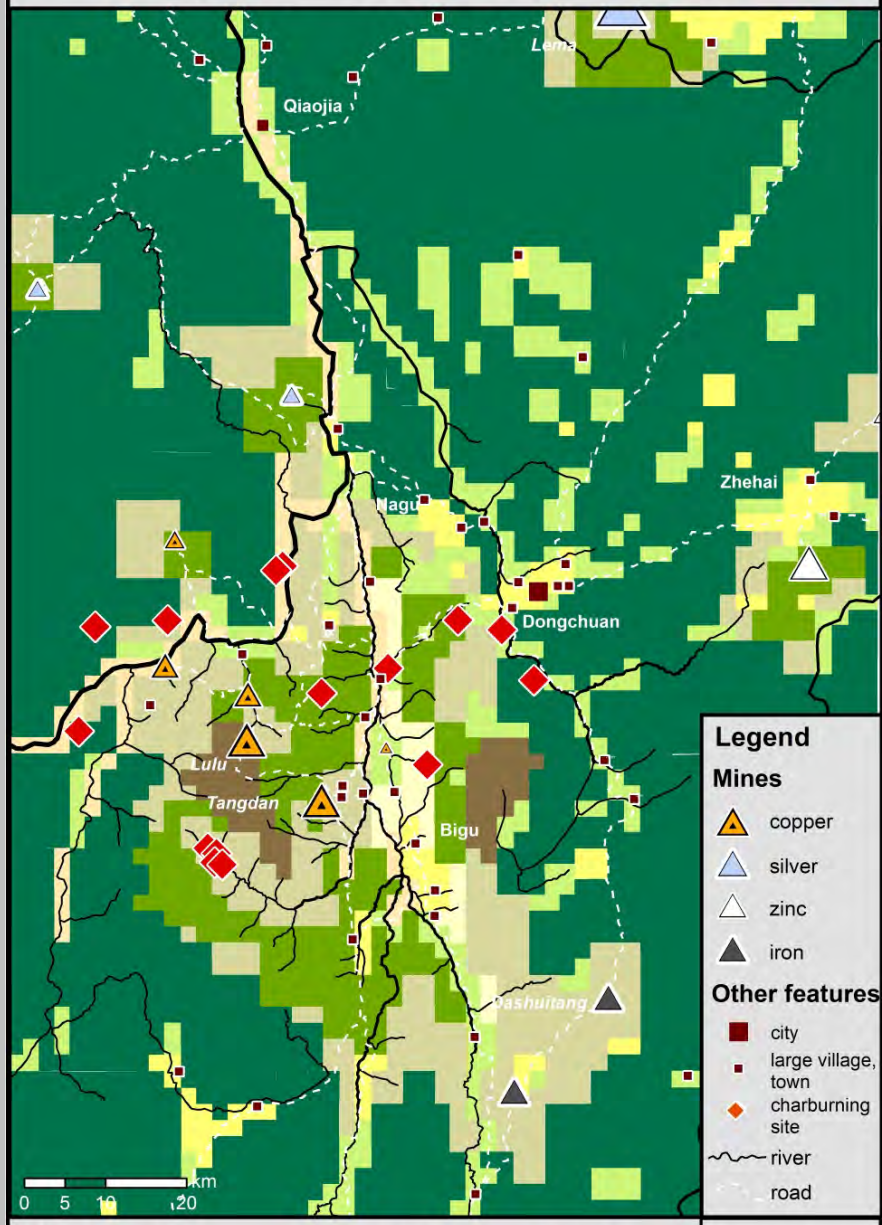
Mines
- copper
- silver
- zinc
- iron

Other features
- city
- large village, town
- charburning site
- river
- road

Vegetation
- mature forest
- young secondary forest
- agricultural
- pastural
- lowlying, dry & steep
- recently deforested
- permenently deforested
- above treeline

Cartography: Nanny Kim 2013

Vegetation model of Dongchuan: 1780



Legend

Mines
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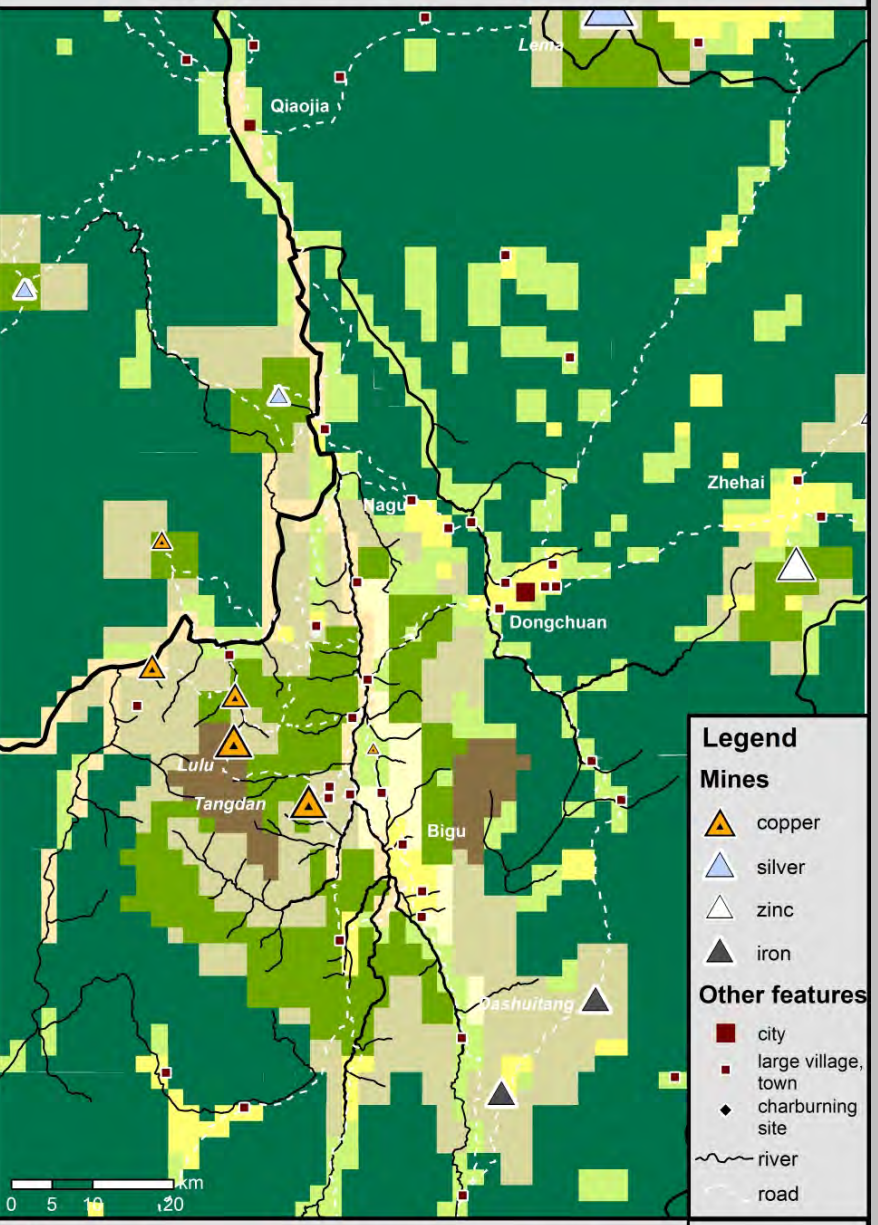
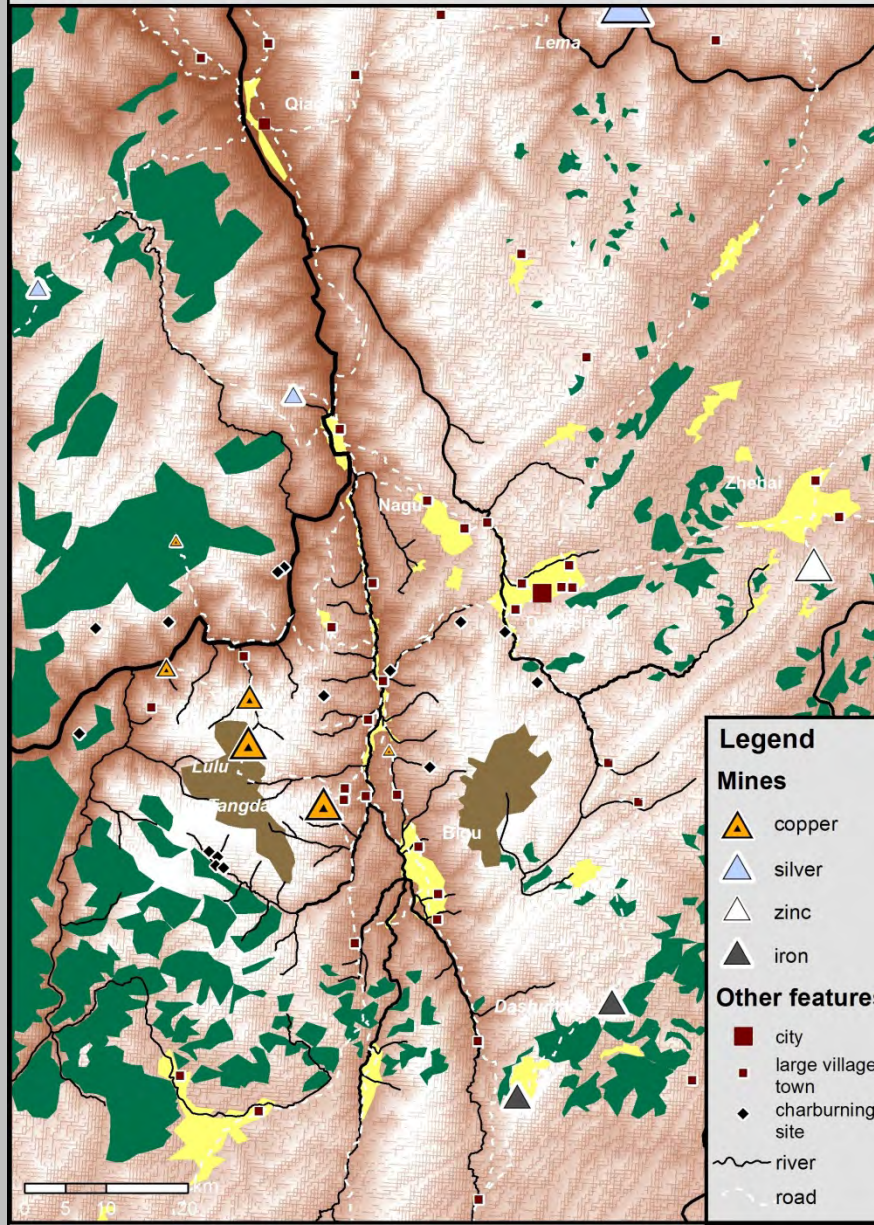
Cartography: Nanny Kim 2013

Vegetation model of Dongchuan: 1780



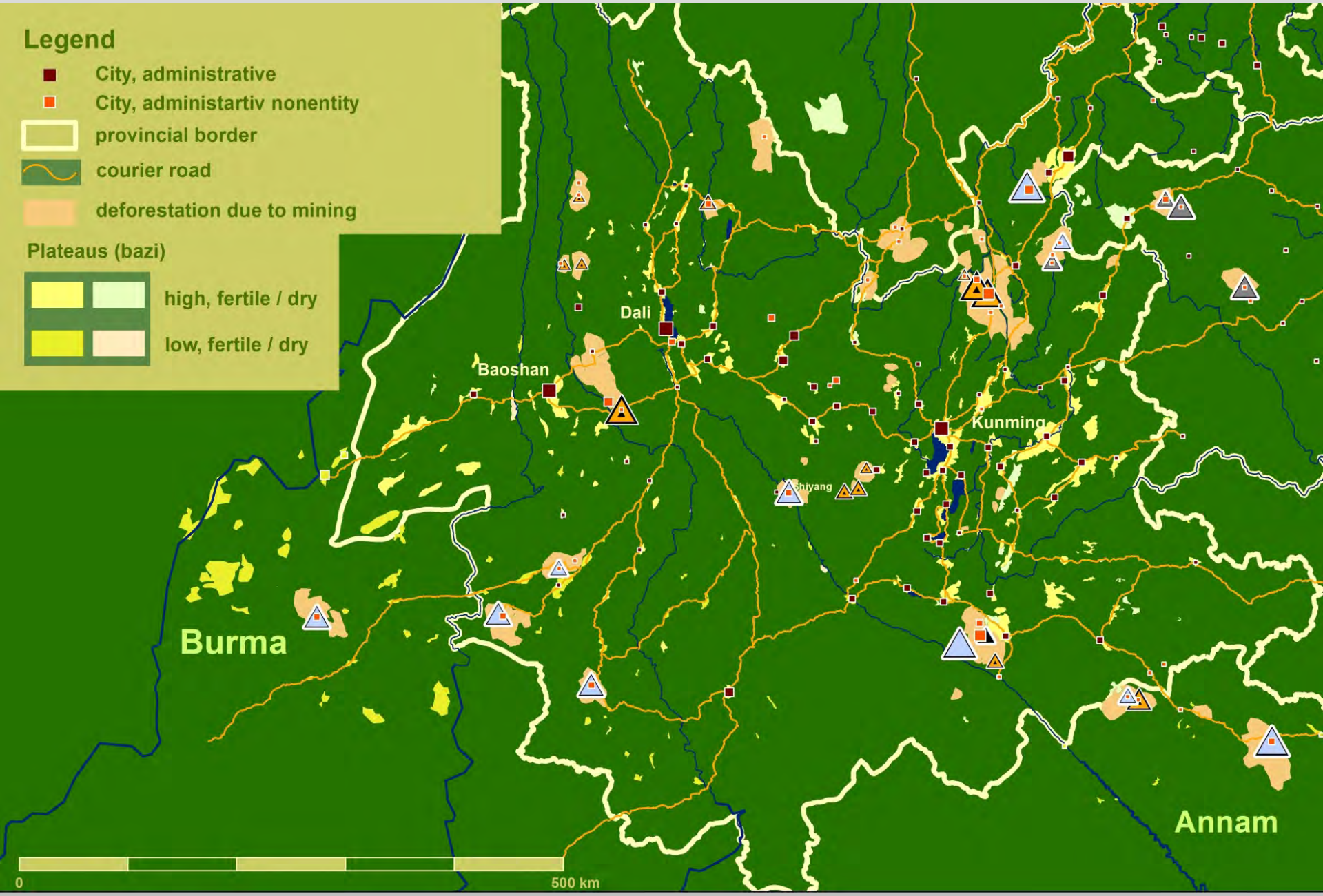
Forested areas and plateaus in Dongchuan, ca. 1970s



Die abschließende Karte ist ein statische Erweiterung aufgrund der vorhandenen Daten für den gesamten fernen Südwesten.

Sie zeigt massive, aber keine flächendeckende Entwaldung durch den Bergbau.

Extent of deforestation due to mining ca. 1800



Spezifische, geographisch lokalisierte Untersuchungen und Modellierungen sind eine Möglichkeit, trotz unzureichender Quellenlage zu substantiellen Ergebnissen zu kommen.
Das Schöne an diesen Ergebnissen ist, dass sie erweiterbar und falsifizierbar sind!


谢谢！

西南和边疆地区的古代银矿
-
从矿工迁入路线探讨清代中叶的矿业组织

Nanny Kim/金兰中
德国海德堡大学

西南和边疆地区的古代银矿

-

从矿工迁入路线探讨清代中叶的矿业组织

1. 白银和全球贸易圈的形成与云南的银矿
2. 从比较角度观察明清时期的银矿开采
3. 矿业的劳动力问题
4. 从内地矿工走厂路线重新考虑矿工收入和走厂动机

历史上的大银矿



Cerro Rico (富山)
位于南美北部
玻利維亞伯托西市



湖广大山
位于云南省沧源县滇缅
边界



波托西

大规模开采：约 1570年-1620年
开采迄今

大规模开采期间白银产量：
约达 62,000 t

茂隆

大规模开采：约1750年-1800年
约1850年停止开采

白银总产量：
可能达 3000 t

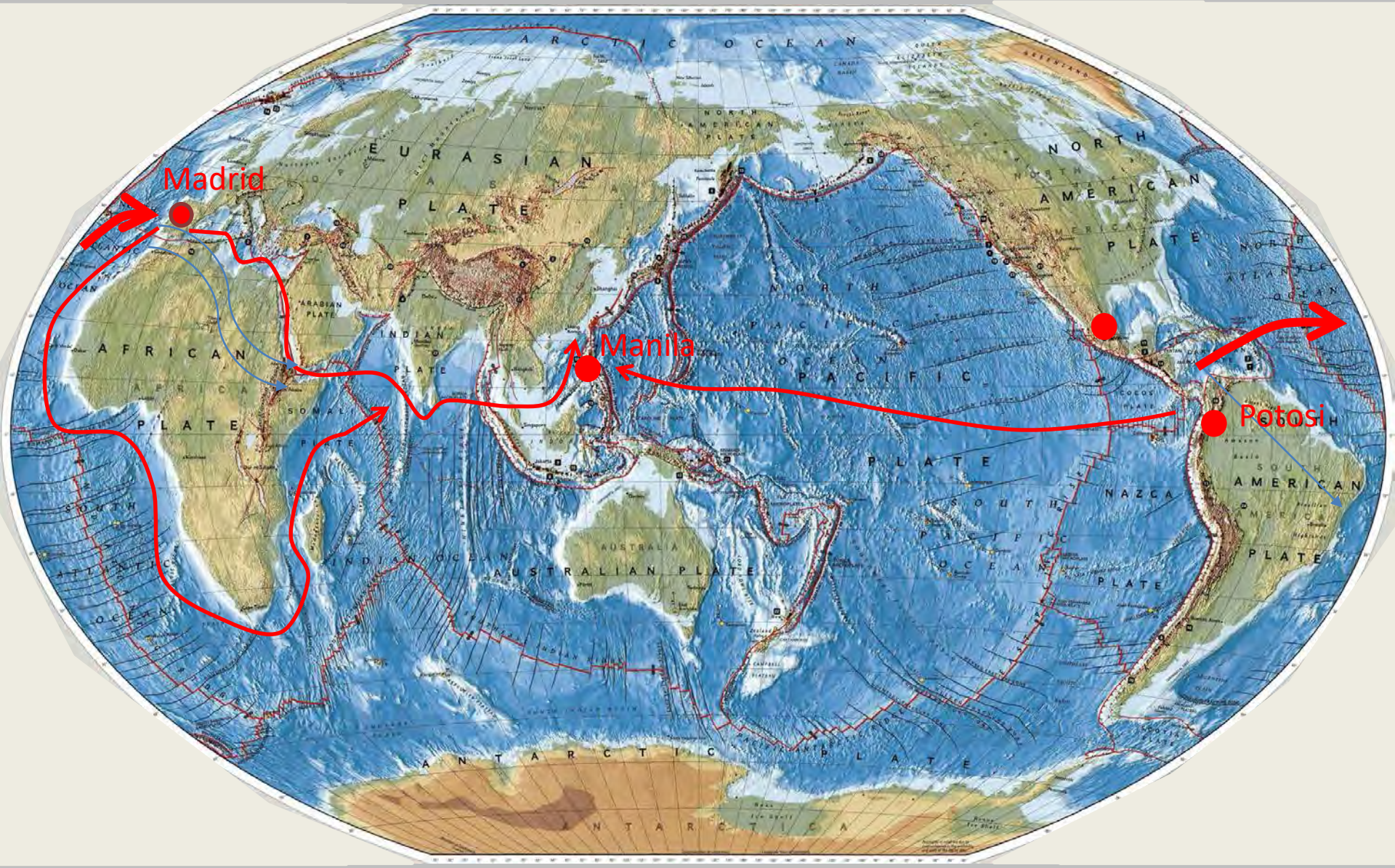


Dennis O. Flynn and Arturo Giráldez
Born with a “Silver Spoon”: The Origin of World Trade in 1571.
(“诞生以来白银为伴侣”:全球贸易网的起源是1571年)
(*Journal of World History*, 1995, pp. 201-221)

16世纪下半叶人类历史上第一次形成全球化贸易网络
技术条件:航海技术(绕行非洲和南美, 度过太平洋)
关键商品:白银
关键事件:葡萄牙和西班牙在美国建立的殖民地发现银矿

全球化如果要定年份, 开端应该定在1571年:
菲律宾岛上创建Manila城 (吕宋), 南美和东南亚航线成文贸易孔道

1571年之后形成的全球白银流
中国为白银流的汇流地 the global sink of silver



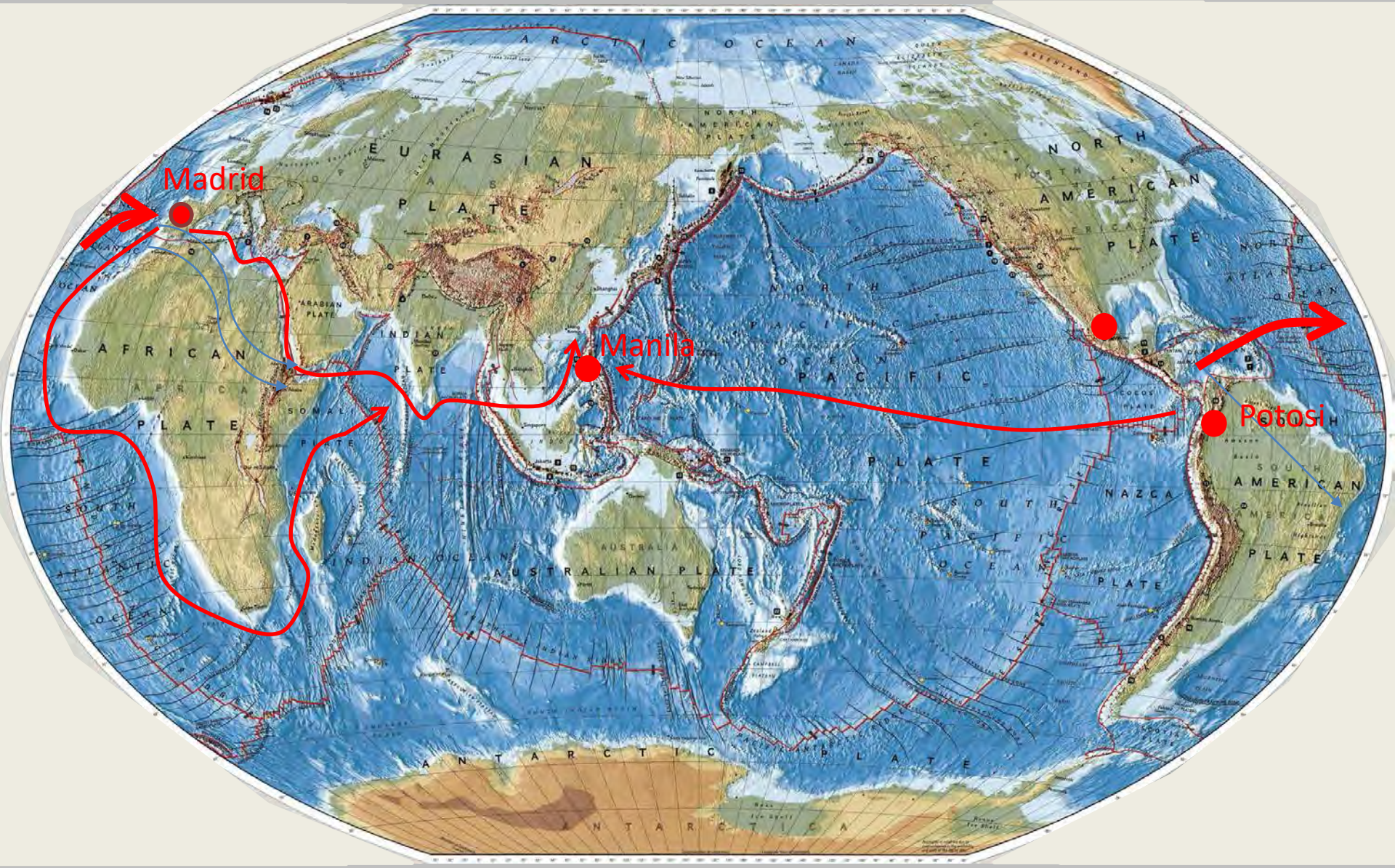
明清中国为全球白银流汇流之地的迷：global sink

中国白银的用途主要是货币
需求和价格一直稳定反应货币量与人口增长和商品经济发展同步增长

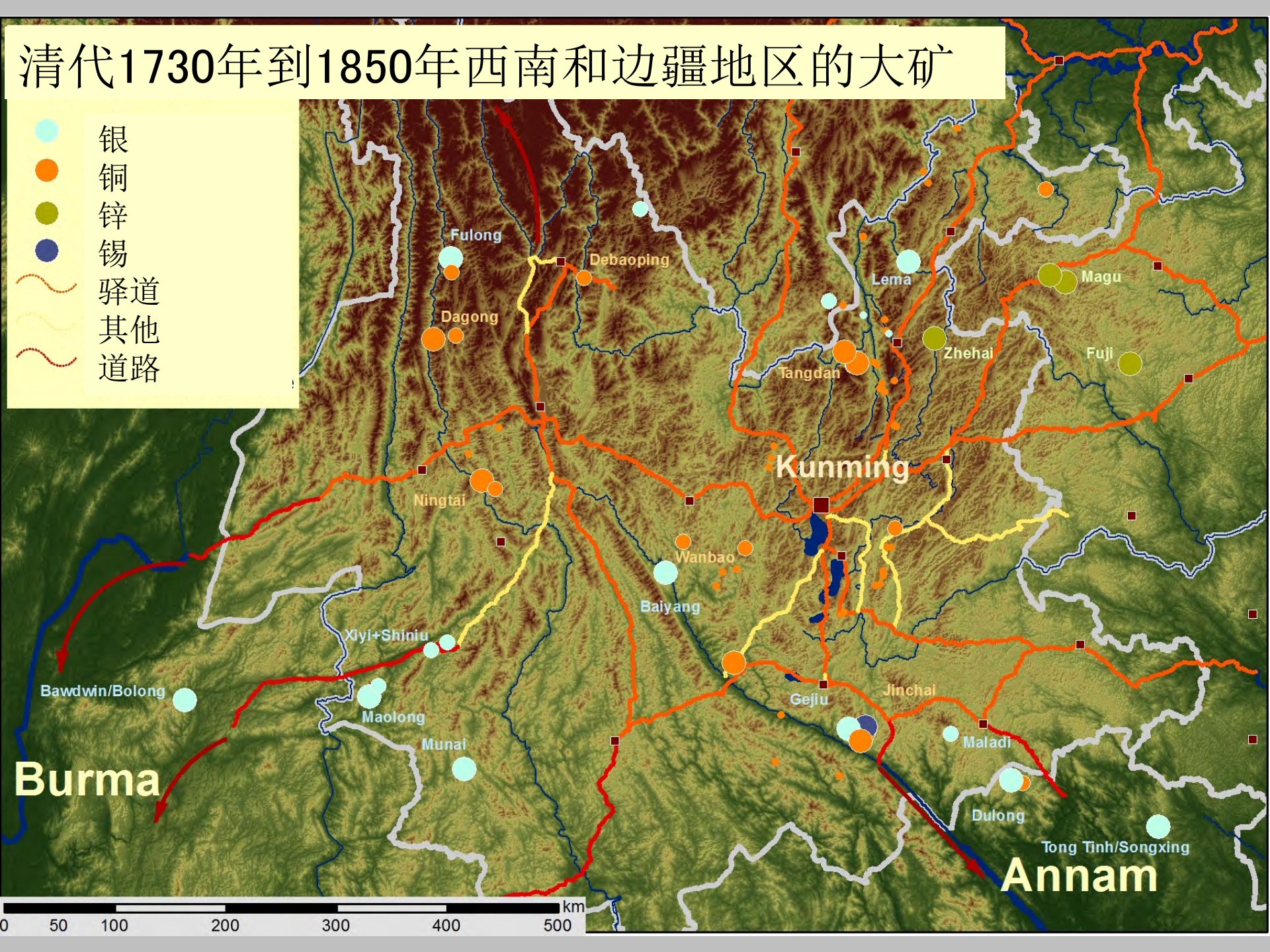
（1）　日本和美洲白银流入之前的迷
1436年：华东地区纳税允许折成白银：白银的货币化完成
1567年：通过日本和东南亚海贸开始大量引进白银
一般认为明代银矿的开采明初延伸元代的开采，15世纪上半叶萧条之后没有回复发展。
盛明时期的商品经济白银流通量始终稳定不变吗？

（2）美洲白银流入时期银价一直高昂稳定的迷
明清时期的经济能带动全球贸易网，引进大量白银，反而无力开展国内银矿的开采吗？

1671年之后形成的全球白银流
中国为白银流的汇流地 the global sink of silver



清代1730年到1850年西南和边疆地区的大矿



欧洲中世纪后期以来银矿业史料丰富

我们对矿工的工作，收入，
生活条件了解相当详细



图形出处：德国，1556年



波伯托西矿山

1570年开矿到19世纪初矿工死亡总数达100万人（当地土著人和非洲人）



图形出处：Theodor de Bry 铜版画，约 1590年

明清时期银矿业

- 史料极少
- 对矿工的了解很有限





图形出处：《滇南矿产图略》1844年版本

明清时期银矿业

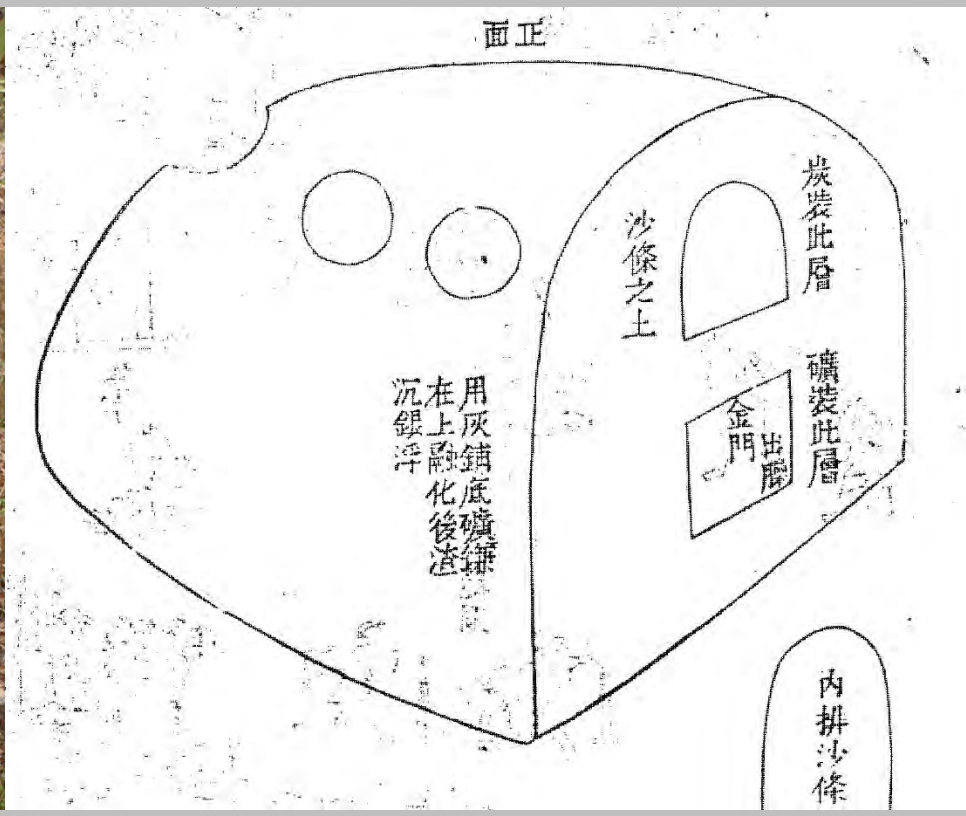
- 史料极少
- 研究需要参考遗迹，口述历史等
- 需要创新科研方法



鹞嘉白羊厂的硐口
2011年金兰中摄影

遗迹:分银罩子





石羊厂，2011年杨煜达和金兰中考查　　七星罩

《滇南礦廠圖略》(1844)

遗迹：炼渣



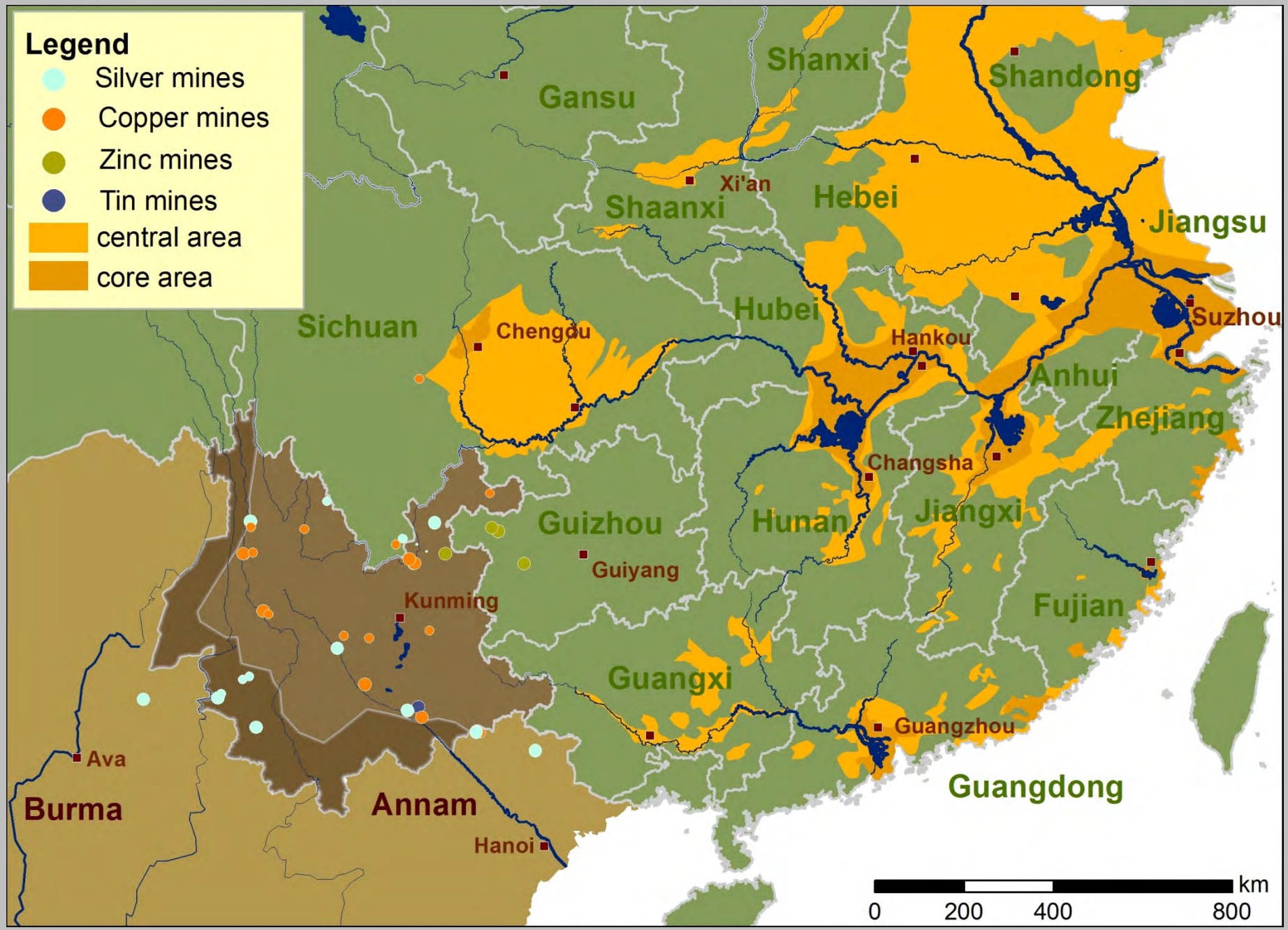
石羊厂

口述历史

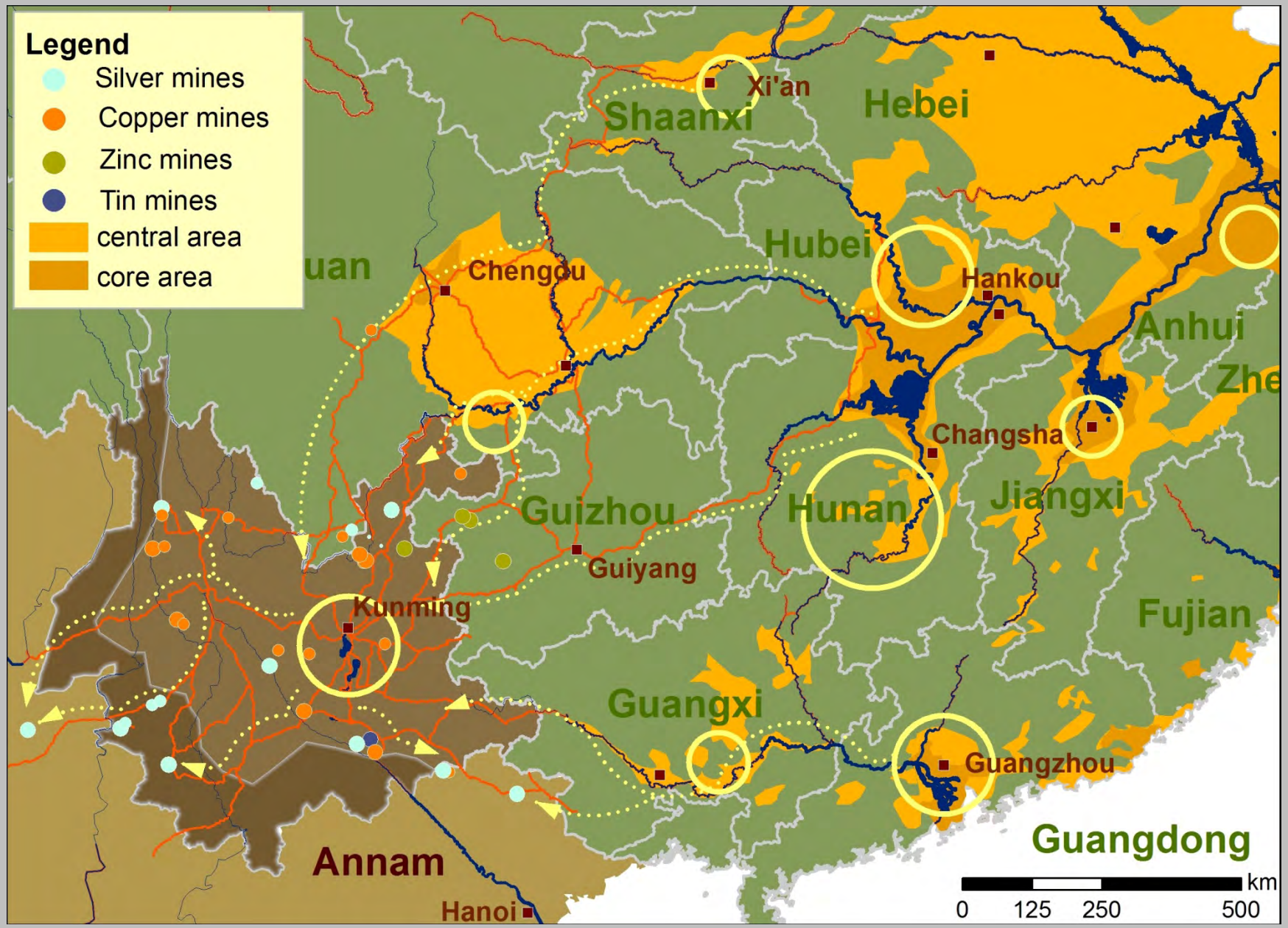








内地核心地区、云南省、边疆土司地区和主要矿产



矿区流动人口的主要原籍省份和路程

矿工为社么离乡背井？

爐戶砂丁皆**無產業之人**，彼見無利可圖，勢必棄而他适，有誤銅斤，殊多未便。
（《东川府志》概括唐丹等铜矿约1850到1860年代的情况）

职连年以来屡饬有等**无籍异省棍徒**，开厂为名，滥扯客货，夤干厂委招摇……及至土司地方，凌虐官目，采买米麦，纠众开挖，人多费广。
（康熙三十三年(1694)莅任的永顺总兵周华凤）

➡ **矿民不是赤贫流民就是流氓棍徒**

矿工为社么离乡背井？

赵翼因清缅战役对波竜银厂的记录)（1769年）：

滇边外有缅属大山银厂，极旺，而彼土人不习烹炼，故听中国人往采，彼特税收而已。大山厂多江西、湖广人，……时各厂丁江楚人所居采银者，岁常有四万人。……岁常有一百余万金赍回内地。

➡ **矿民定期回乡，每人携带几十两银子**

地形



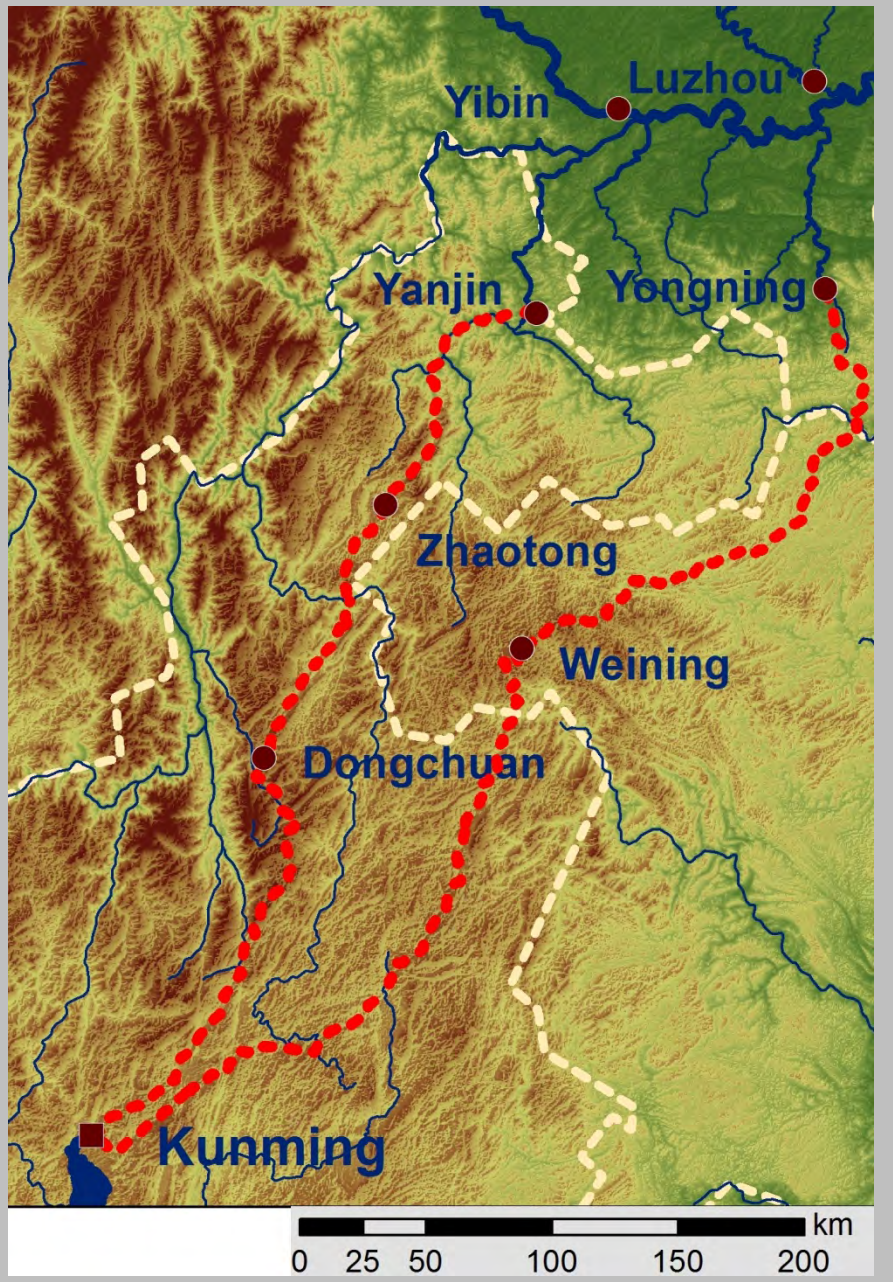
Along the road from Menggu 蒙姑 to Huili 會理.
Lithography after a drawing by Louis Delaporte, member of the expedition Francis Garnier, 1870.

山路

翻越阿尔卑斯山和四川盆地如滇中道路的比较



The Reschen Pass Road



昭通和威宁路线

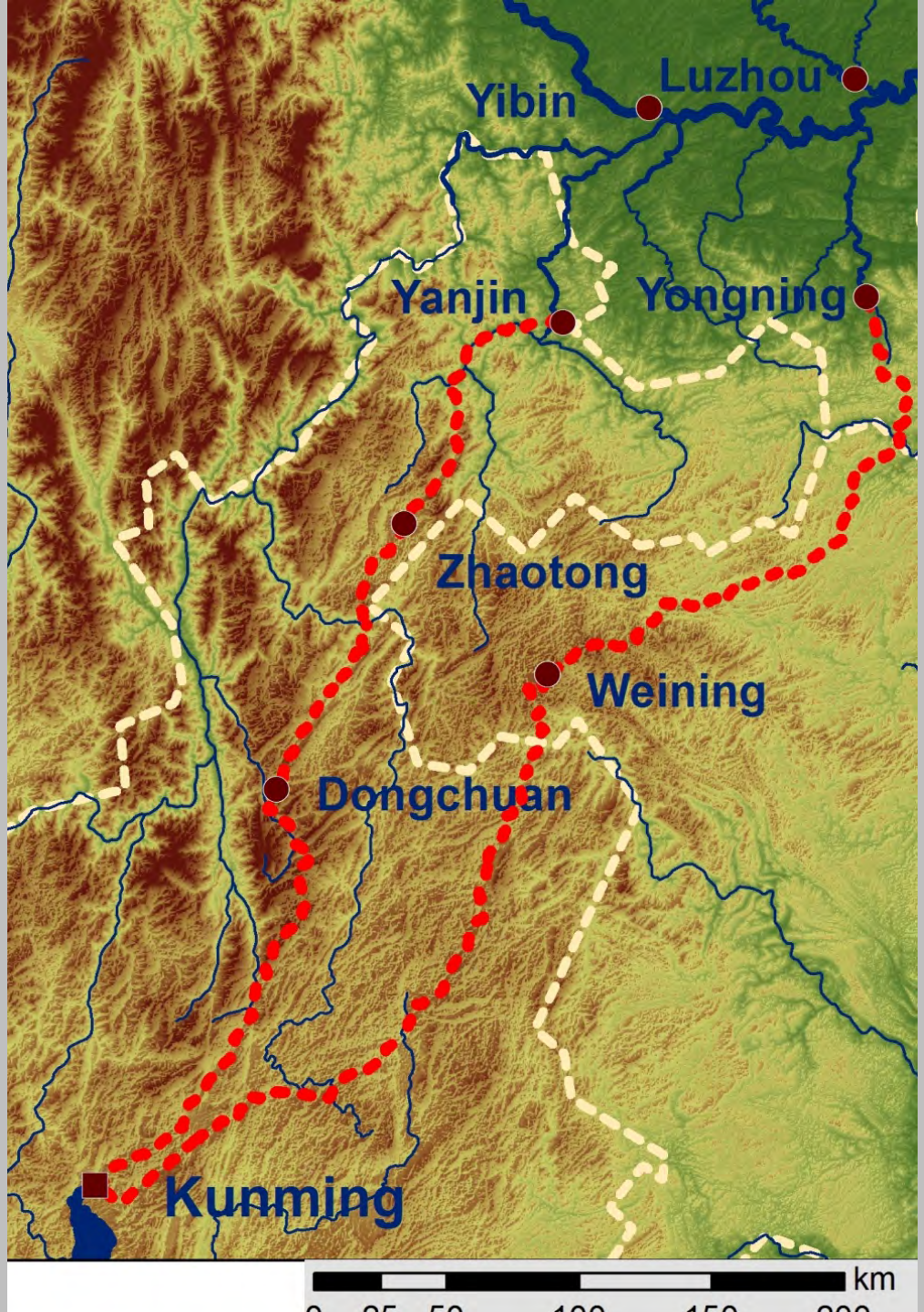
翻越阿尔卑斯山和四川盆地如滇中道路的比较

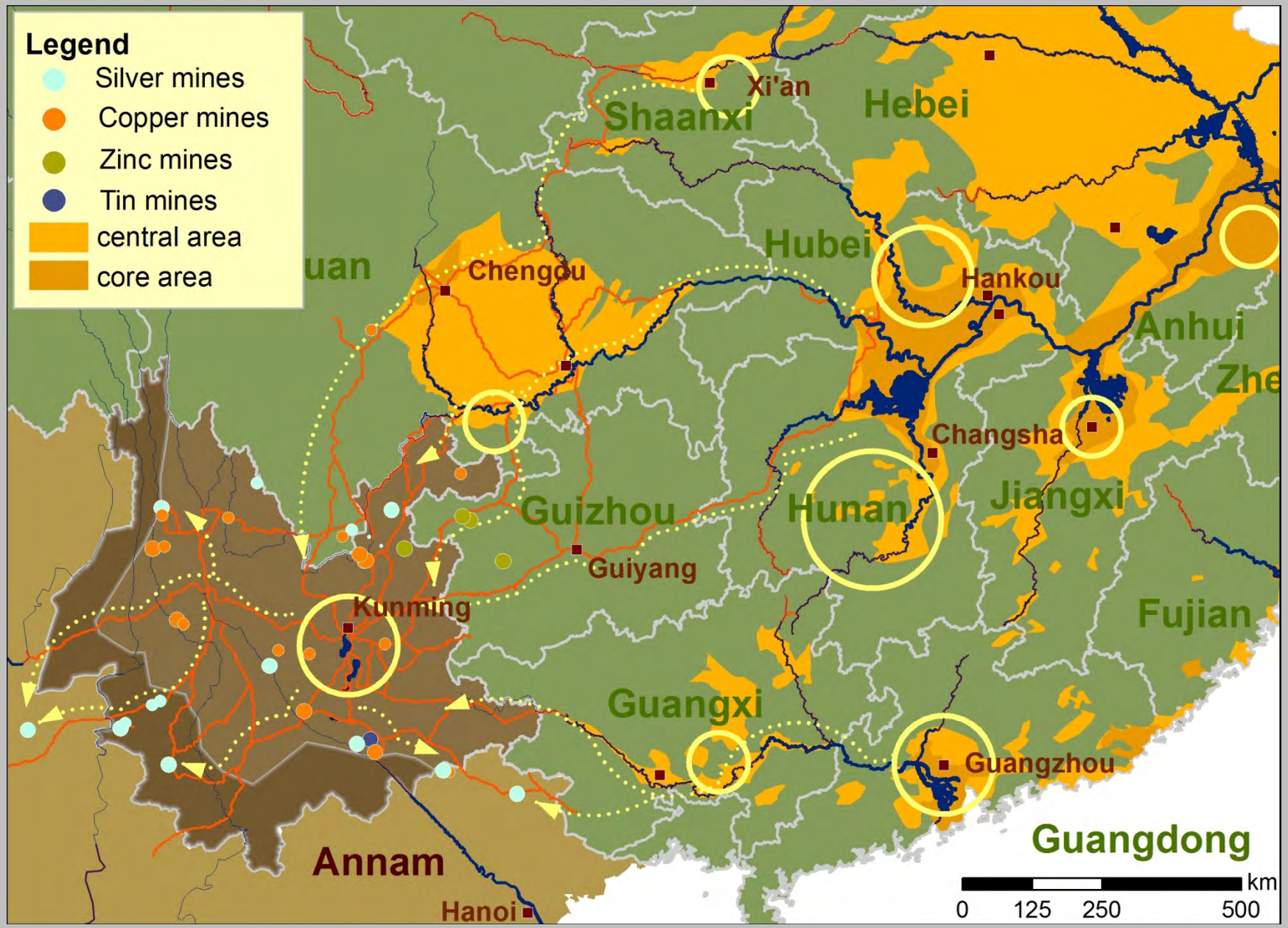


	Reschen Pass Road	昭通路线	威宁路线
总长	480 km	490 km	630 km
累计高差	21,000 m	52,000 m	50,000 m

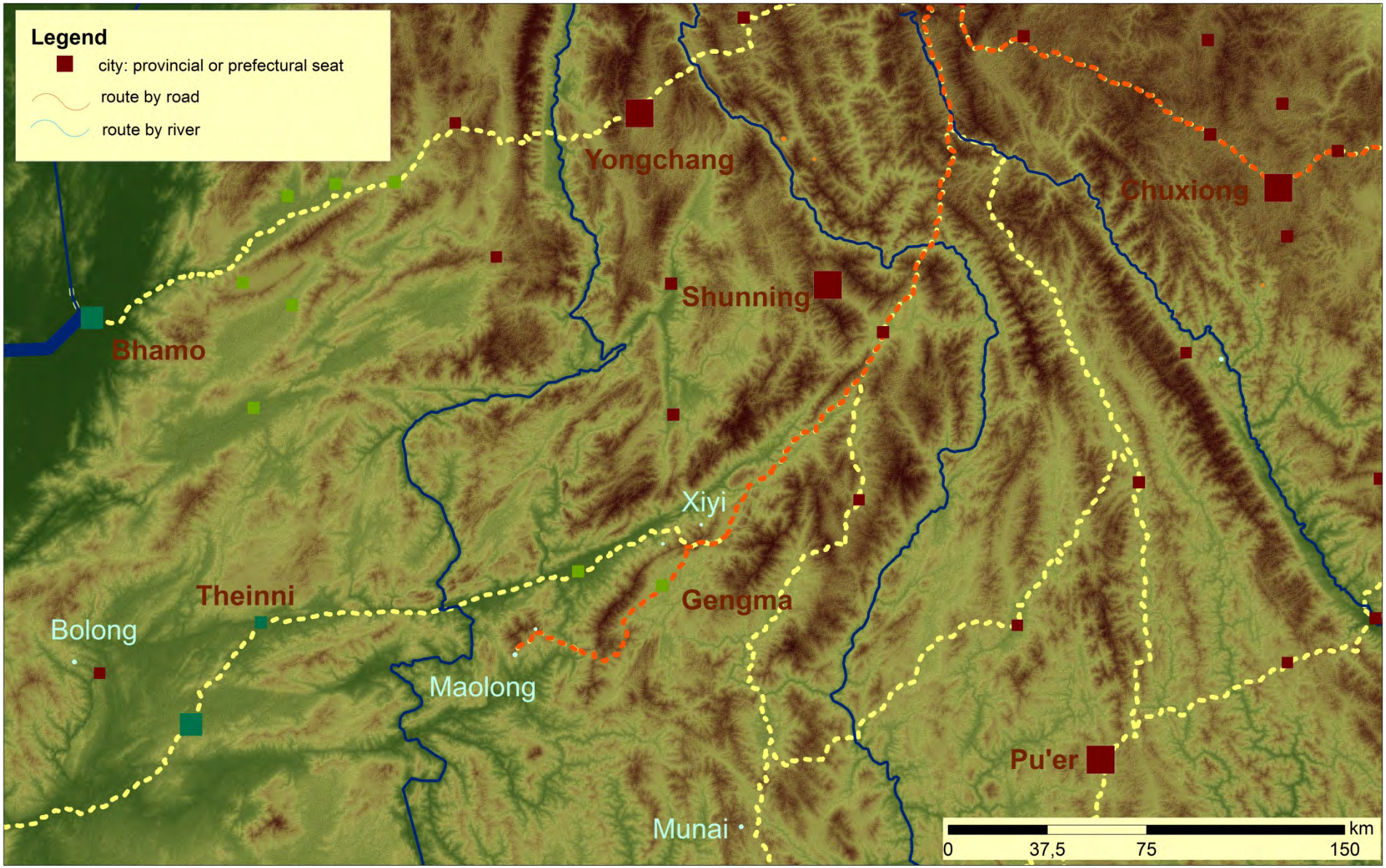
Lithography after a drawing by Louis Delaporte, member of the expedition Francis Garnier, 1870.


Augsburg
Füssen
Reschen - Resia
Merano
Bolzano
Verona
km
0 12,5 25 50 75 100

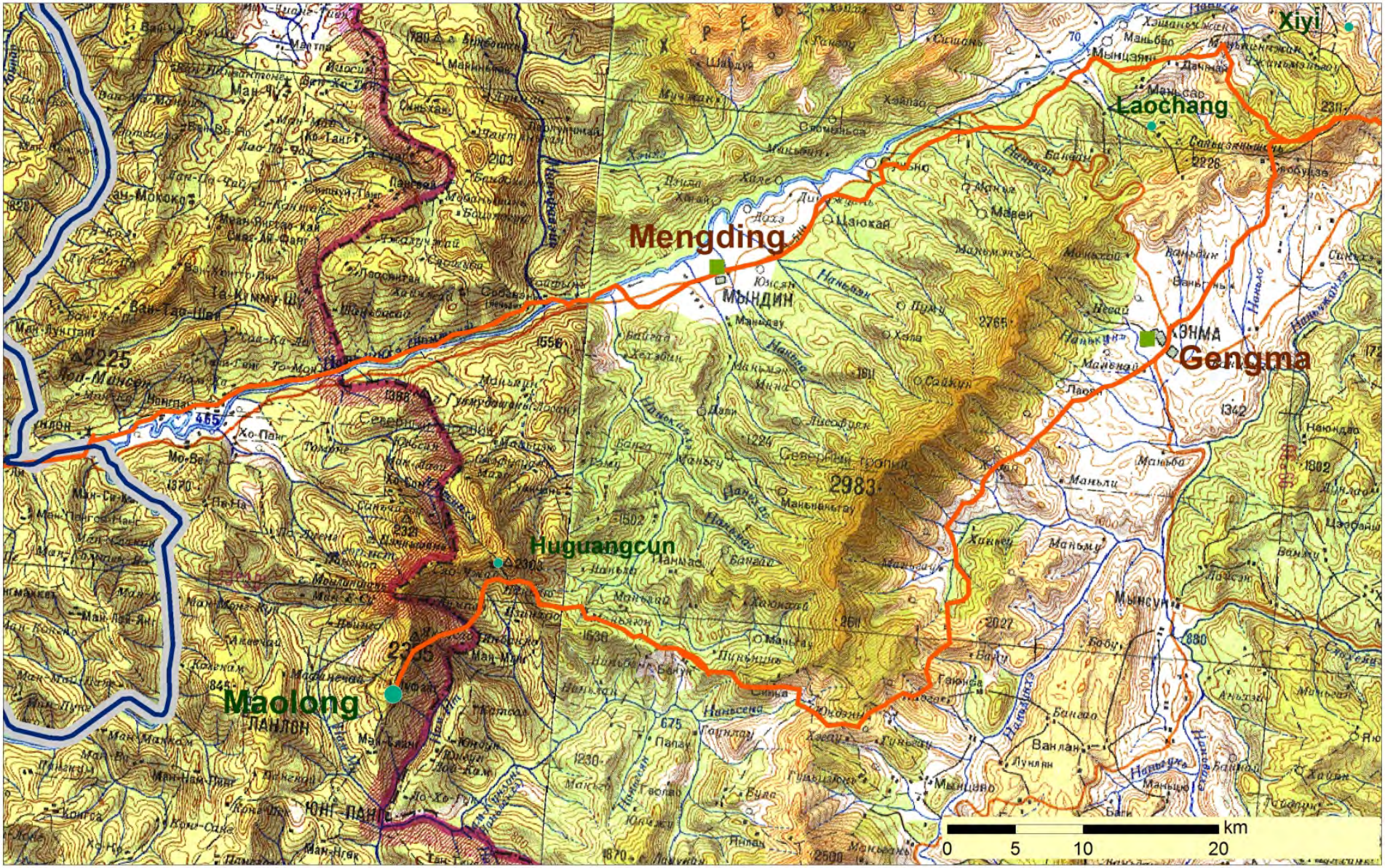

Yibin
Luzhou
Yanjin
Yongning
Zhaotong
Weining
Dongchuan
Kunming
km



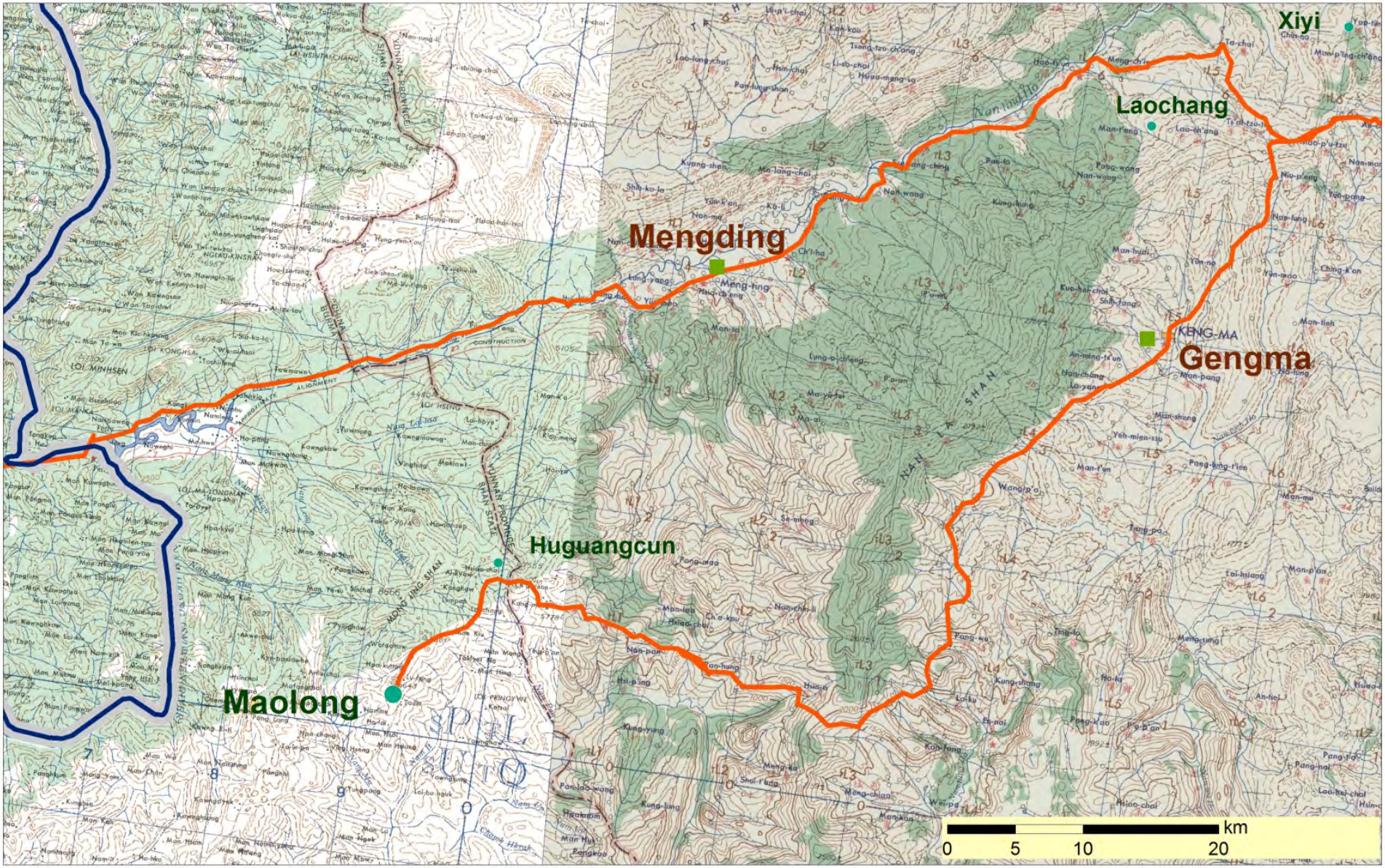
矿区流动人口的主要原籍省份和路程



地图7:边疆地区的茂隆厂

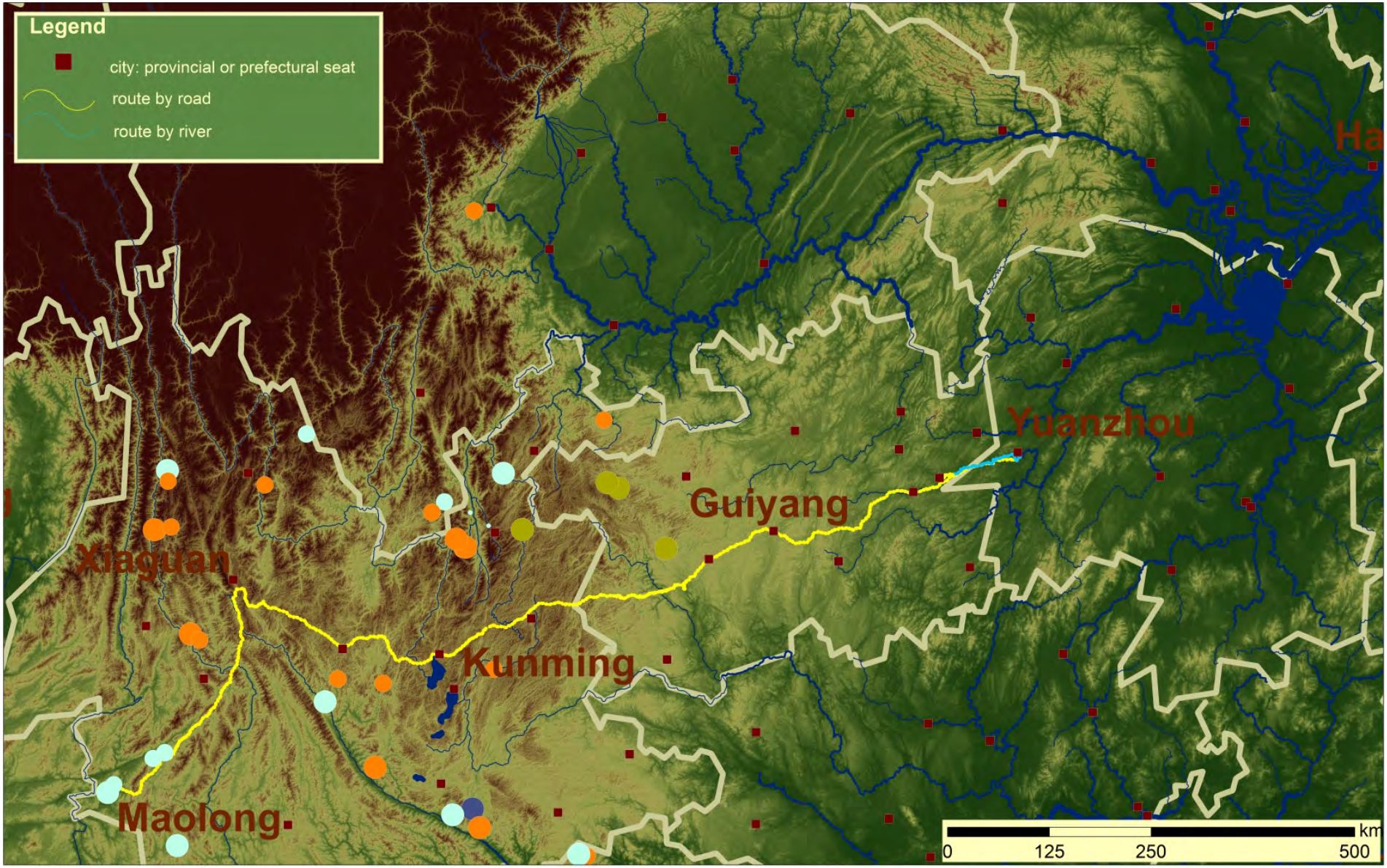


地图9：茂隆厂地区地形（苏联地图）

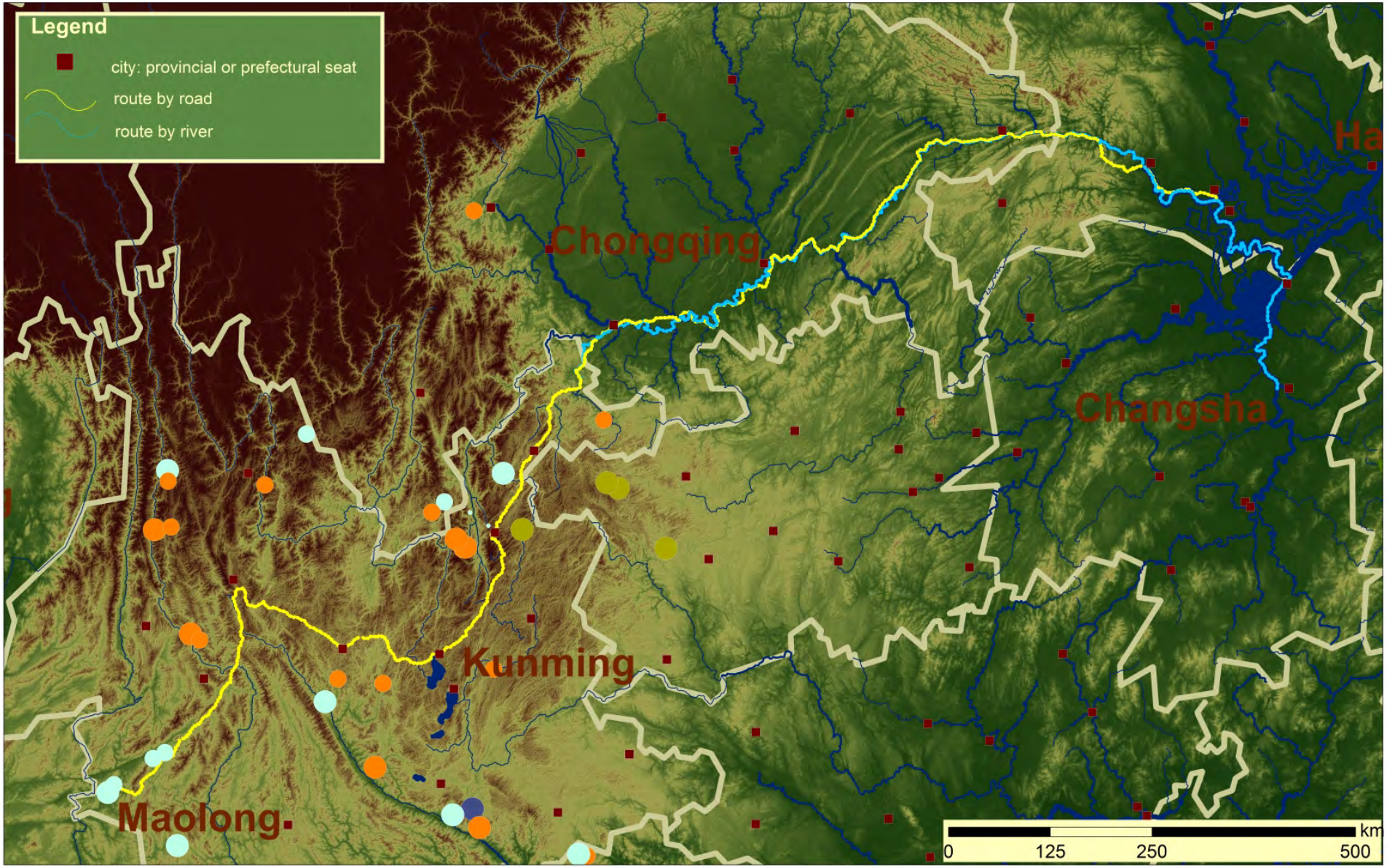


地图10:茂隆厂地区近代路线和植被(美国地图)

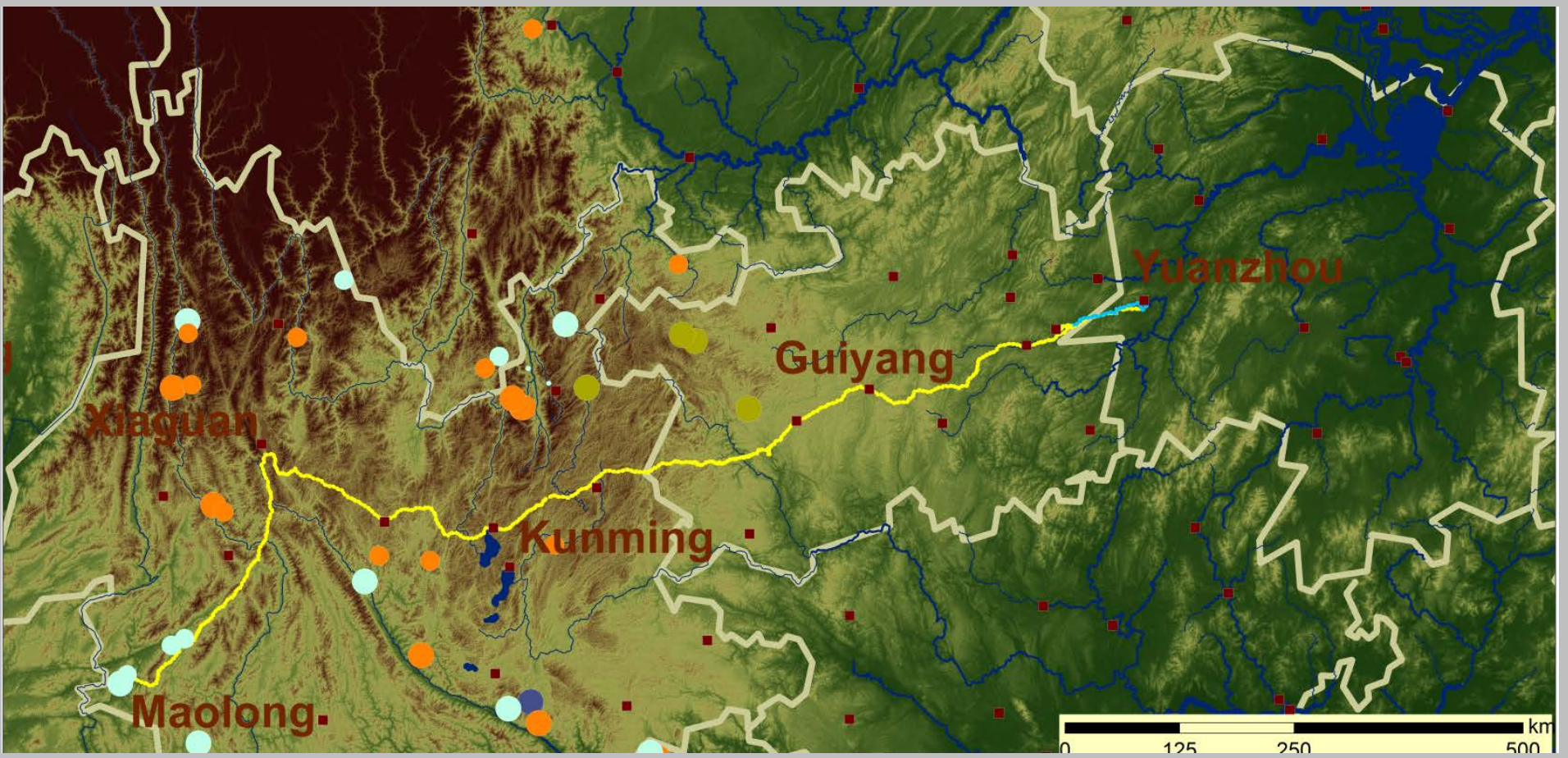

戶标
小府算
芒兴
海牙
水塘
赵保寨
白岩
焦山
缅
南腊
中仰洞
湖广
2302
岩脚
卡河
岔沟
老六寨
甘勐
银带
2000
爹河
营盘
坏口寨
新寨
纳勐
金坝
香婚林
老寨
新寨
1471
新寨山
大河



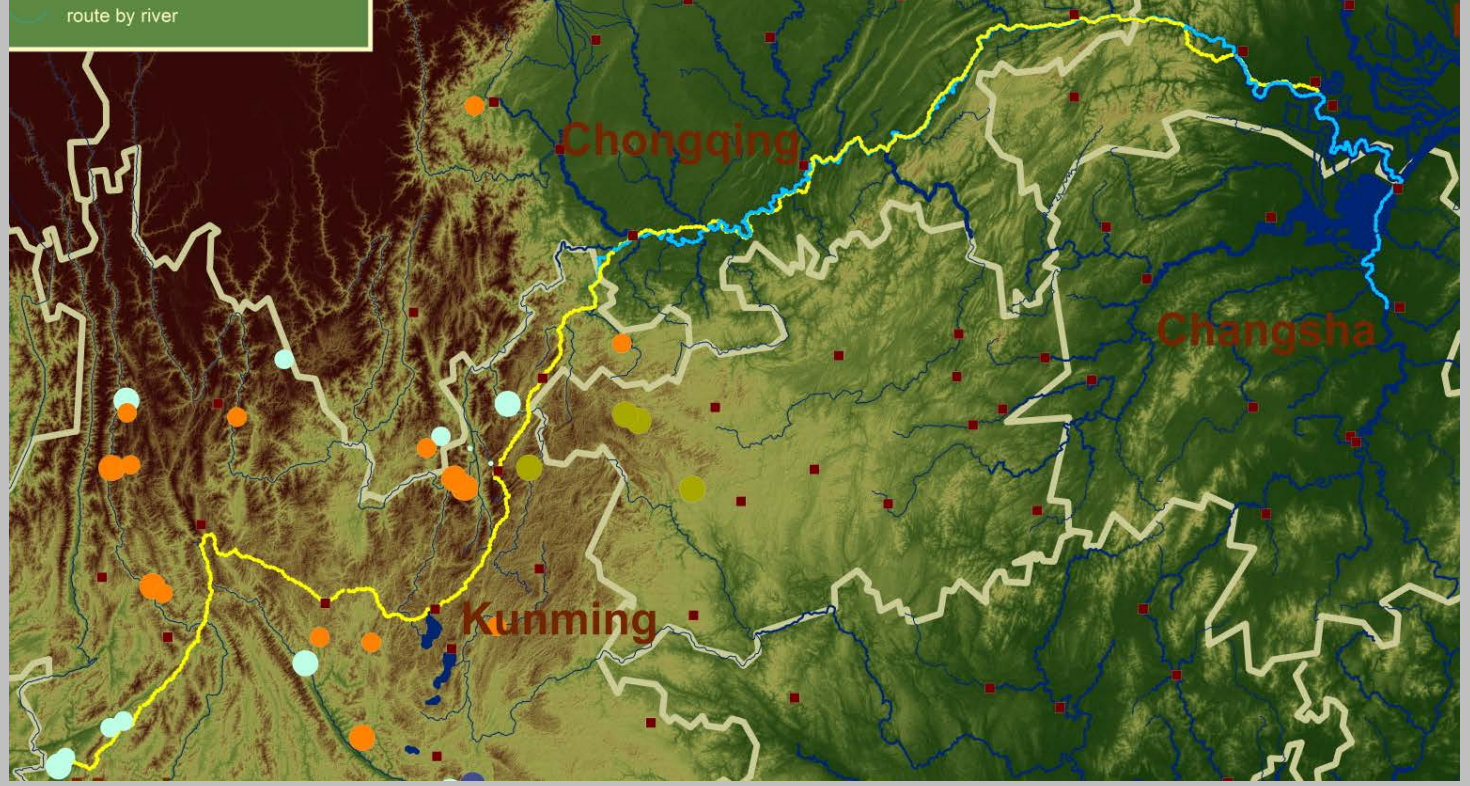
沅州(芷江)到茂隆厂湖广村的路线



长沙到茂隆厂湖广村的路线



	距离 （公里）	交通条件	程限
沅州 – 镇远	150	驿道	7
	170	小船	14
镇远 - 昆明	880	驿道	12
昆明 - 湖广村	642	驿道，其他道路	13
	1672		**61**



	距离（公里）	交通条件	程限（日）
长沙 - 岳州	184	大船，顺流	2,5
岳州 - 宜昌	385	大船，逆流	4,5
宜昌 - 重庆	659	中船，逆流（三峡！）	30
重庆 - 宜宾	258	中船，逆流	8-9
宜宾 - 盐津	140/89	小船/驿道	10/5
盐津- 昆明	487	驿道	20
昆明 -湖广村	642	驿道/其他道路	13
	2604		**83-90**

基本生活费

贵阳府万寿宫账簿, 1772年			
		文	折成银两
一般工人每人每日工钱		50	0.052
木匠每人每日工钱		80	0.082
雇佣期间日用开支（工钱以外）			
米	1.5 kg	27	
盐	34 gr	2	
酒	0.54 l	8	
油	24 gr	1	
菜	?	10	
基本消费		48	0.049
肉，每第二天	300 gr	20	
烟草	?	3	
基本消费加肉和烟草		61	0.062

（张强《1772-1773年贵阳府物价考——基于万寿宫账簿》贵州社会科学，2013年)

根据以上考虑假设最基本生活费为20文，
条件稍微好一点为40文。

	距离（公里）	路上时间（日）	路费（两）	
沅州 – 湖广村，贵阳路线	1672	80	2	4
长沙 – 湖广村，长江路线	2604	120	3	6

分析结果：

边疆地区人口稀少，矿工到部分从内地找工。

矿厂的劳动强度高，需要专业知识，开采成功要身体健康并开矿熟练的人。

穷困的贫民出来，会到周围地区找生计糊口。
流到西南地区的矿厂应该是少数。

矿厂的经营包括招工体系，有目标地组织内地老矿业区的招工。
出来大矿是有本事并有胆量的青年人，动机是赚钱发财之后回家建业，和当今的农民工很相似。


谢谢！

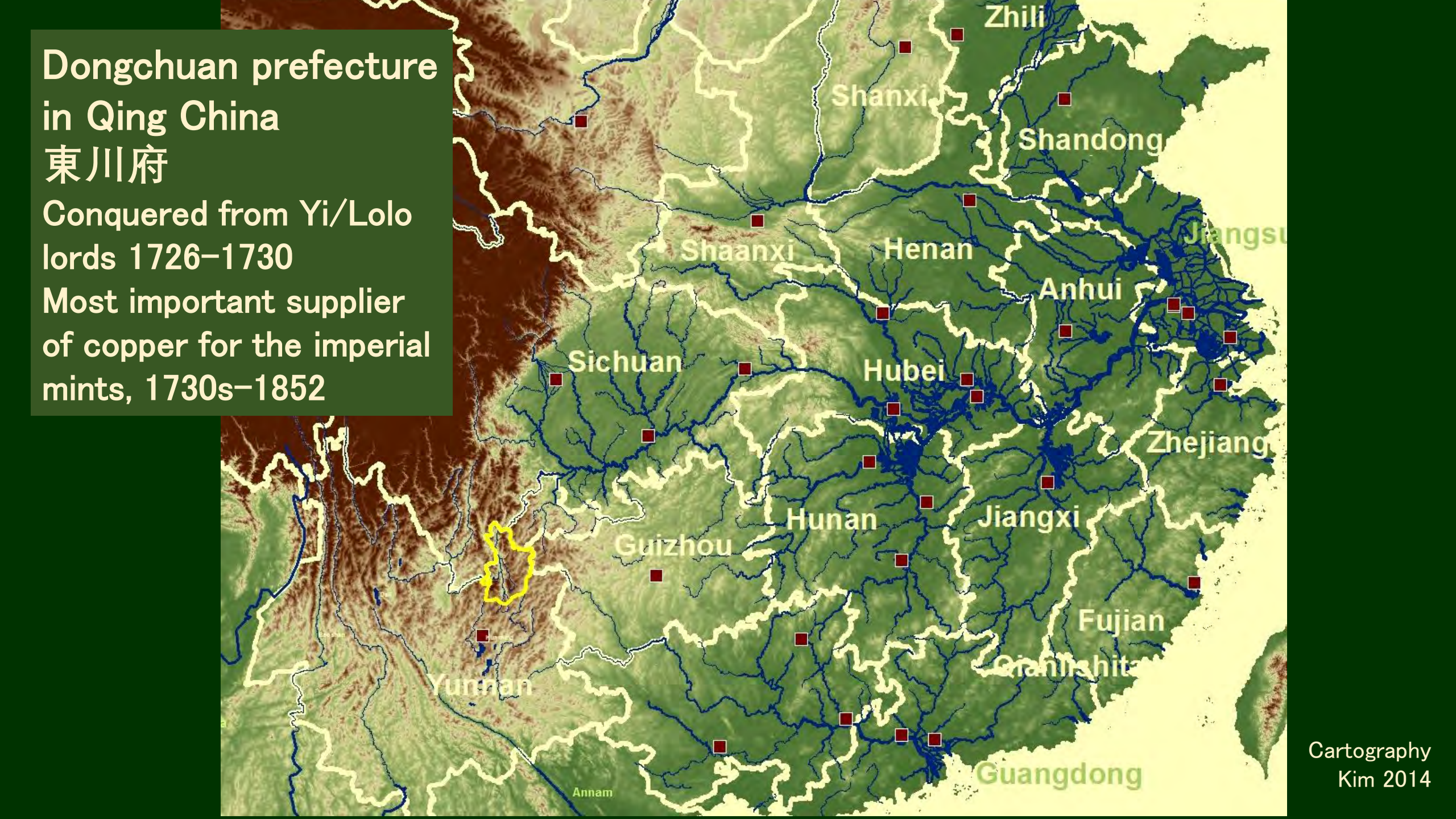
Perceiving mining landscapes: Dongchuan prefecture in Qing China

Nanny Kim (Heidelberg)

Seminar Environmental History of China,
26 October 2016



Landscape near Huize
(Photo Kim 2007)


Dongchuan prefecture in Qing China
東川府
Conquered from Yi/Lolo lords 1726-1730
Most important supplier of copper for the imperial mints, 1730s-1852
Zhili
Shanxi
Shandong
Shaanxi
Henan
Anhui
Sichuan
Hubei
Zhejiang
Hunan
Jiangxi
Guizhou
Fujian
Yunnan
Guangdong
Annam
Cartography
Kim 2014



High gradients, extensive deforestation

Landscape near Huize

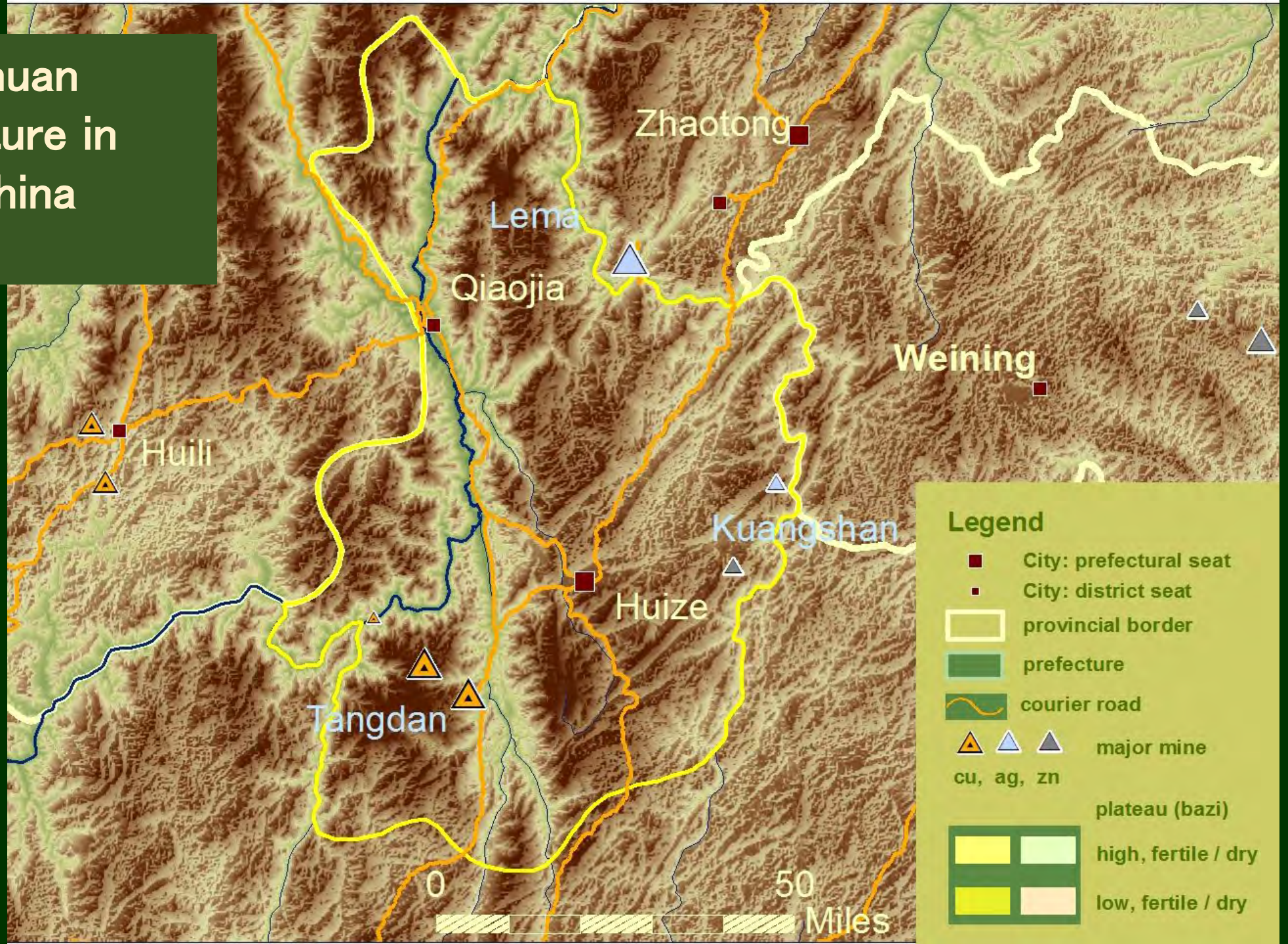
Photo Rosner, 2007



Valley of the Daguanhe, northeastern Yunnan

Engraving after a drawing by Louis Delaporte, journey 1871

Dongchuan prefecture in Qing China
東川府



Cartography
Kim 2014

Huize 會澤





Huize 會澤







The Nagu Plateau

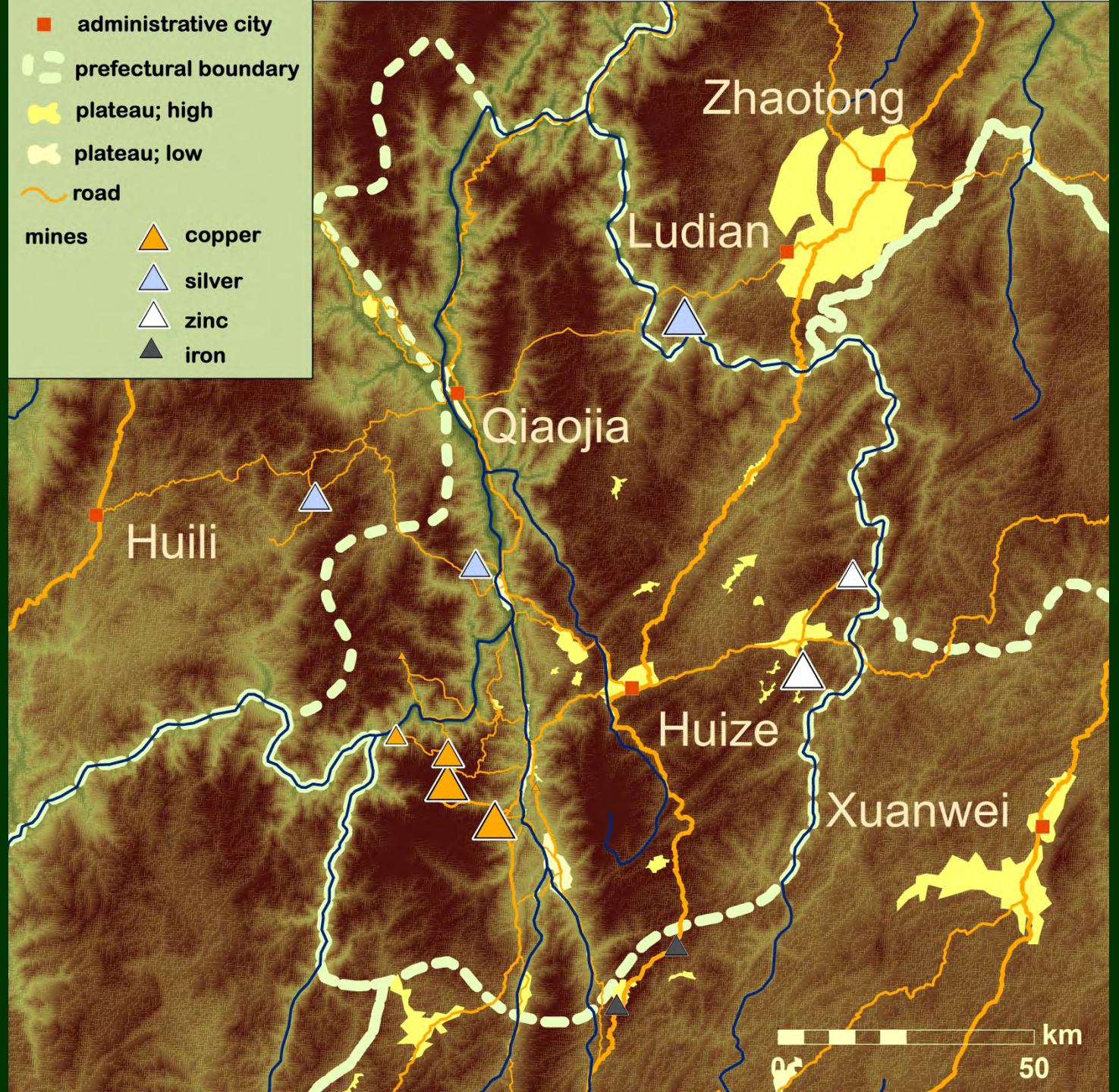
Photo Kim, 2007



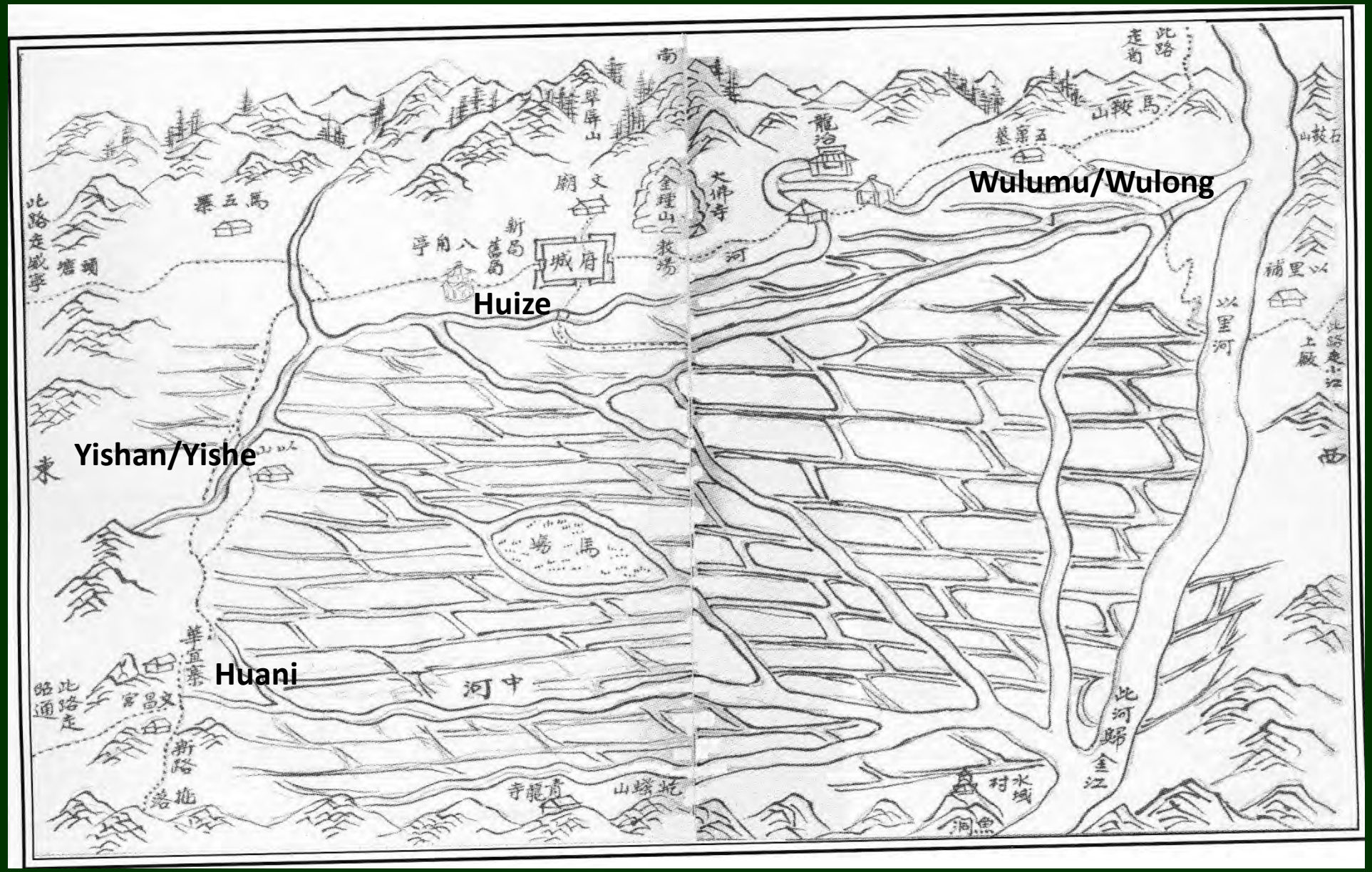
The Yilihe at the northeastern corner of the Huize Plateau



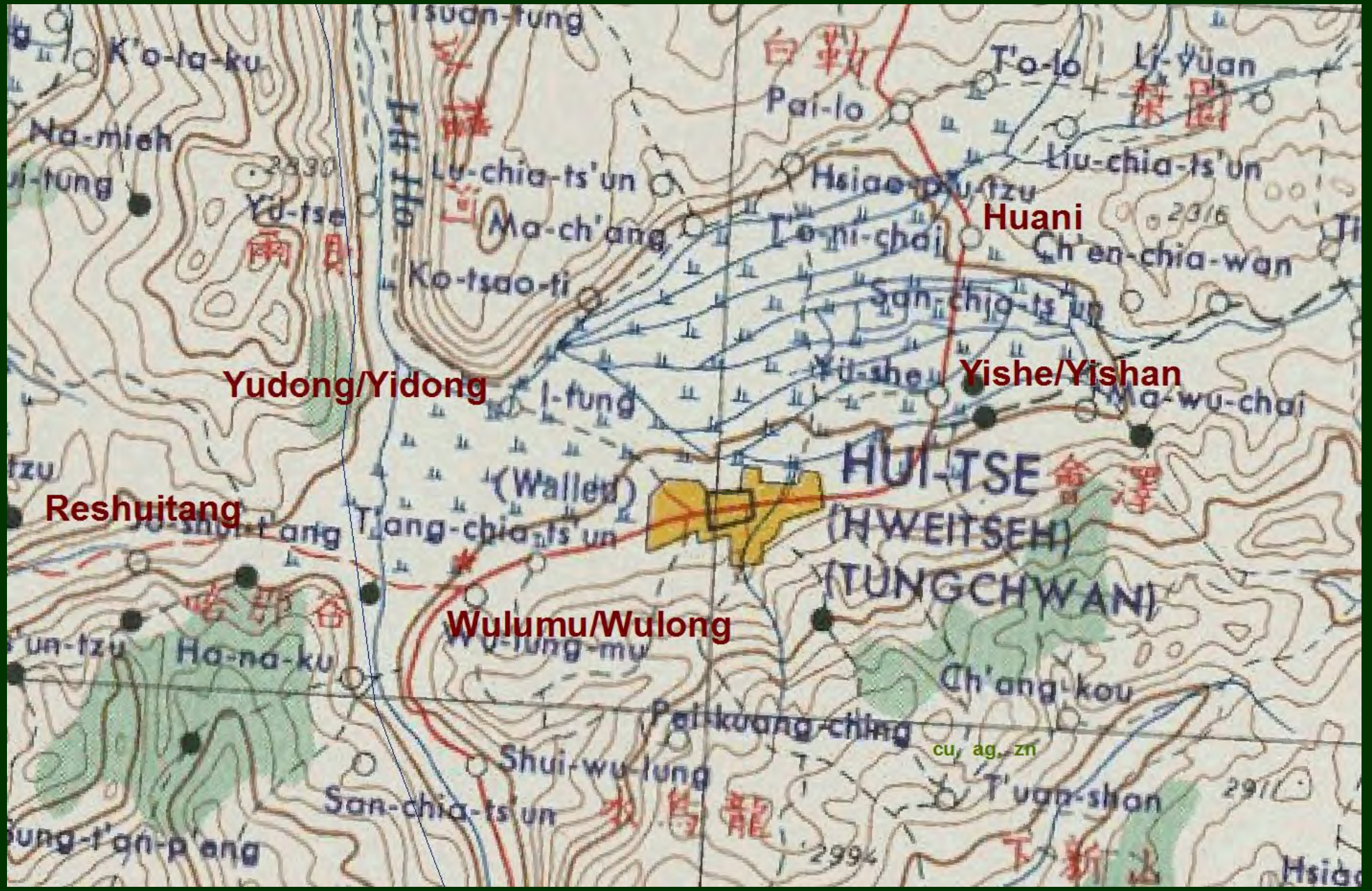
Dongchuan prefecture in Qing China
東川府



Cartography
Kim 2014



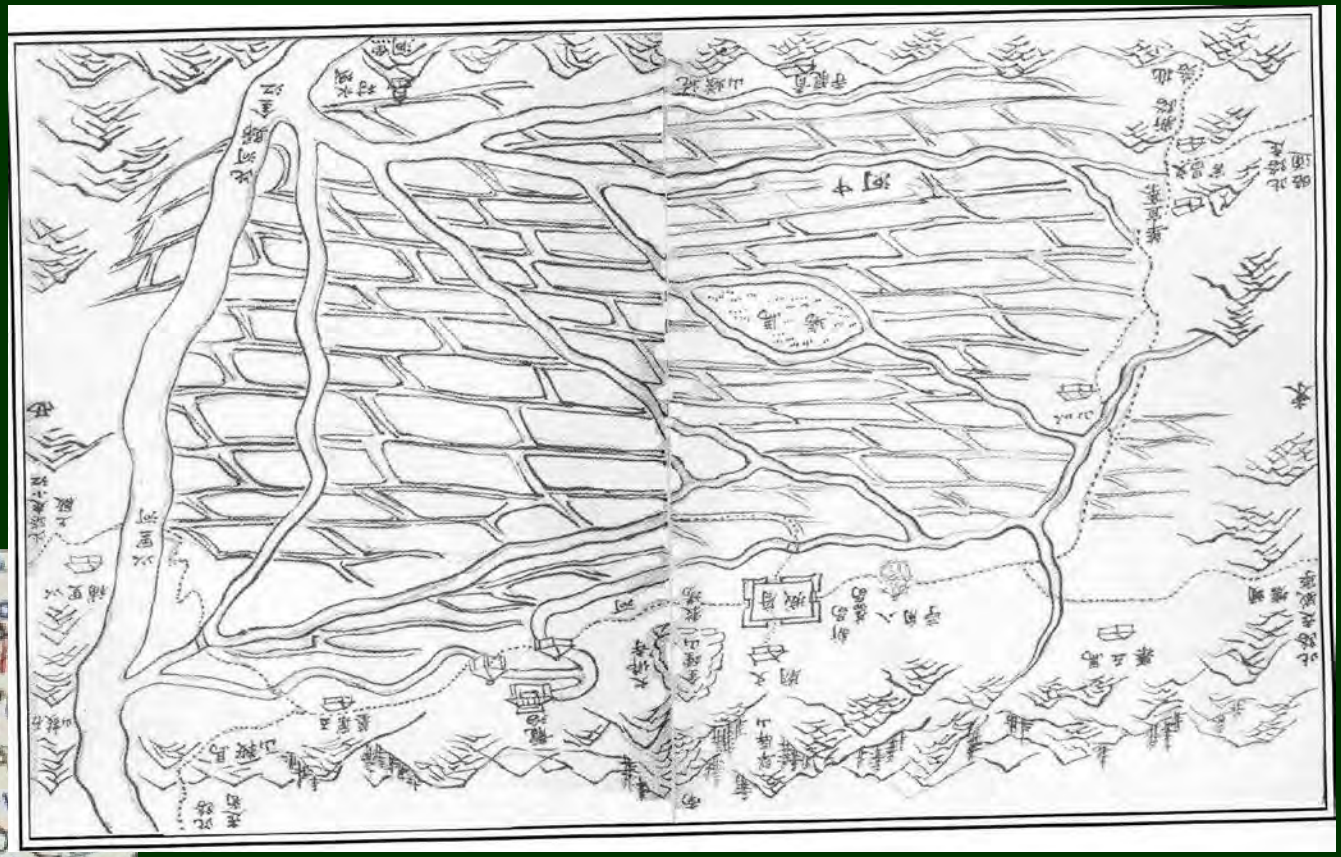
The Huize Plateau in the gazetteer of 1763

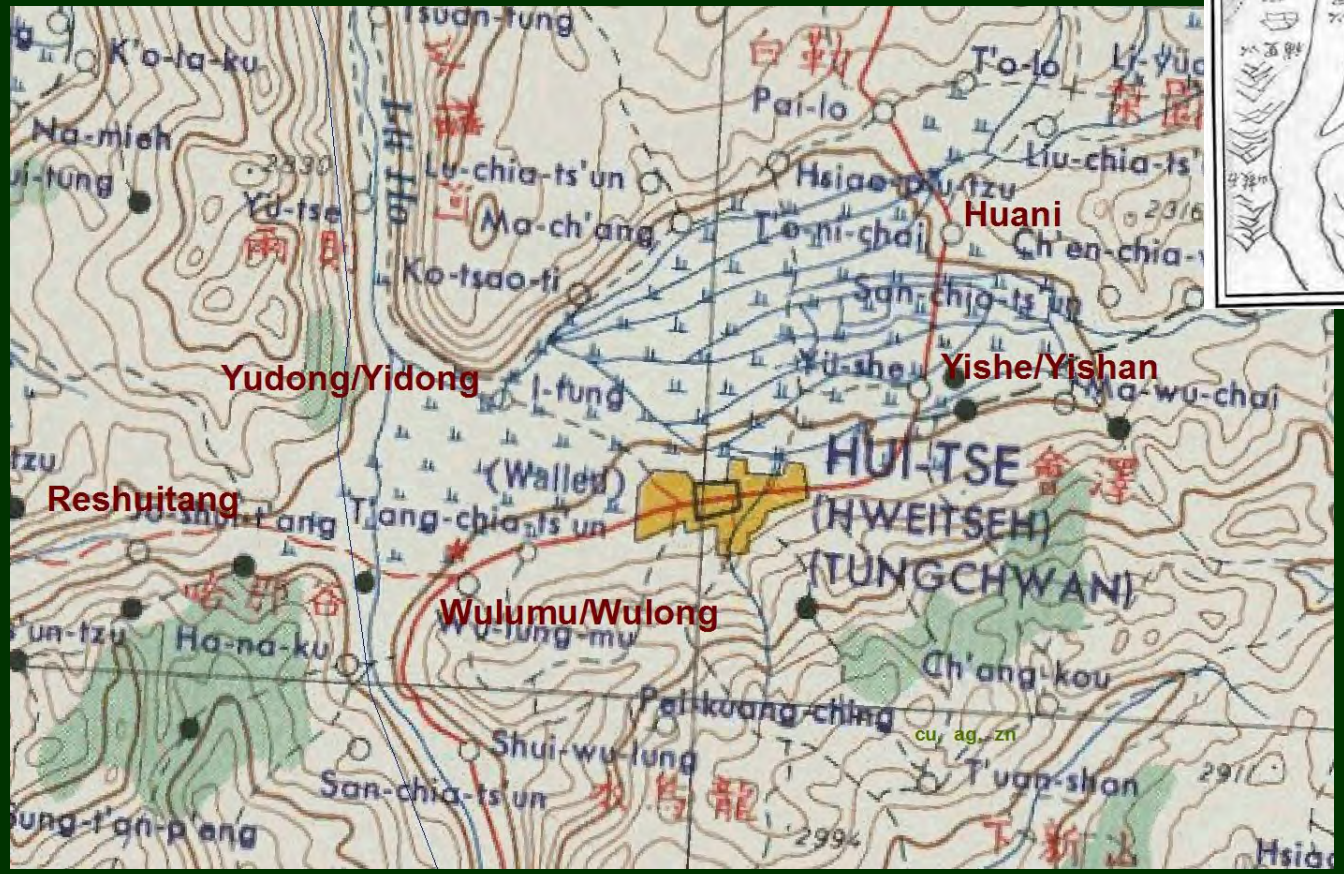


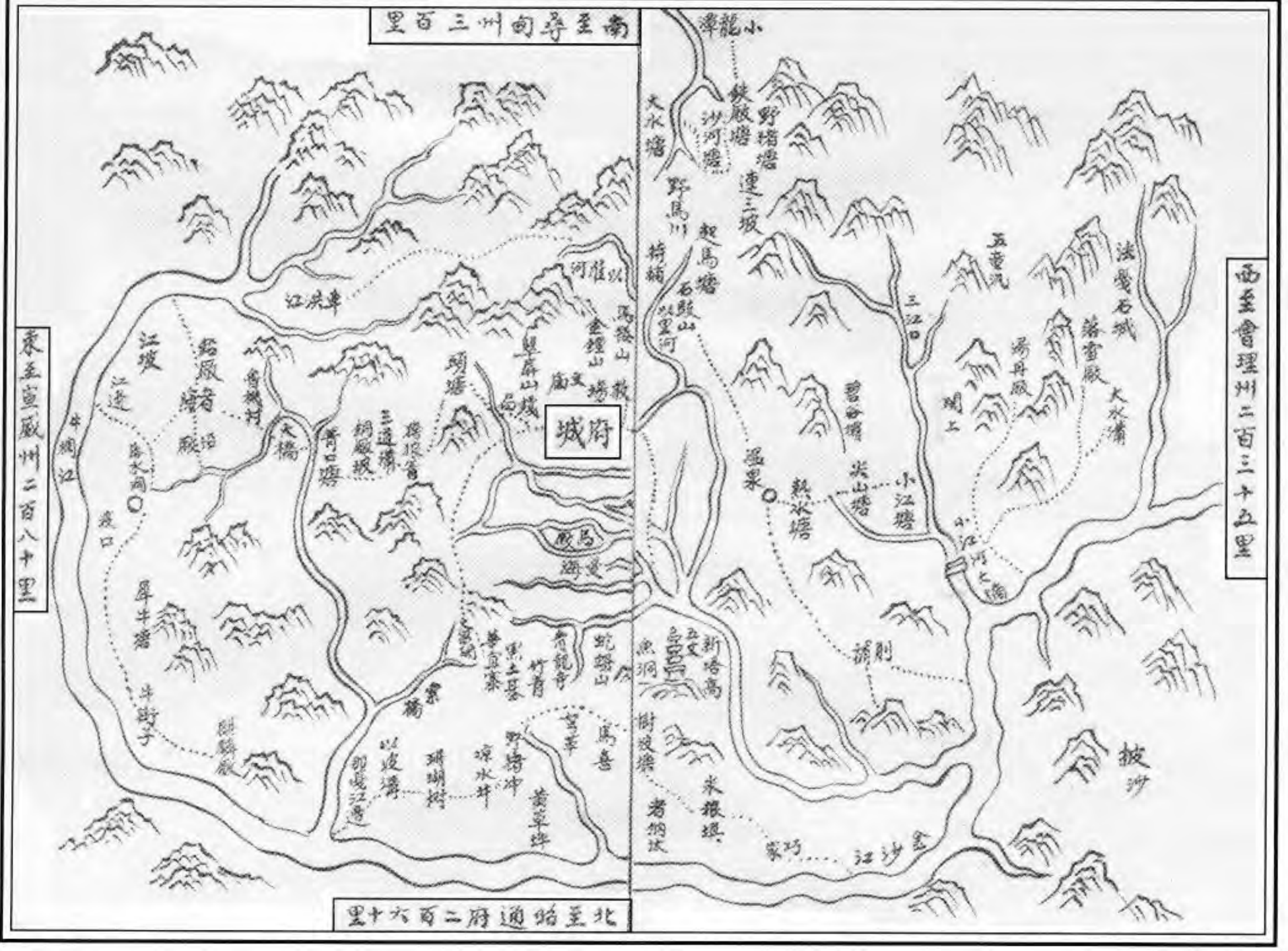
The Huize Plateau around 1940

US military maps, 1:250,000 digitized by the Castaneda Library, U Texas

Huize Plateau

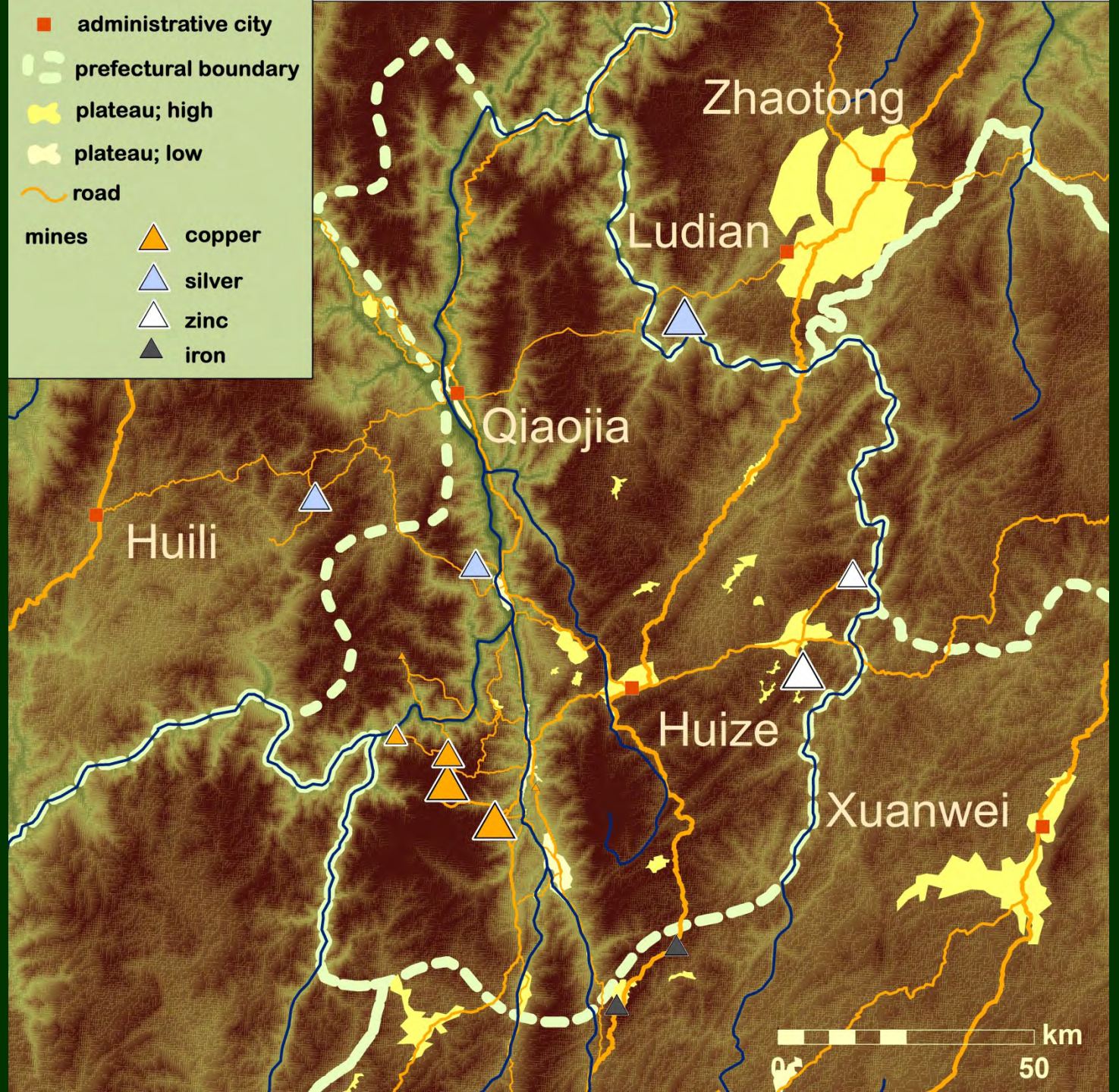






The Huize Plateau in the gazetteer of 1763

Dongchuan prefecture in Qing China
東川府



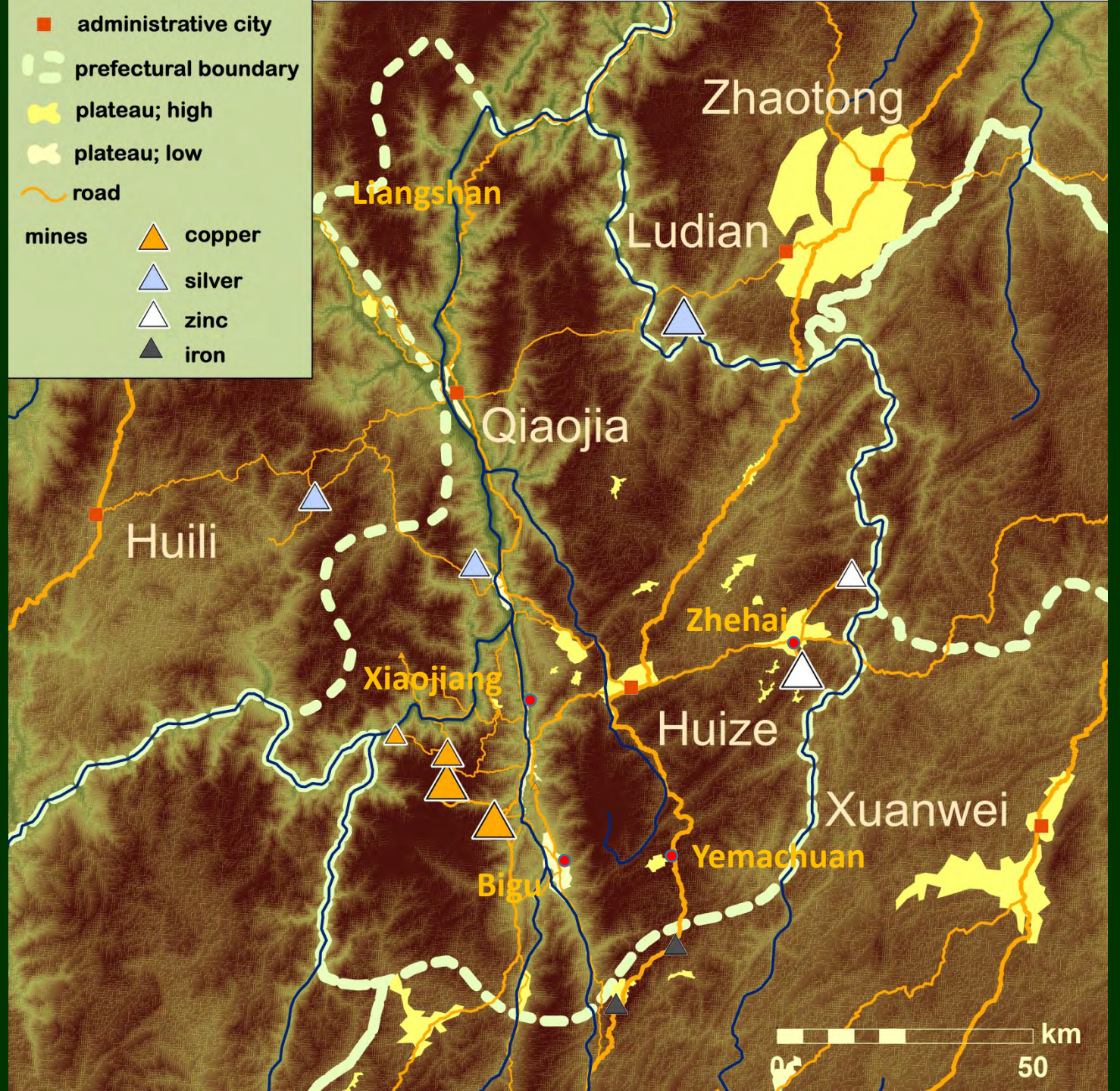
Cartography
Kim 2014

崔乃鏞:
東川去省五百里，近城川原氣候微寒，四境氣候各異。碧谷、巧家、小江極熱，夏秋間濕熱相蒸，多瘴癘，者海、野馬川、涼山諸處嚴寒，七月即霜，四月常雪。大約地形低下者，篇於熱，地勢高仰者，偏於寒。

自雍正十年建城後，設局鼓鑄，四方負販者絡繹不絕，城中居民漸集，氣候亦漸和暖云。

Cui Naiyong, prefect of Dongchuan 1731–1735:
Dongchuan is 500 li from the provincial capital. The river plain near the prefectural city is slightly cold, the climate in the four areas [of the prefecture] is different. Bigu, Qiaojian and Xiaojiang are extremely hot, in summer and autumn heat and humidity are steaming, zhangqi is frequent. Zhehai, Yemachuan and Liangshan are severely cold, rawfrast begins in the 7th month and permanent snow lies until the fourth month. This is presumably becase where the land is low, it tends to be hot, where is rises high, it tends to be cold.

Dongchuan prefecture in Qing China
東川府



Cartography
Kim 2014

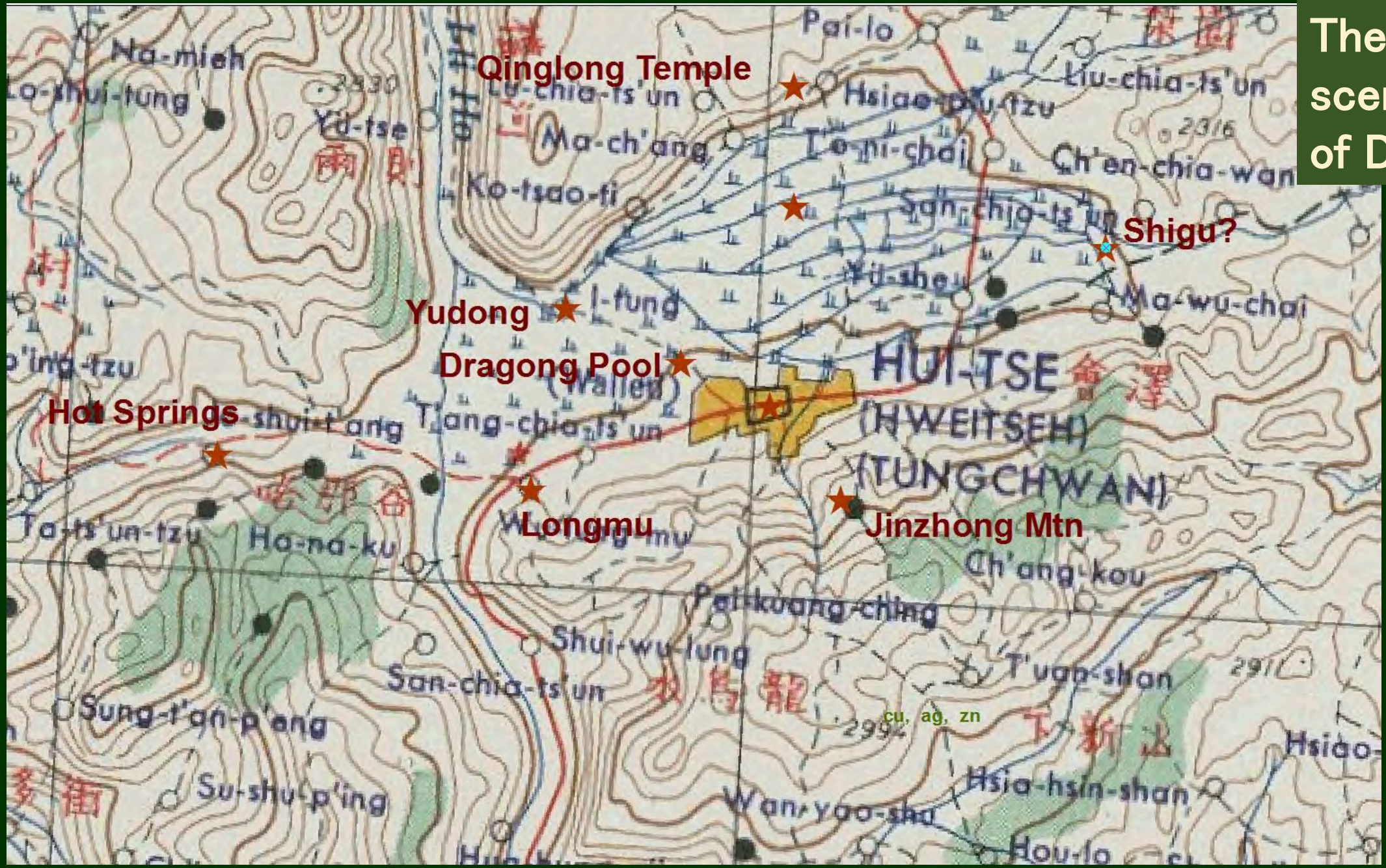
崔乃鏞, writing in 1733, perhaps 1735:

自雍正十年建城後，設局鼓鑄，四方負販者絡繹不絕，城中居民漸集，氣候亦漸和暖云。

Since 1732, when the city [of Huize] was built and the mint set up, traders have been coming in a steady flow, the inhabitants of the city have gradually become numerous, and the climate also has gradually become warmer.

東川十景

Spring dawn at Cuiping 翠屏春晓、
Evening sun on Jinzhong Mountain 金种夕照、
Rainbow under cloud banks 饮虹云阵、
Moonshine on the Dragon Pool 龙潭夜月、
Fish flute at Shuicheng 水城鱼笛、
Woodcutter’s songs at The Stone Drum 石鼓樵歌、
Peach blossom at Longmu 龙幕桃花、
Willow waves at the Hot Springs 温泉柳浪、
Last Snow at Qinglong Temple 青龙残雪、
Harvest at Manhai Lake 蔓海秋成


The Ten scenic spots of Dongchuan
Qinglong Temple
Shigu?
Yudong
Dragong Pool
Hot Springs
Longmu
Jinzhong Mtn
HUI-TSE
(HWEITSEH)
(TUNGCHWAN)
Na-mieh
Yü-tse
Ma-ch'ang
Ko-tsao-ti
Pai-lo
Hsiao-pu-tzu
T'o-ni-chai
Ch'en-chia-wan
San-chia-ts'un
Yü-she
Ma-wu-chai
Liu-chia-ts'un
Ta-ts'un-tzu
Ho-na-ku
Ch'ang-kou
Pai-kuang-ching
Shui-wu-lung
San-chia-ts'un
T'uan-shan
Sung-t'an-p'ang
Su-shu-p'ing
Wan-yao-sha
Hsia-hsin-shan
Hou-lo
Hsiao-
cu, ag, zn



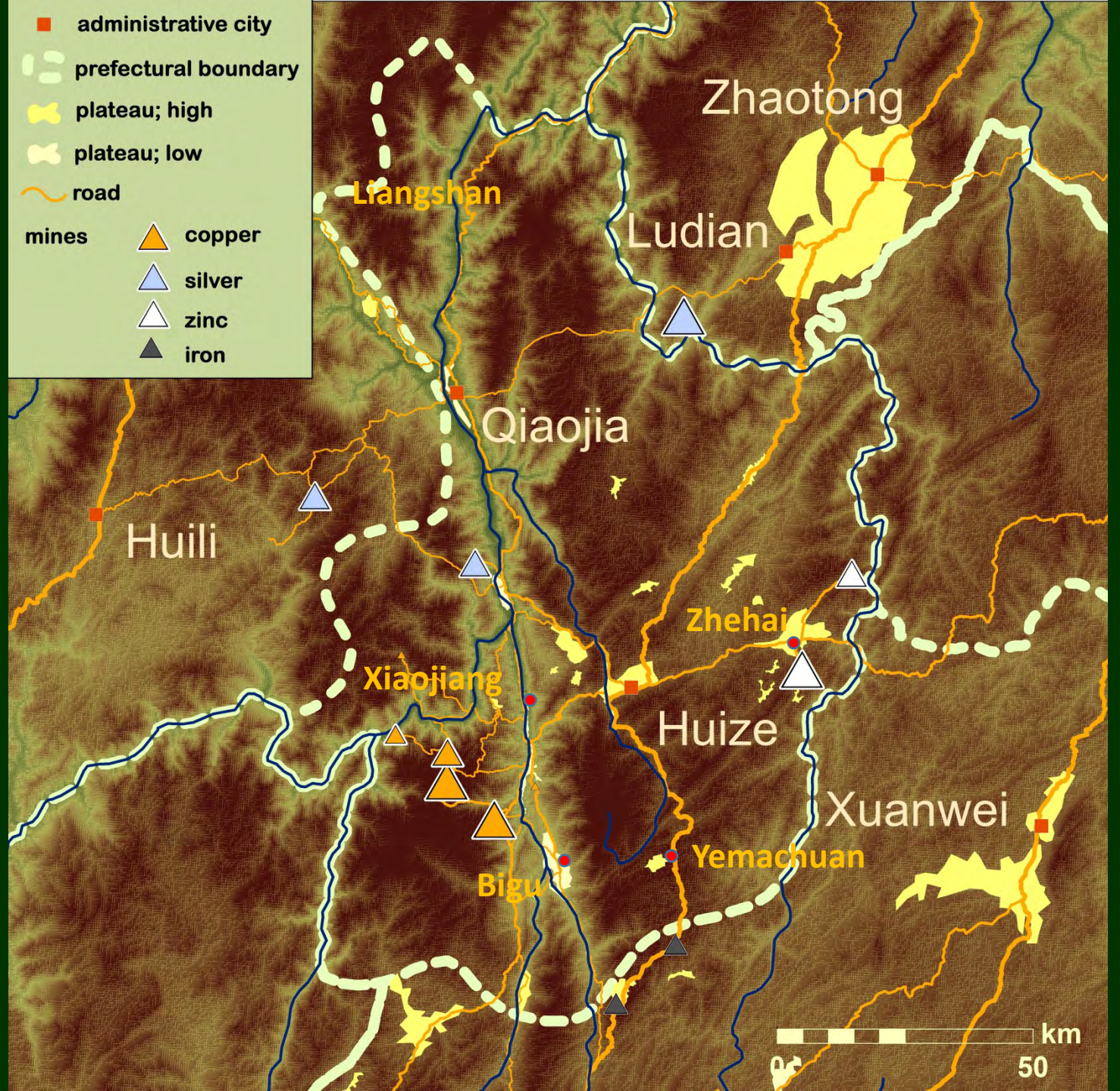


Restored guildhalls of Jianxi and Huguang





Dongchuan prefecture in Qing China
東川府



Cartography
Kim 2014

Huang Mengju 黃夢菊, district magistrate magistrate of Huize 1843 – 1846

劝民种植示 Encouraging the people to plant trees

会泽县属幅员两千余里，童山濯濯，全无树株，不独材薪艰贵，即土田亦渐瘠硗，甚至近山田地因无树木拦护，一遇雨洗土松沙石冲流全行淤压，民间疾苦日甚一日，非补种树株难期培养。

For 2000 li around Huize District, the mountains are bare and bleak, without a single tree. Not only is firewood hard to procure and expensive, but the soil in the field gradually becomes poor and stony. In the worst cases, in fields that are without the protective screen of trees, a single downpour washes all loose soil and stones into a mudslide. The population suffers increasingly badly , without re-planting trees there is no hope in restoring the situation.

Huang Mengju 黄蓼菊, continued:
本县访查与情有山之家，或恐成林后厂烧炭斤多不给价，又恐方种时牛羊践踏、孩幼刨折。是以任其荒芜，[…]。有一二补种者，人反指为迂阔，殊不知种树之利胜于种谷，十年之后存小取大，层递滋长，其用无穷，况山有树木如人有衣饰、鸟有翎毛，不独材木胜用，而田土可保肥润，是种树实为目今急务。
Inquiring among households that possess mountain land, I have found that either they are afraid that once forest has regrown the charcoal burners of the mines will not pay them the full rate, ot that the newly planted trees will be trampled by cattle and sheet and chopped off by boys. This is why they leave the land barren […] . The few sho replanted are accused of being impractical, it is simply not known that the profit from panting trees can be higher than from planting rice, that after 10 years the large trees can be harvested and the small left, growing them in levels and using the cope continuously. Moreover, to the mountain, trees are like clothes to the human body or fethers to the birds, not only are the trees useful, they protect the humidity and fertility of the soil in the fields. Hence, planting trees indeed is an urgent task.

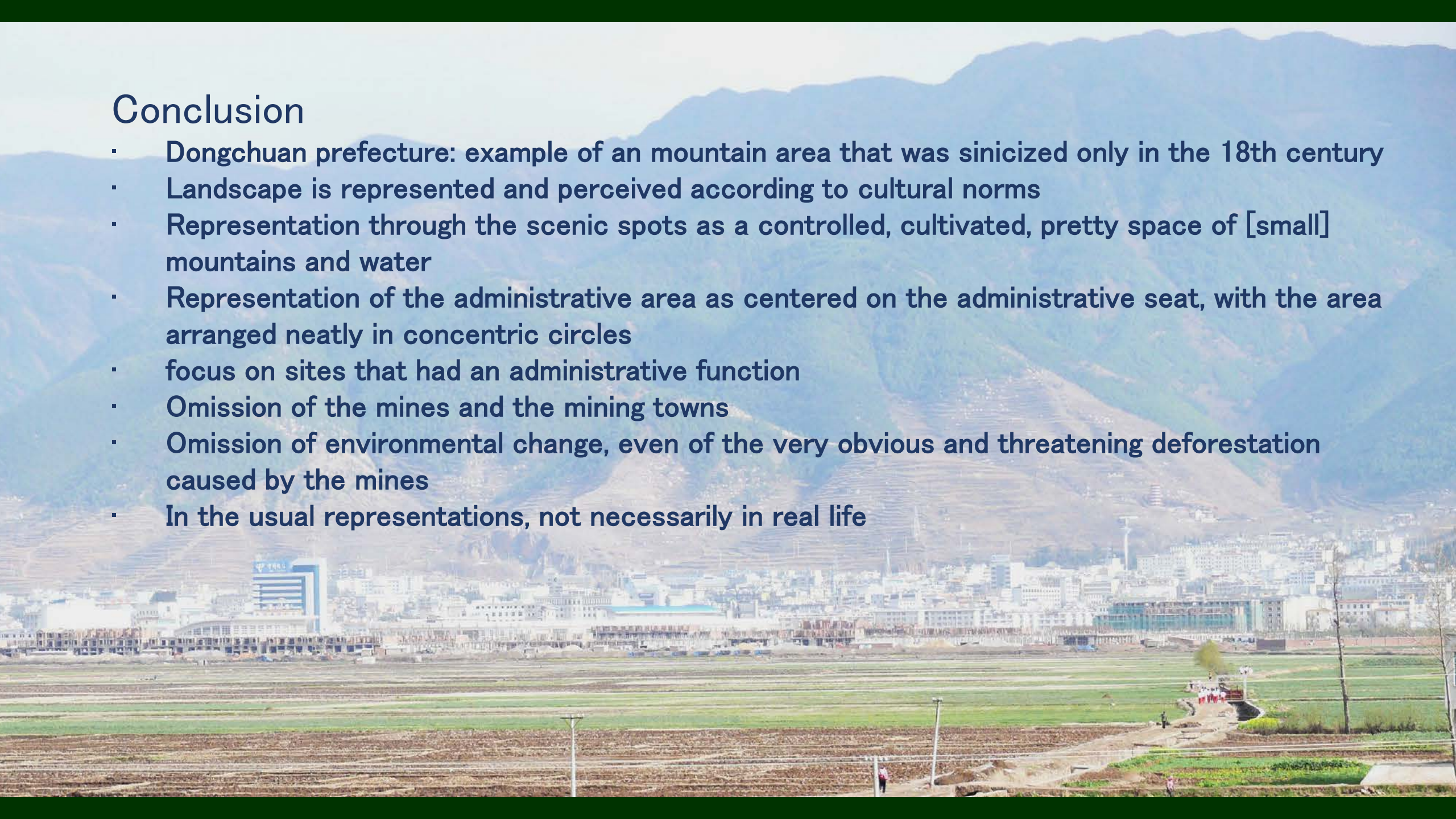


Valley of the Daguanhe, northeastern Yunnan

Engraving after a drawing by Louis Delaporte, journey 1871

Conclusion

- Dongchuan prefecture: example of an mountain area that was sinicized only in the 18th century
- Landscape is represented and perceived according to cultural norms
- Representation through the scenic spots as a controlled, cultivated, pretty space of [small] mountains and water
- Representation of the administrative area as centered on the administrative seat, with the area arranged neatly in concentric circles
- focus on sites that had an administrative function
- Omission of the mines and the mining towns
- Omission of environmental change, even of the very obvious and threatening deforestation caused by the mines
- In the usual representations, not necessarily in real life





Nanny Kim nanny.kim@zo.uni-heidelberg.de

明清时期西南和边疆地区的银矿
-
GIS分析和冶炼技术探讨

Nanny Kim/金兰中
德国海德堡大学

明清时期西南和边疆地区的银矿

与复旦大学历史地理研究院杨煜达教授的合作项目

本报告内容：

1. 全球白银流与中国银矿业
2. 西南与西南边疆地区银矿的历史地理分析：
   矿山分布、交通网络、矿民来往与去也社会变迁
3. 明清时期冶炼技术：炼铅炉和分银炉

历史上的大银矿



Cerro Rico 富山
伯托西银矿
玻利維亞伯托西市



湖广大山
云南省沧源县滇缅边界
茂隆厂



波托西
人类史上第一大银矿

大规模开采：约 1570年-1620年
开采迄今

大规模开采期间白银产量：
约达 62,000 t

茂隆厂

大规模开采：约1750年-1800年
约1850年停止开采

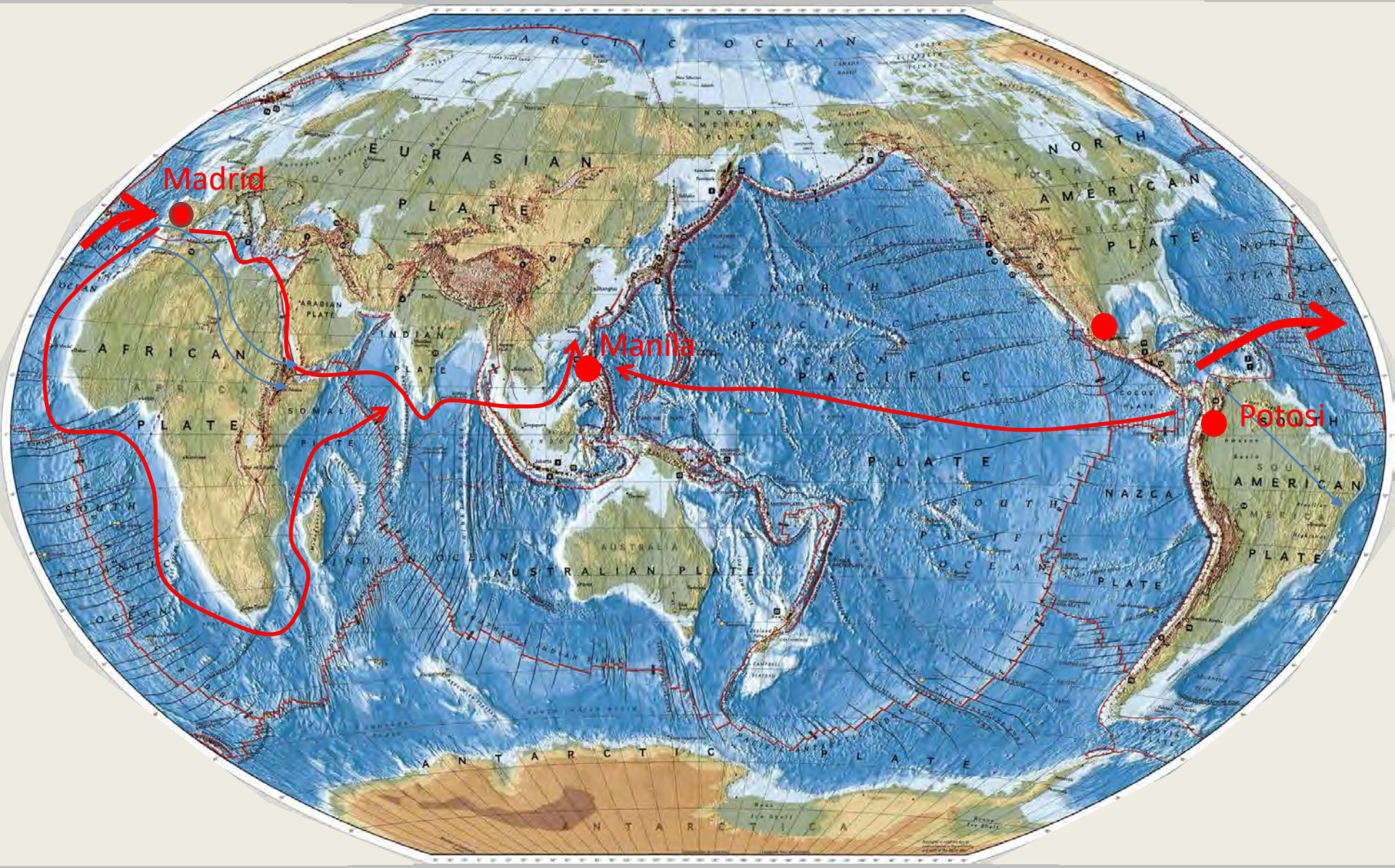
白银总产量：
可能达 3000 t



Dennis O. Flynn and Arturo Giráldez:
Born with a "Silver Spoon": The Origin of World Trade in 1571.
诞生以来白银为伴侣":全球贸易网的起源可定在1571年
(*Journal of World History*, 1995, pp. 201-221)

André Gunder Frank :
ReOrient: Global Economy in the Asian Age.
以东方为中心:全球经济网络的亚洲世纪
(Berkeley: University of California Press, 1998)

1571年之后形成的全球白银流
中国为白银流的汇流地 the global sink of silver



Dennis O. Flynn and Arturo Giráldez. André Gunder Frank：

16世纪下半叶人类历史上第一次形成全球化贸易网络
技术条件：航海技术(绕行非洲和南美，航过太平洋)
关键商品：白银
关键事件：葡萄牙和西班牙在美国建立的殖民地发现银矿

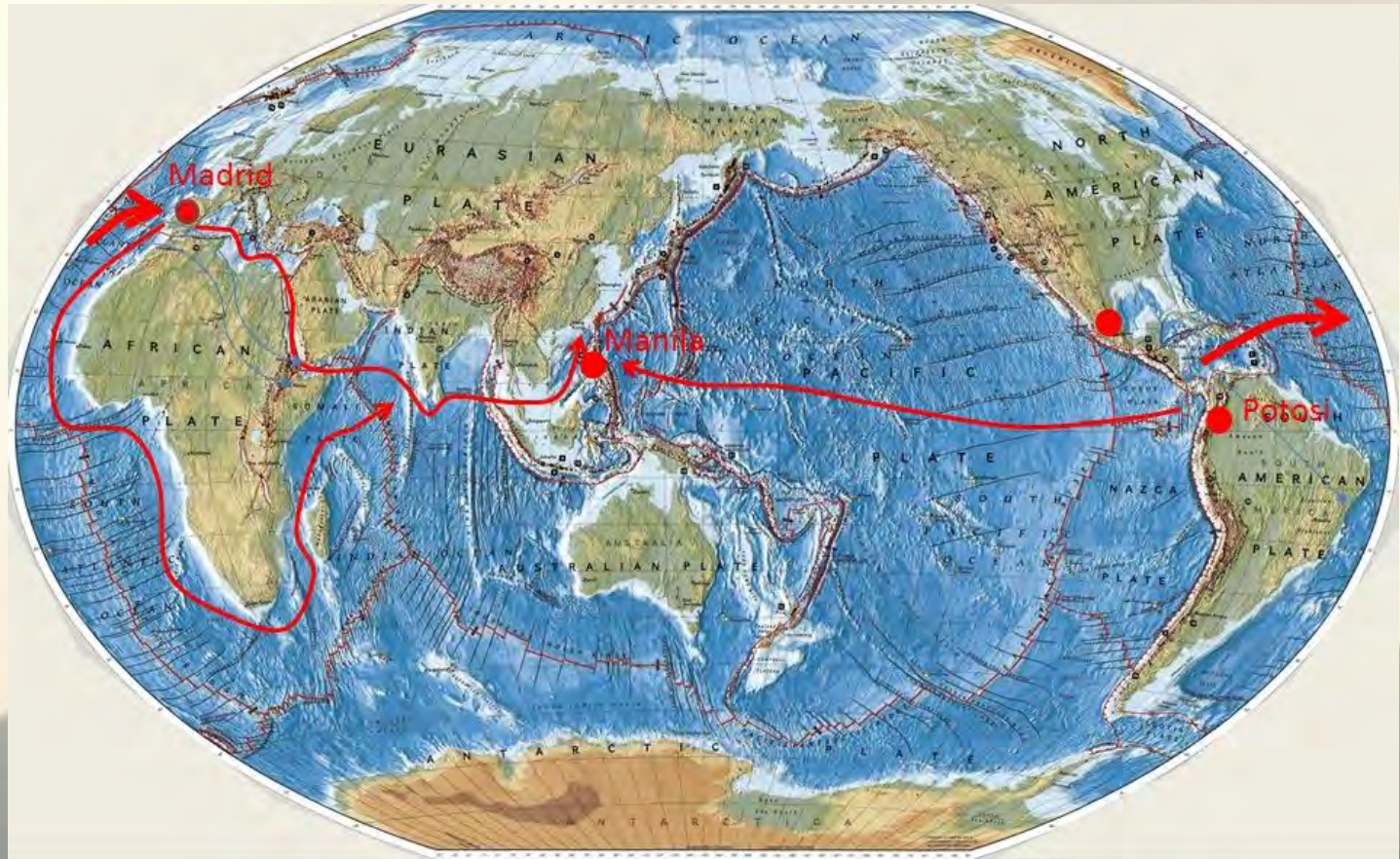
全球化要定创立年，应该是1571年：
西班牙在菲律宾的Manila(吕宋)建城，全球贸易网完成。

1571年到1830年代全球产量最旺的银矿是波托西和墨西哥银矿总产量在10万吨以上。
通过间接贸易渠道**美洲白银的3分之2流入中国**。

明清中国为全球白银流汇流之地(global sink)

明清中国为全球白银流汇流之地的迷

中国白银的用途主要是货币
白银购买力始终高，并且在全球范围内在中国最高
反应需求始终比较大，大概货币量与人口增长和商品经济发展同步增长。



先后过程矛盾

宋代： 古代矿业高峰
元代:银矿从华东转到云南
明清时期:剩下银矿在云南，矿业萧条

1436年:华东地区纳税允许折成白银:白银的货币化完成
1567年:海禁取消，日本和美洲白银开始流入

疑惑问题
(1)盛明时期的商品经济白银流通量始终稳定不变吗？
(2)明清时期的经济能带动全球贸易网，引进大量白银，反而不能推动国内银矿的开采吗？

重新研究西南与边疆地区银矿

史料缺乏

全汉升先生40年前已完成根据中央政府有关税额记载的估算，确定反应的产量不大、边疆土司地区的银矿税额和产量无关。

⟹ 方法和资料方面创新才有可能得出结果

从边疆地区银矿入手

(1)有关产量的直接记载虽然没有，但在几次危机情况下进行考查并留下的资料间接反应具体情况。

(2)偏僻边疆地区里，工业开采比较晚，留下炉渣和遗迹比较多，田野考查条件比较好。

⟹ 搜集炉渣的地址报告等资料

⟹ 进行田野考查

⟹ 用比较方法研究冶炼技术

⟹ 进行系统地理分布分析

欧洲中世纪后期以来银矿业史料丰富

我们对矿工的工作，收入，
生活条件了解相当详细



图形出处：德国，1556年



波伯托西矿山



图形出处：Theodor de Bry 铜版画，约 1590年

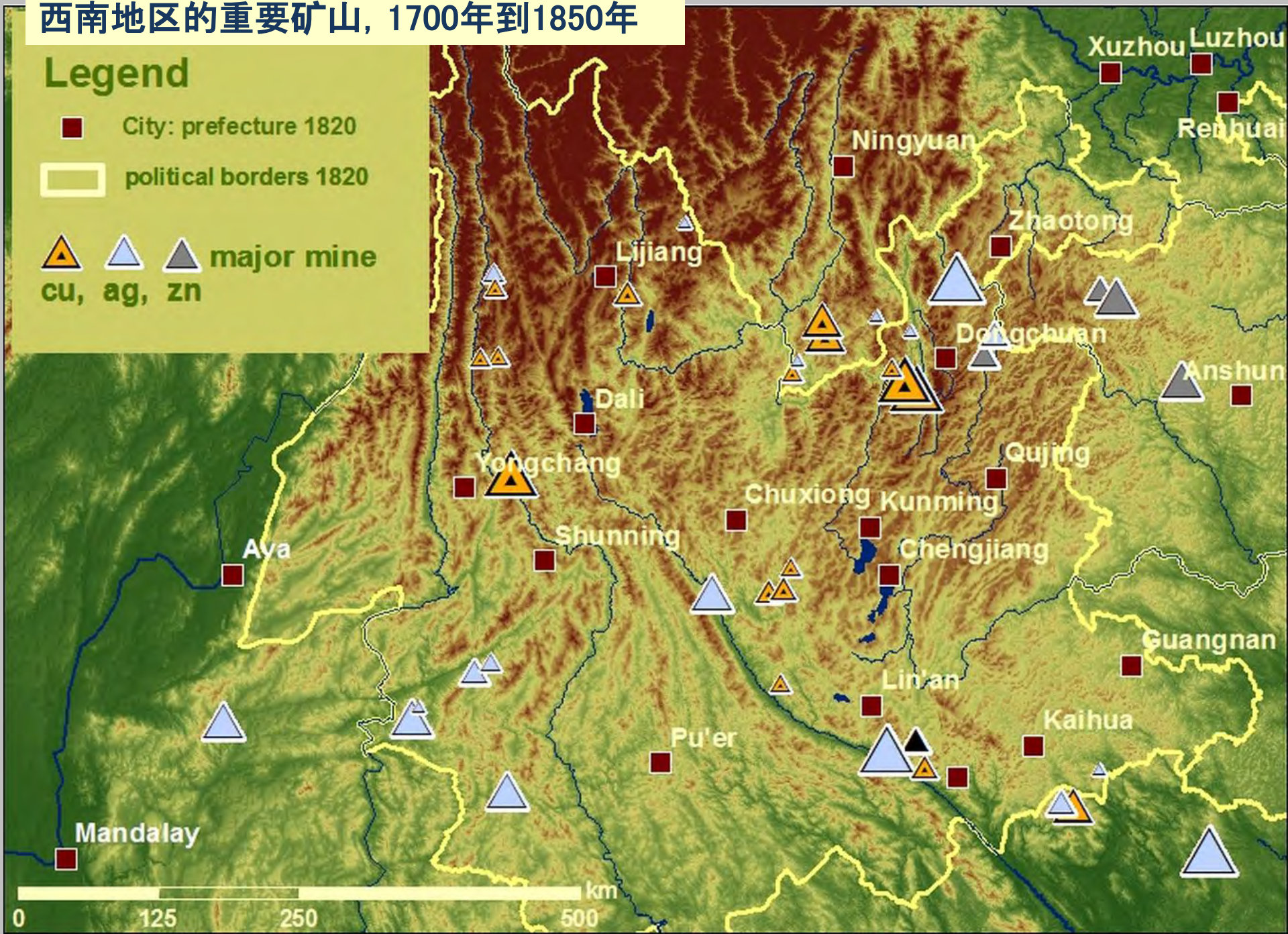
明清时期银矿业的史料极少

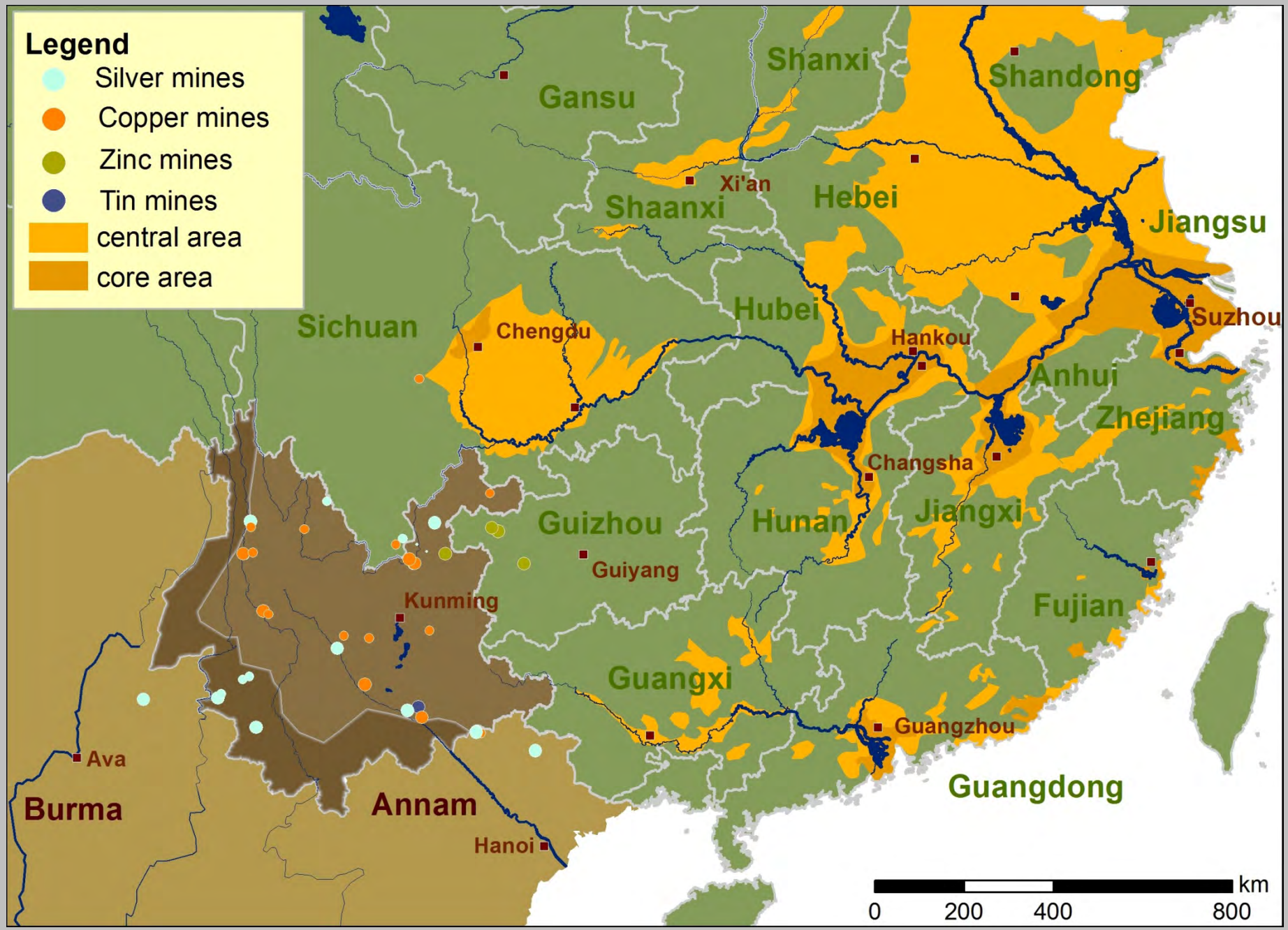




《滇南矿产图略》1844年版本

西南地区的重要矿山，1700年到1850年





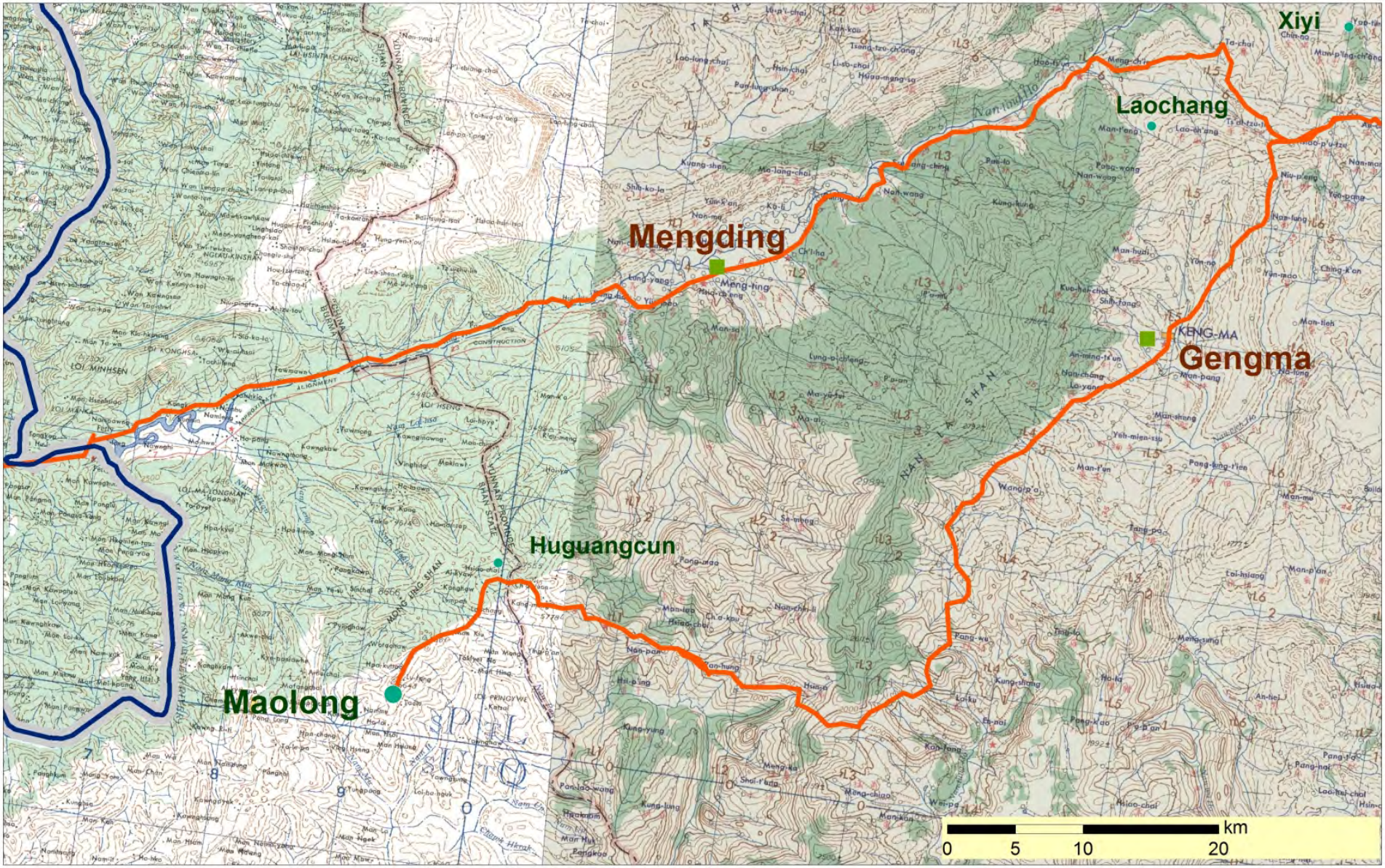
内地核心地区、云南省、边疆土司地区和主要矿产

交通路线

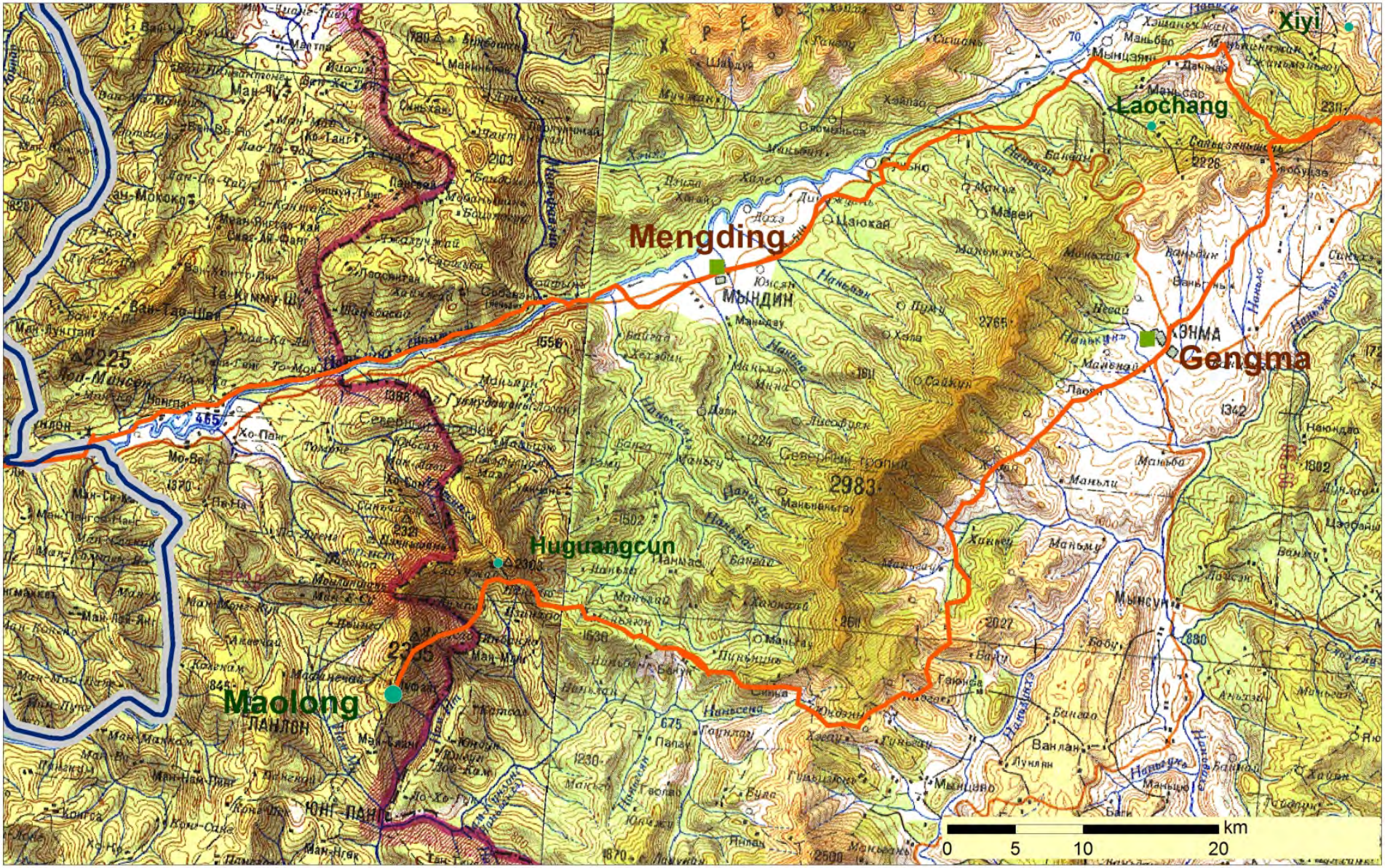


Along the road from Menggu 蒙姑 to Huili 會理.
Lithography after a drawing by Louis Delaporte, member of the expedition Francis Garnier, 1870.

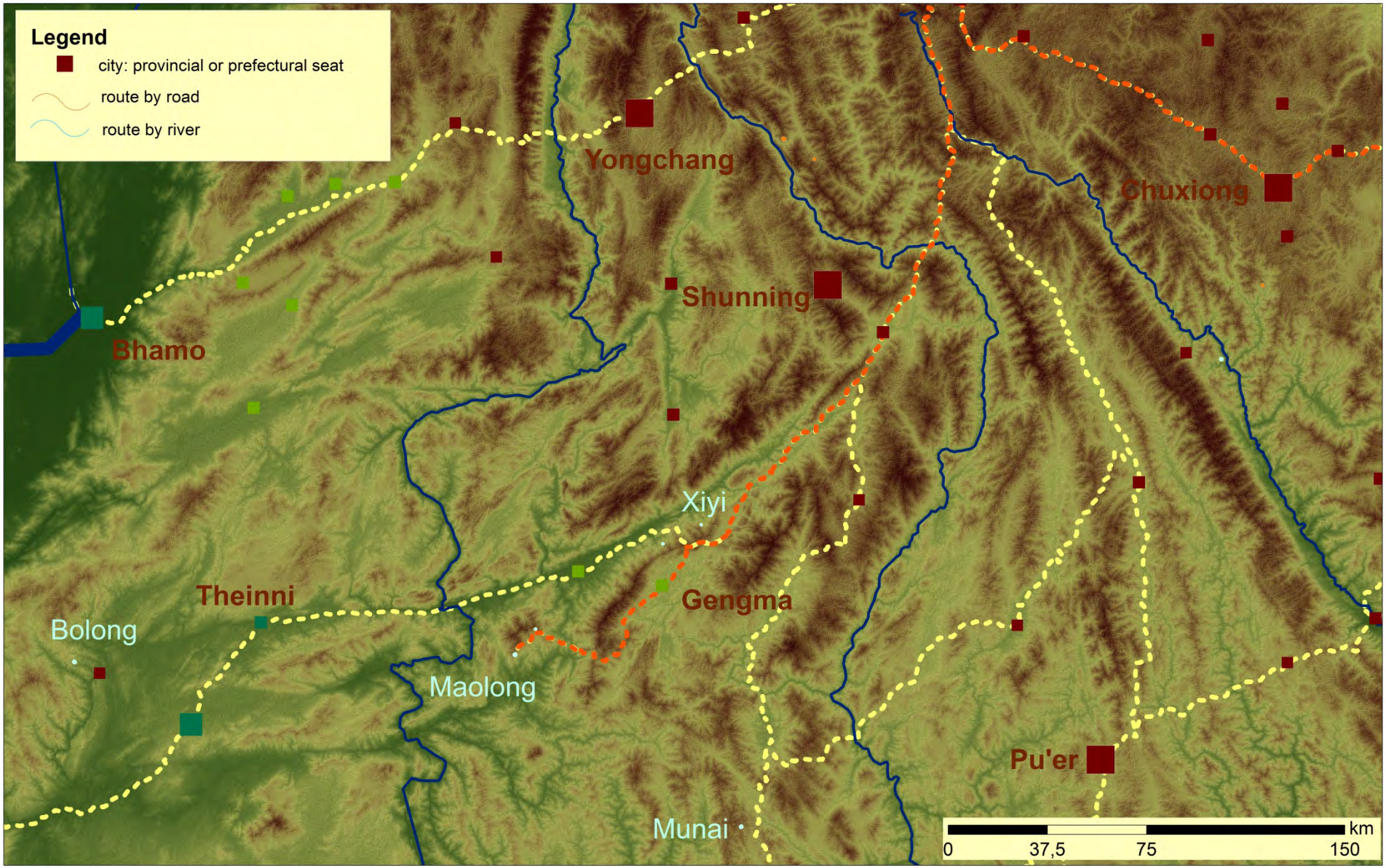

戶标
小府算
芒兴
海牙
水塘
赵保寨
白岩
焦山
缅
南腊
中仰洞
湖广
2302
岩脚
卡河
岔沟
老六寨
甘勐
银带
2000
爹河
营盘
坏口寨
新寨
纳勐
金坝
香婚林
老寨
新寨
1471
新寨山
大河



地图10:茂隆厂地区近代路线和植被(美国地图)



地图9：茂隆厂地区地形（苏联地图）



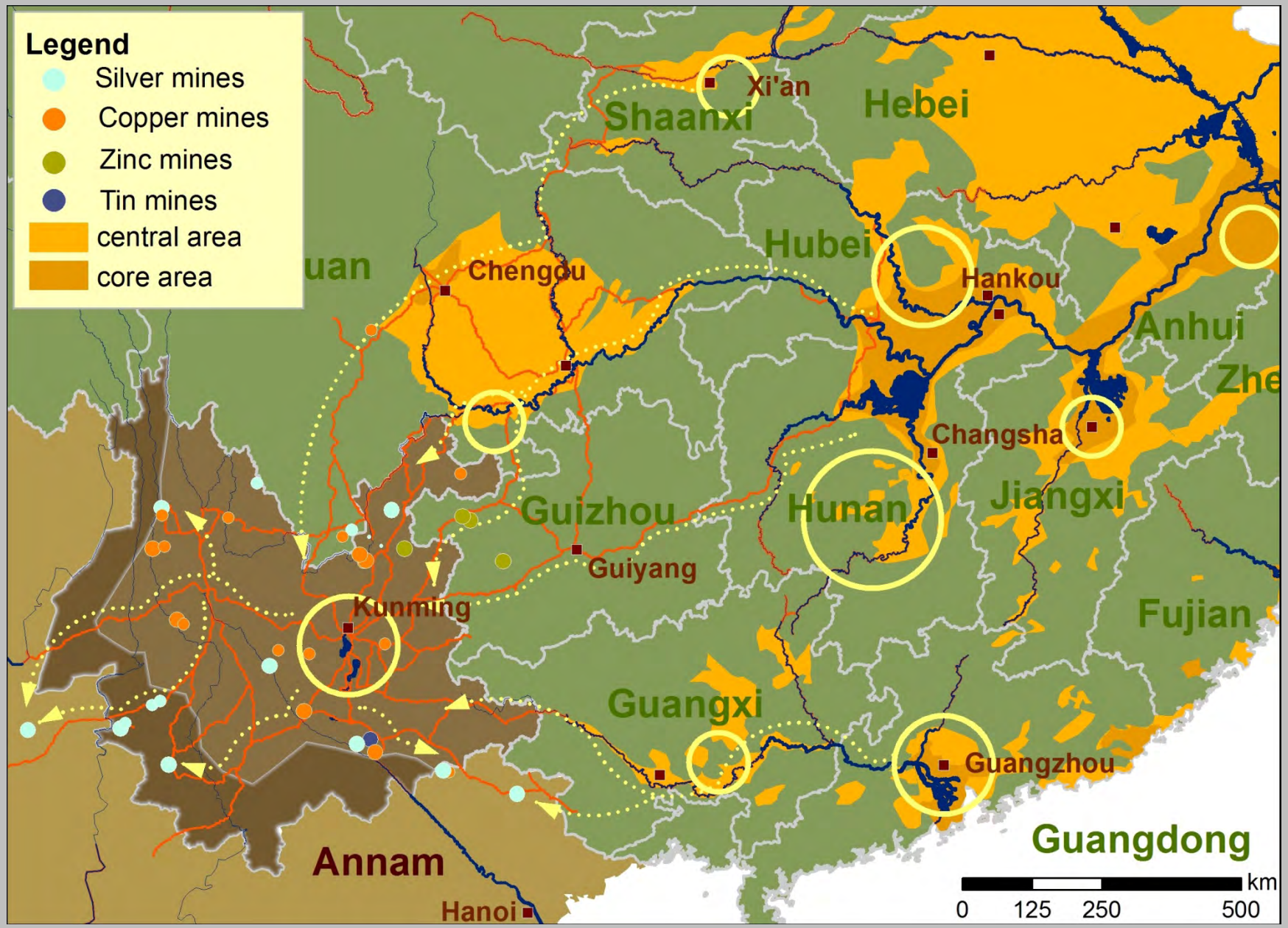
地图7:边疆地区的茂隆厂

用路线和地理分析
对矿工的迁移和经济动机进行探讨

赵翼因清缅战役对波竜银厂的记录)（1769年）：

滇边外有缅属大山银厂，极旺，而彼土人不习烹炼，故听中国人往采，彼特税收而已。大山厂多江西、湖广人，.....时各厂丁江楚人所居采银者，岁常有四万人。.....岁常有一百余万金赍回内地。

➡ **矿民定期回乡，每人携带几十两银子**



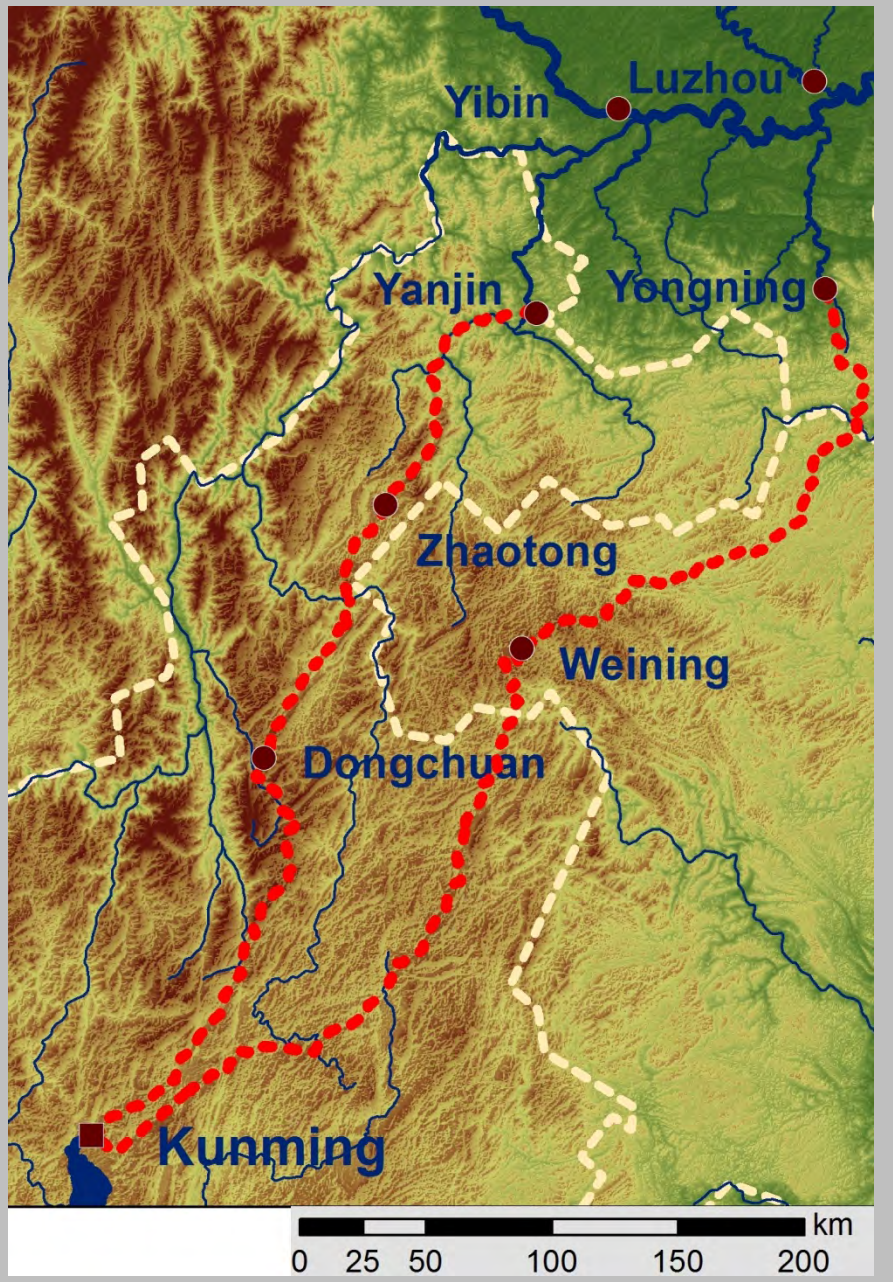
矿区流动人口的主要原籍省份和路程

山路

翻越阿尔卑斯山和四川盆地如滇中道路的比较



The Reschen Pass Road



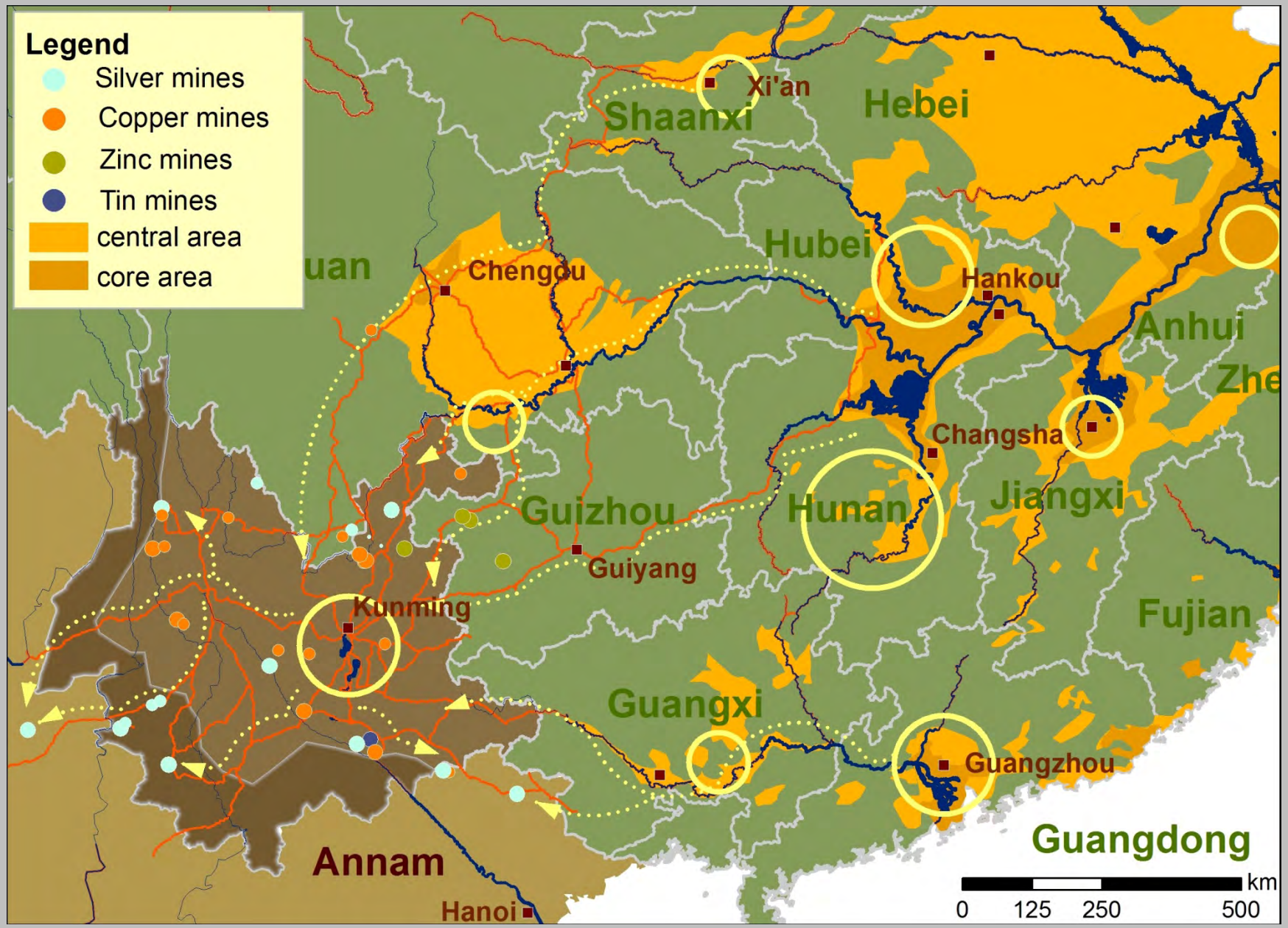
昭通和威宁路线

翻越阿尔卑斯山和四川盆地如滇中道路的比较



	Reschen Pass Road	昭通路线	威宁路线
总长	480 km	490 km	630 km
累计高差	21,000 m	52,000 m	50,000 m

Lithography after a drawing by Louis Delaporte, member of the expedition Francis Garnier, 1870.



矿区流动人口的主要原籍省份和路程

Fieldwork



鹍嘉白羊厂的硐口
2011年金兰中摄影

遗迹：炼渣



石羊厂

寺庙与会馆遗迹





兰坪县福隆厂，2011年摄影


碑文与坟墓
耿马县悉宜厂刘氏合葬墓碑

口述历史







口述历史：土法冶炼与当地传统



田野考查与分银技术变迁





白羊厂 分银炉 （2011年摄影）

冶炼遗址的常见废物

沙条

炼渣





史料

宋代：
陈百朋《龙泉志》，1200年前后浙江矿区的冶炼技术
明清时期：
宋应星《天工开物》，约1637年
吴其濬《滇南矿产图略》，1844年刻印
黄梦菊《滇南事实》，1834到1836年任会泽知县时的记录

近现代：
Emile Rocher，1871年个旧等矿的情况
宋赓平，1900年前后会理银矿的情况
Emile Leclère ，1901年个旧和会理的情况
山口義勝《东川考察报告书》，1912年者海矿山的情况
张石庵 《募乃厂的一般情况 》，民国时期慕乃厂的情况
2011年、2014年、2015年杨煜达和金兰中的田野考查
和俊忠和和小丽父子，兰坪县富隆厂的情况

技术

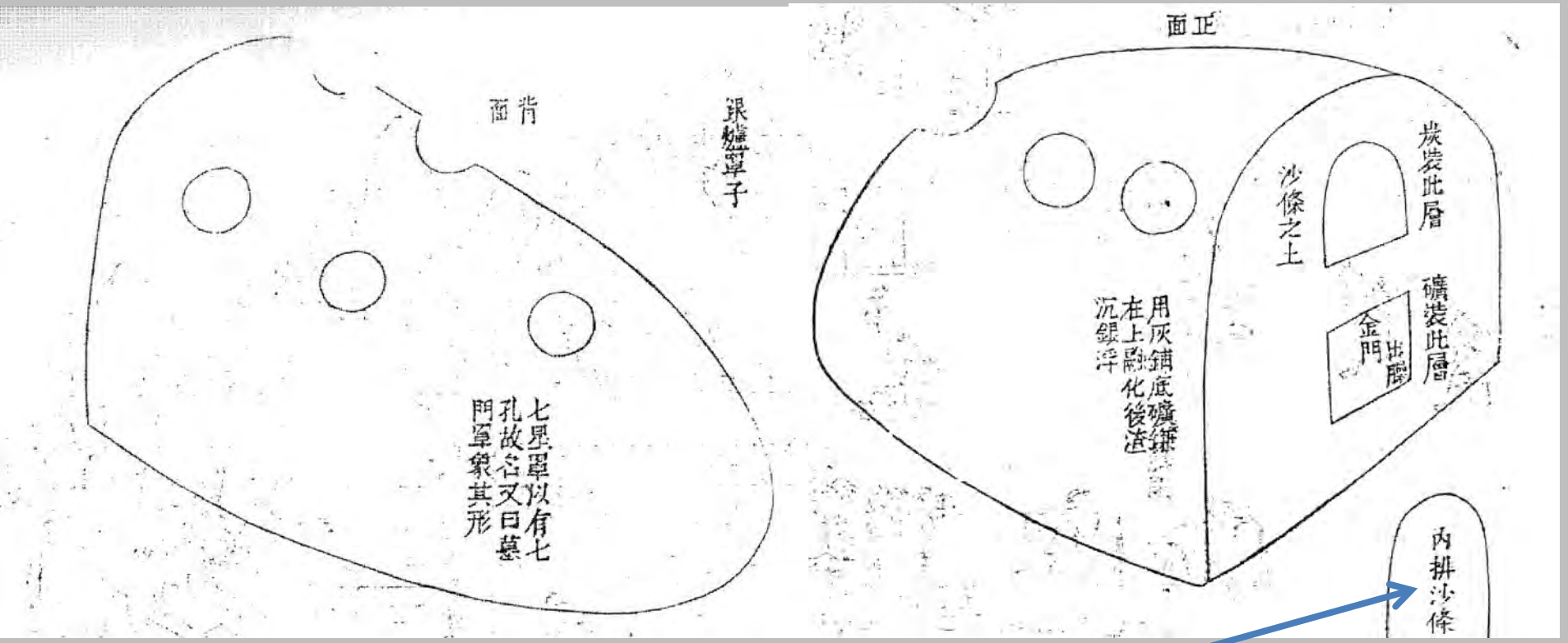
到民国时期：灰吹法

	炉的名称	入炉材料	分银炉的容量	氧气供应器	技术特点
	灰巢	铅驼	根据铅淀而定	鞴鼓	
	分金炉，一名虾蟆炉	铅团	礁百斤、铅二百斤	风箱、交箑	
	大曰七星罩	粗铅	宽约1 m、长约 2 m、前高约64 cm	风箱	可连续添炭
	小曰蛤蟆罩	粗铅、炸矿	髖约32 cm、高约32 cm	风箱	富矿直接入据精矿量修
	罩子	粗铅	直径约 1.5 m、高约 1 m，铅七百斤	风箱	一次分银约炉子清洁修续使用
勞		粗铅	铅八百斤、炭一百二十斤	风箱	一次分银34时



Song Yingxing 宋应星,*Tiangong kaiwu* 天宫开物 (1637)

《滇南礦廠圖略》1844年刻印

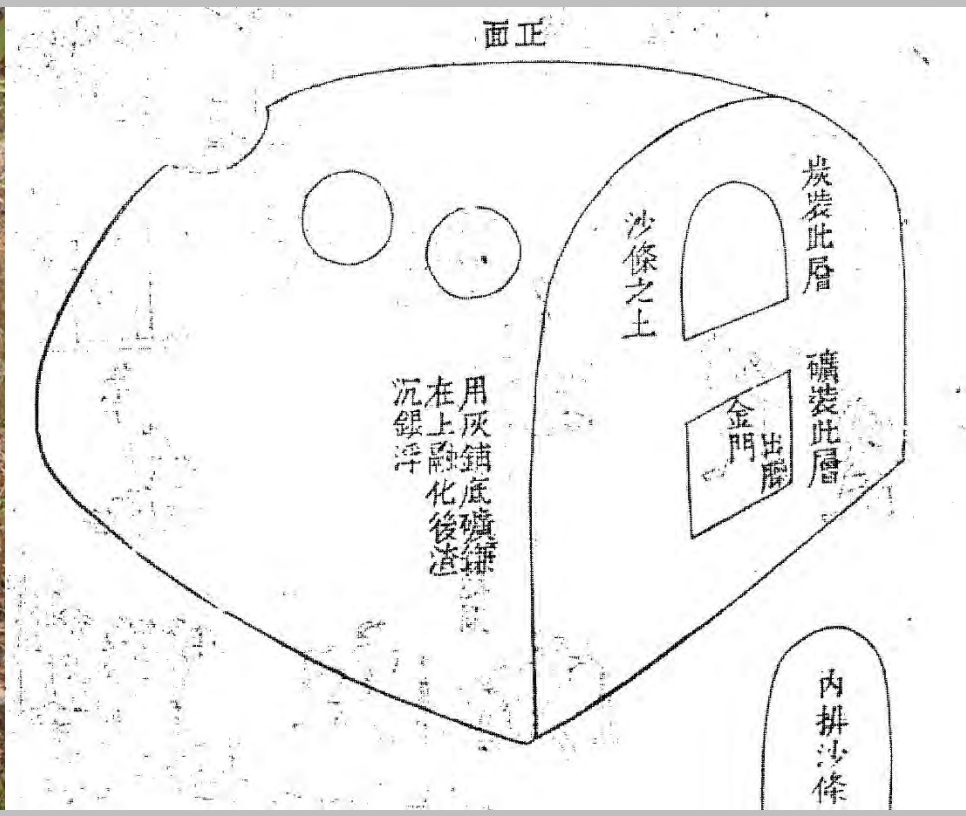


內排沙条

Seven-star hearth 七星罩, back and front

遗迹:分银罩子





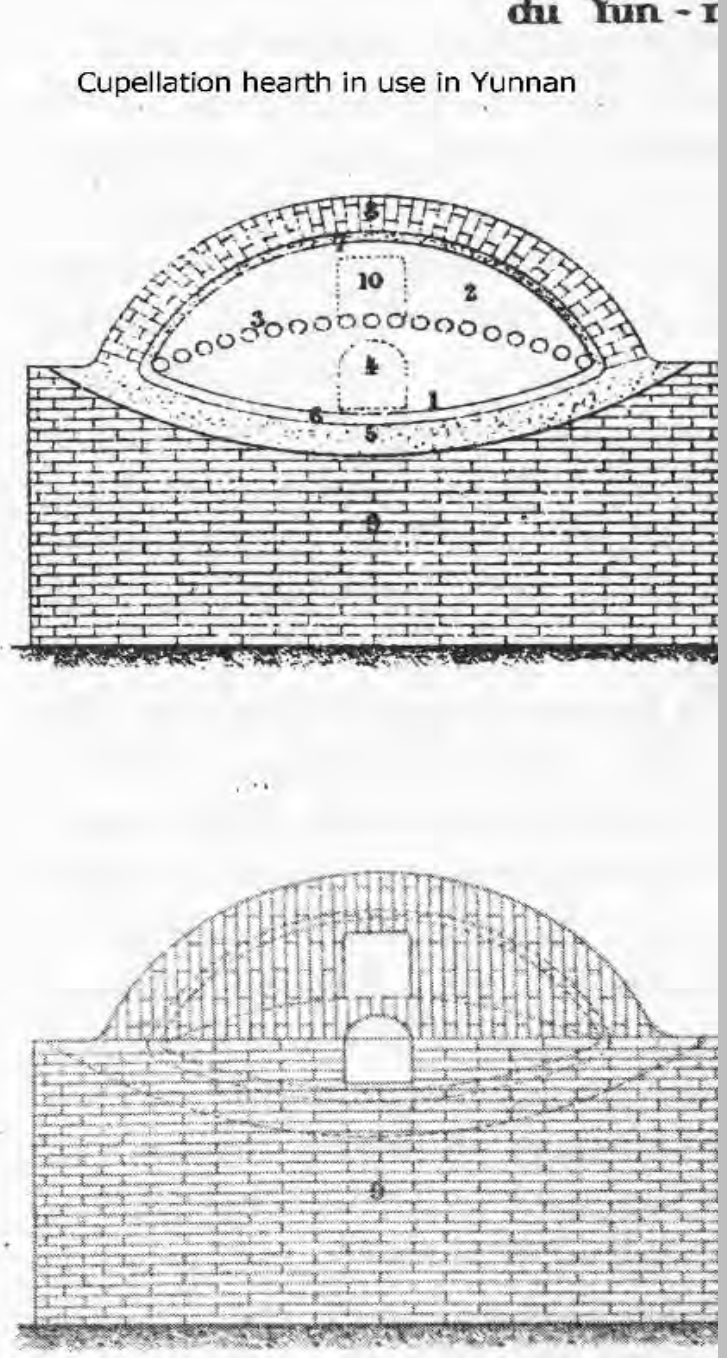
石羊厂，2011年杨煜达和金兰中考查　　七星罩

《滇南礦廠圖略》(1844)

分银罩子



石羊厂，2011年杨煜达和金兰中考查



Emile Rocher, 1871

分银罩子



石羊厂的罩子



奥地利古代分银炉
（16世纪以来欧洲中部普遍技术）

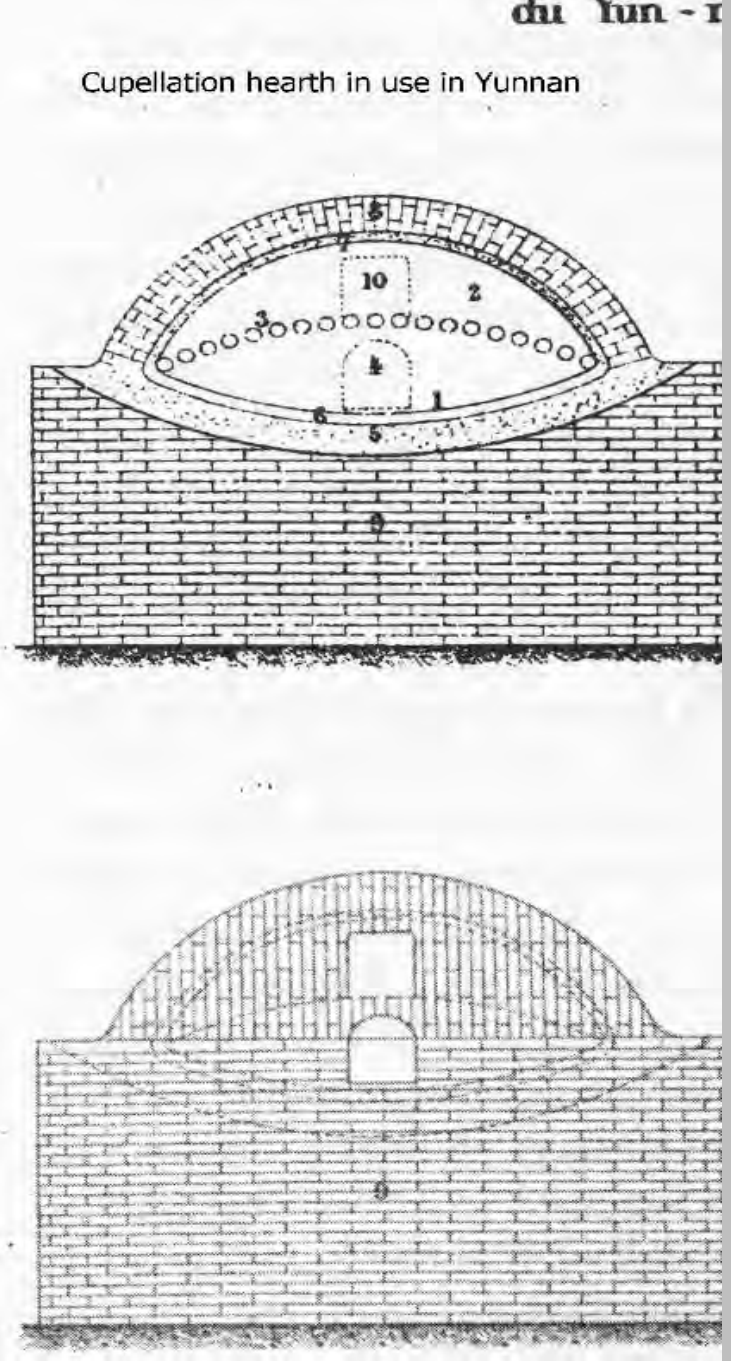
沙条



山口義勝， 1912年

和俊忠，2011年：

下面的炉略似锅底，大约深30厘米，在大锅底的上面收起，放置龙骨。龙骨用沙石做成的。一排排放置，上面放炭。从放龙骨的地方到炉顶大约高70公分。



Emile Rocher, 1871年

分银技术初步结论：

- 宋代后期灰吹法成熟
- 明代后期风箱逐渐普遍，氧气输入量提高，分银炉容量增大
- 清代道光年间大罩子比明末大四倍，加工函银不高的粗铅
- 同时还用蛤蟆罩，大小与明末详细，专门加工富矿
- 七星罩与近代穹形罩子大小和结构类似，形状不同
- 但连续分银不好理解。也许吴其濬描写的是最新技术，未曾普遍应用，也许根据Rocher的记载经过清洁修补后再用。
- 近代回收老炉渣的分银技术尺寸变大，劳动投入变低、回收效率也变低


谢谢！

天工开物：

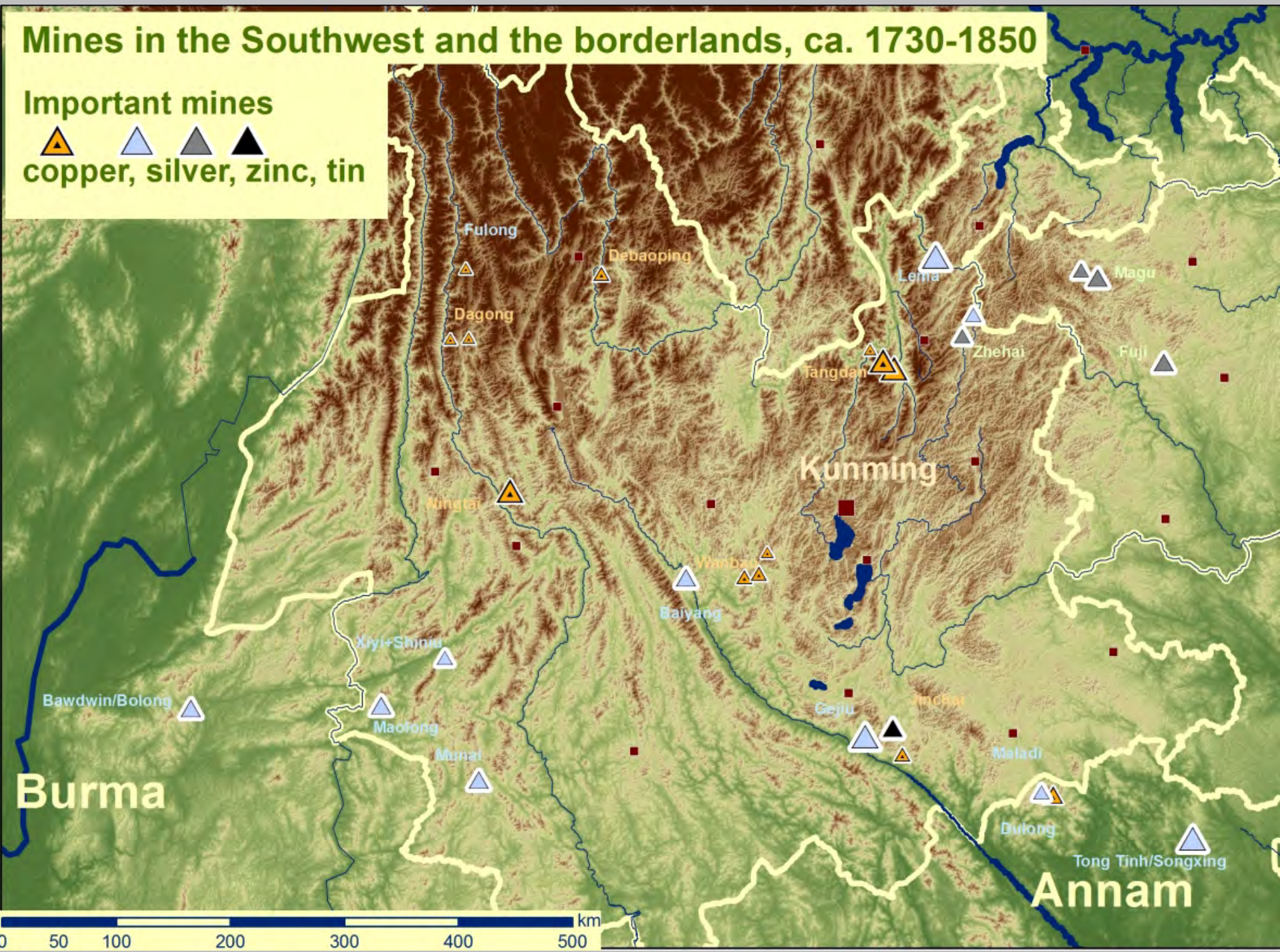
冷定取出，另入分金炉（一名虾蟆炉）内，用松木炭匝围，透一门以辨火色。其炉或施风箱，或使**交箑**。火热功到，铅沉下为底子。(其底已成陀僧样，别入炉炼，又成扁担铅。)
频以柳枝从门隙入内燃照，铅气净尽，则世宝凝然成象矣。此初出银，亦名生银。倾定无丝纹，即再经一火，当中止现一点圆星，滇人名曰‘茶经’。逮后入铜少许，重以铅力溶化，然后入槽成丝。

其楚雄所出又异，彼硐砂铅气甚少，向诸郡购铅佐炼。每礁百斤，先坐铅二百斤于炉内，然后煽炼成团。其再入虾蟆炉沉铅结银，则同法也。

滇南矿产图略：

小曰蛤蟆罩，形似之，下为土台，长三四尺，横尺余，四周土墙，高尺许，顶如鱼背，面上有口以透火，下有口不封以看火候。铺炭 于底，置铅其中，炭在沙条上，炼约对时许，银浮于罩口内，用铁器水浸盖之，即凝成片。渣沉灰底，即底母也，出银后即坼毁另打。

大曰七星罩，形如墓，又曰墓门罩。下亦土台，长五六尺，横二尺，四周土墙，顶圆，有七空以透火，因曰七星罩。前高二尺，上口添炭，下口为金门，土板封之，后以次而杀。铺灰于底，置矿于上，掺于铅。炭在沙条之上。约二时开金门，用铁条赶臊一次，仍封之。或一对时，或二对时，银亦出于罩口内，出银后添入矿铅，随出银随添矿，可经累月须，俟损裂，再行打造，故又曰万年罩。


Mines in the Southwest and the borderlands, ca. 1730-1850
Important mines
copper, silver, zinc, tin
Fulong
Debaoping
Dagong
Lehua
Magu
Zhehai
Fuji
Tangdan
Kunming
Ningtai
Wanbao
Baiyang
Xiyi+Shiniu
Bawdwin/Bolong
Maolong
Mutai
Burma
Geju
Maladi
Dulong
Tong Tinh/Songxing
Annam
km
0
50
100
200
300
400
500

The awkwardness of silver mining and the realities on site

Nanny Kim
Heidelberg

AAS Annual Convention Toronto, 2017

The awkwardness of silver mining and the realities on site

(1) Why we know so little about silver mining in late imperial China and why mining was so awkward

=> Limitations of written sources

(2) Why and how remains a reconstruction of silver mines in the Far Southwest is possible

=> fieldwork and industrial records

Silver mines in late imperial China

We know precious little about silver mines in Ming – Qing China

- Mining shifted to the Southwest during the Yuan (13th cent.)

- All snippets in Ming records: > 1 printed page
  According to an 18th century source, 23 mines were worked during the late Ming
  Some 10 knwon by name and located

- Qing records: > 10 pages
  Names of some 50 mines,
  (150 in 20th century records)
  Scope and period of expoitation

- 1849–73: Civil wars: collapse of mining



Silver mining and silver money



Tax records suggest very small outputs.

But:

Monetary history and silver imports suggest a different story.

By 1430, the monetary system was silverized. Taxes were payable in silver, reserves were held in silver, and many market transactions used silver

From 1570 to the 1820s, China imported of silver from Japan and from Spanish America

Estimates of domestic outputs: **500 – 2,600 tons**

Estimates of total imports : **20,000 to 100,000 tons**

Reasons for the scarcity of sources

1） Silver was used as money, but it never became a minted and controlled currency.

2） In the Confucian perspective, mining was harmful 礦害

Recklessness: an acitivity in pursuit of profit 礦利
利之一字，凶于而家，害于而国

Pollution: of water bodies and soil, harmful to agriculture, makes people diseased 病民

Miners are a problem for **social stability**: 礦徒
Unruly hordes of single men, prone to rioting and insurgency
礦徒易聚難散，小則争掠，大則啸聚，关系地方不小。

The purist Confucian stance

人睹其利，予睹其害。
夫礦開則人聚，人聚則食廣。
雲南有限之谷，其能飼此不耕之人乎！
(倪蛻 Ni Shui, early 18th cent)

People see profit; I see calamity.
For when mines are opened, people congregate, and where people congregate, they consume food far and wide.
Yunnan, with ist limited grain, cannot feed these people who do not work the land!

The gap between official records and reality



Customary local arrangements　陋規



The prefect of Zhaotong 昭通知府
in official winter outfit, photo ca. 1900.

Increase in materials since 1700, especially for Yunnan

1705: cautious promotion of copper mining in Yunnan
1738: Yunnan made the supplier of copper for the imperial mints

=> Copper mining administration, which in fact also covered silver mines

=>
New approaches for re-assessing domestic silver mining:

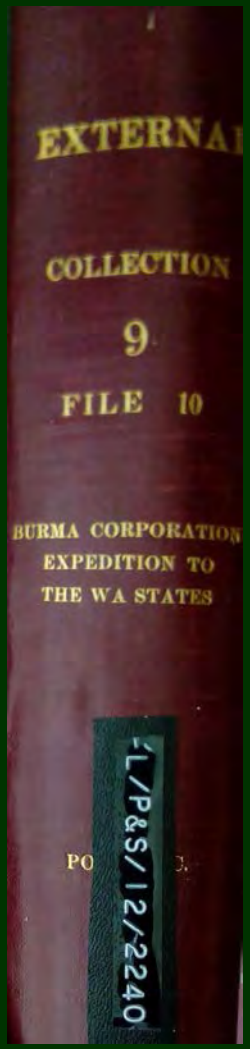
1. **Industrial records**
2. **Remains on site**

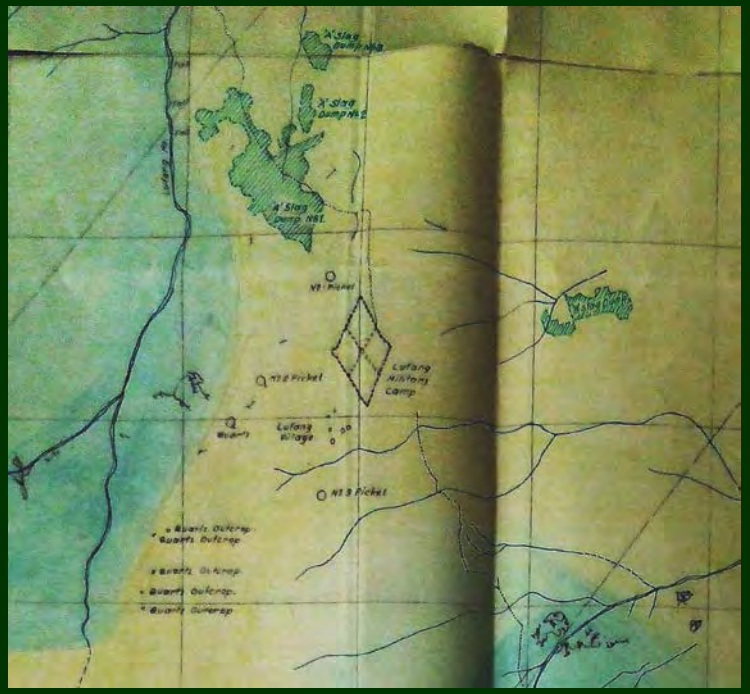


A tax office at a copper mine, ca. 1840. The woodcut shows workers, the tax official in a reclining chair and an accountant at a counter with an abacus.

Industrial and scientific records

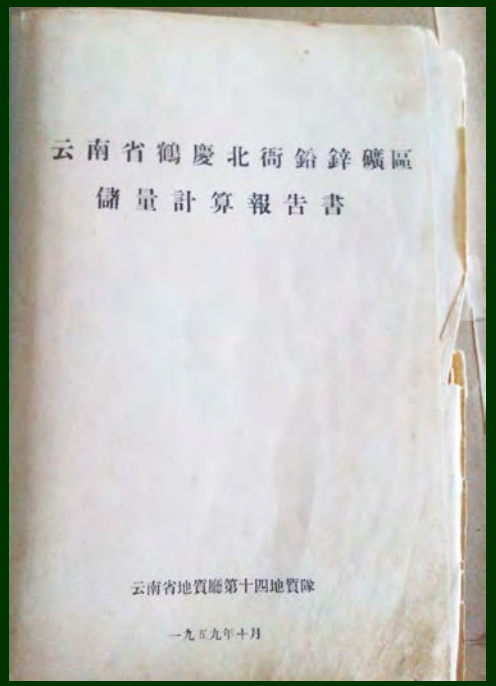
Esp. on re-smelting of old slags

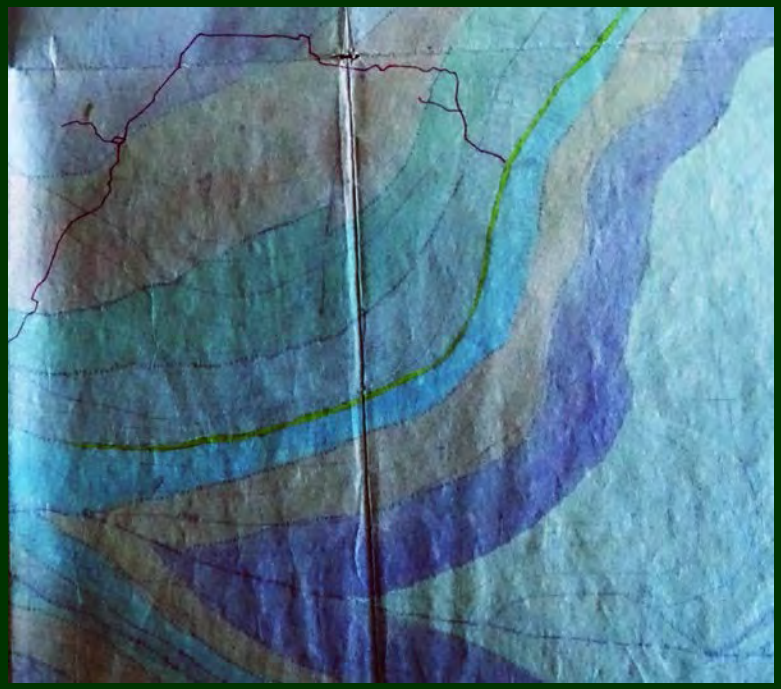




Survey report by the Burma Corporation of the Maolong Mines 1929

Materials 1956 to 1980s held by the Beiya Mining Corp.



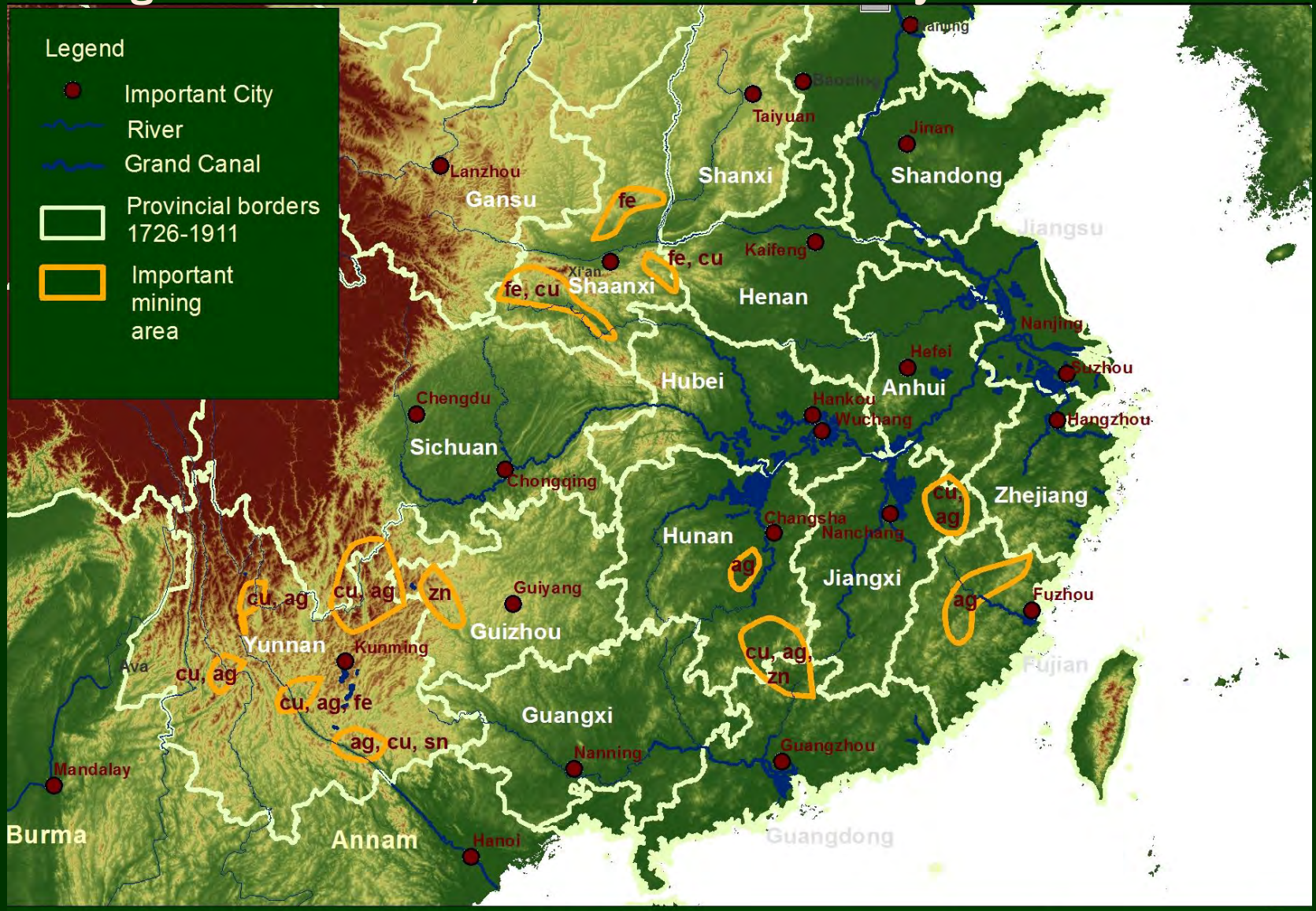


Remains: e.g. slag dumps

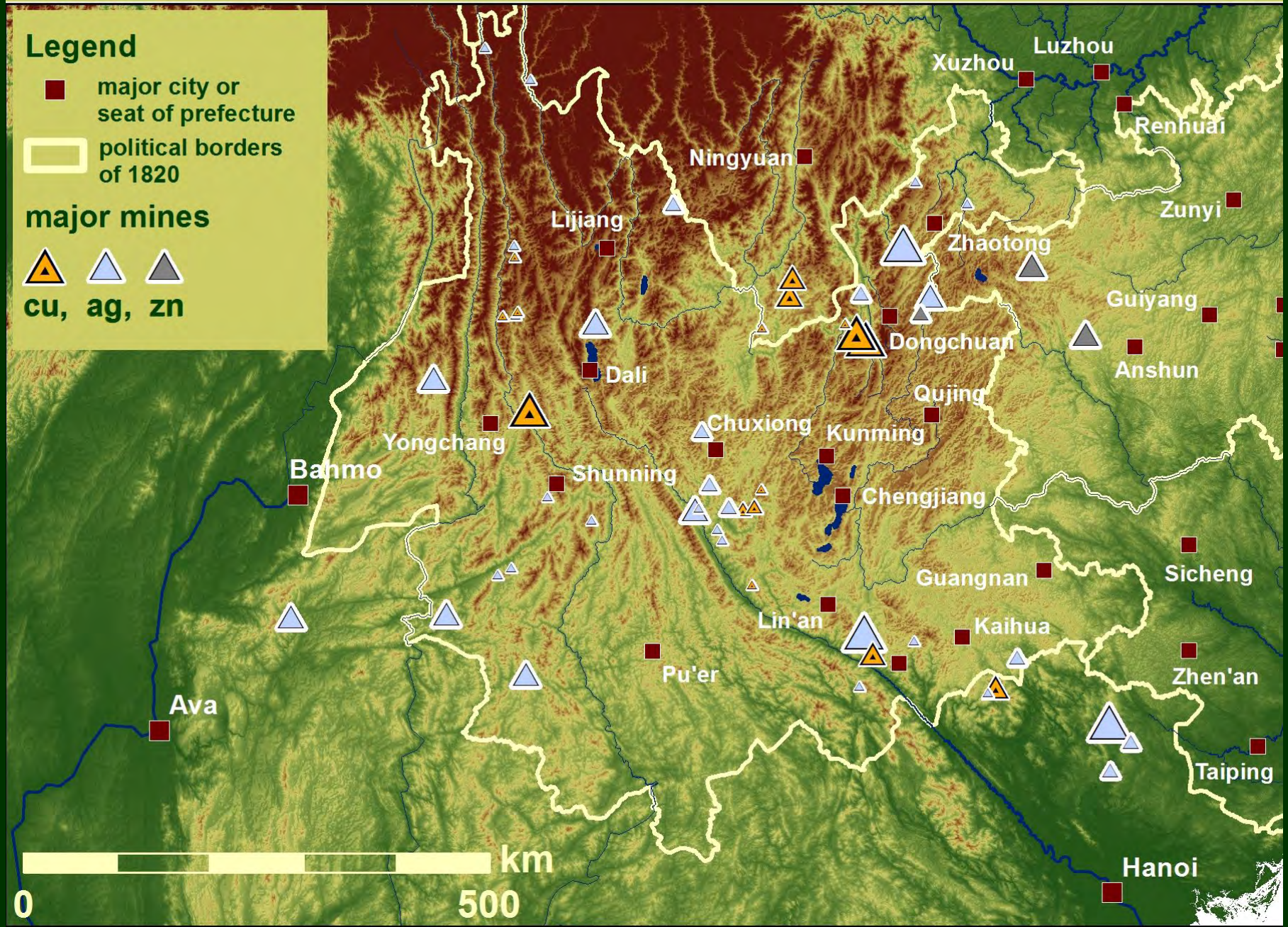


Getting oriented: Mapping and localization

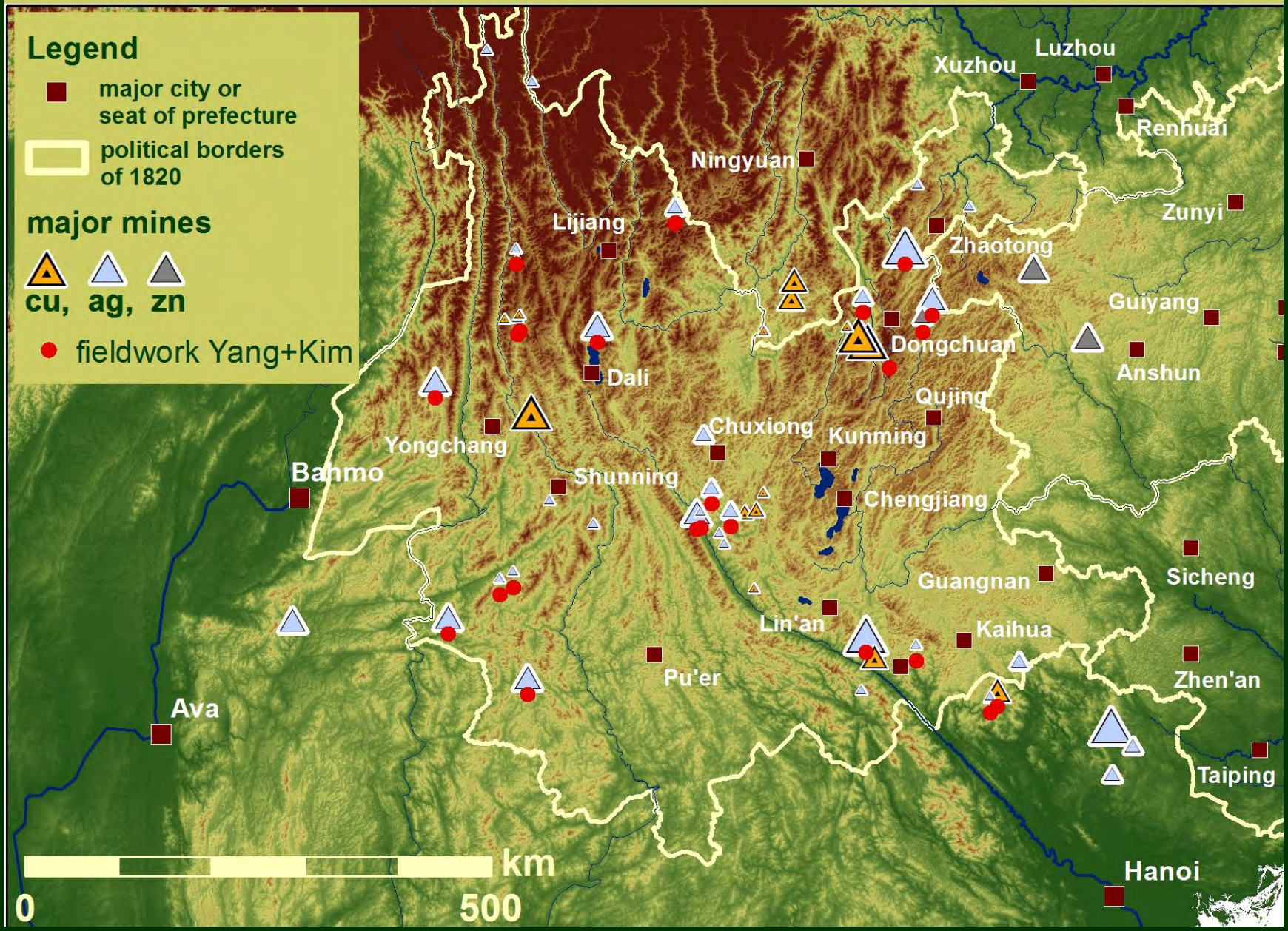
Mining areas in China, 10th to 19th century



Major located silver, copper and zinc mines, Ming and Qing periods



Major located silver, copper and zinc mines, Ming and Qing periods



Fieldwork



A mining gallery,
Shiyang Mines 石羊厂

The main mining slope of the
Lema Mines 乐马厂:
A ruptured limestone cone

Oral Histories and local knowledge





Informants at Laochang, Gengma; Fulong, Lanping and Dashuigou, Shuangbai



Remains





Mr. Peng at a grave, Malong Mines 马龙厂

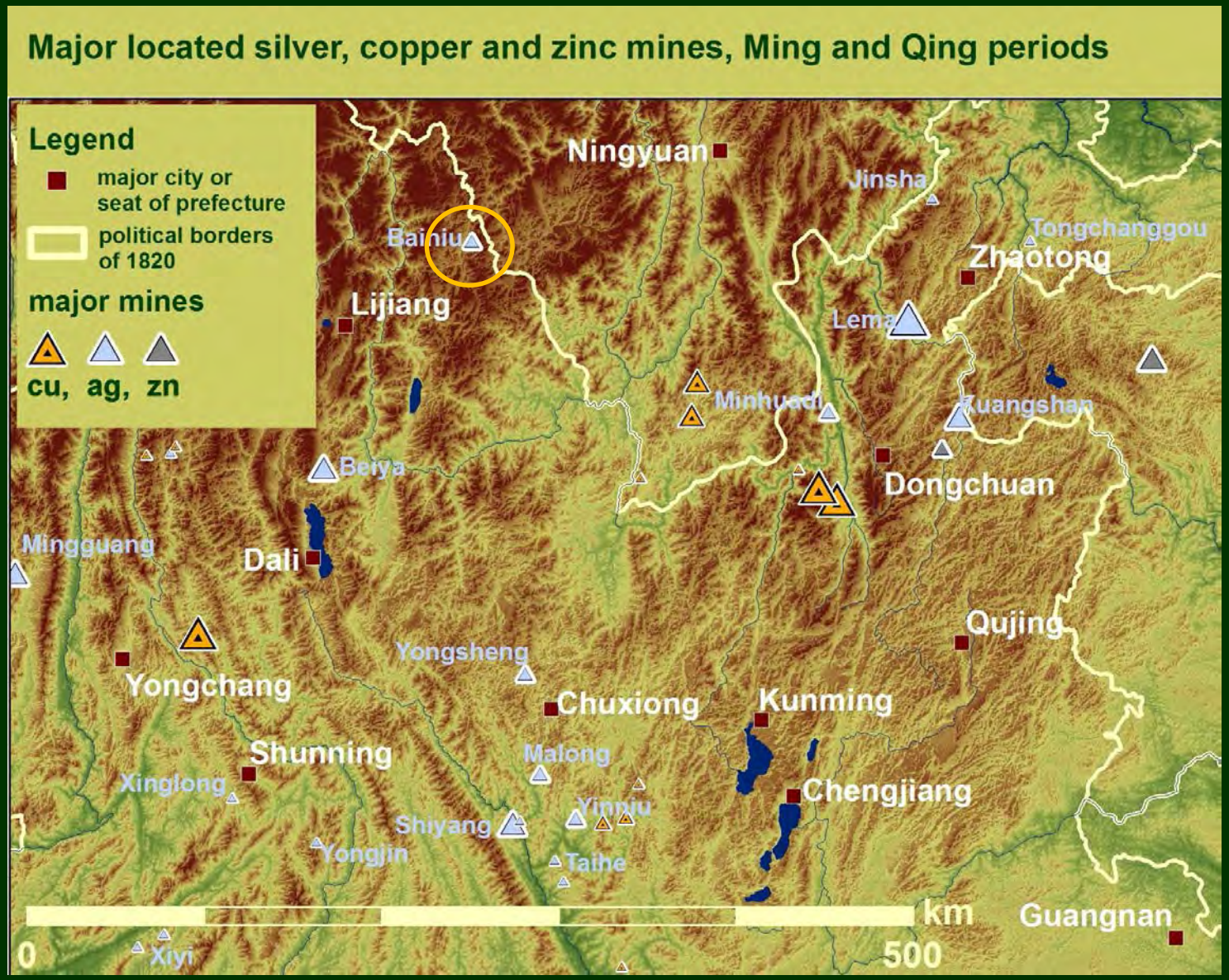


Temple site and cupellation hearth,
Shiyang Mines 石羊厂

The Bainiu Mines in Ninglang District

宁蒗县白牛厂

No offical tax records



He Zongzhang 賀宗章, late Qing reminiscences of period before 1850:

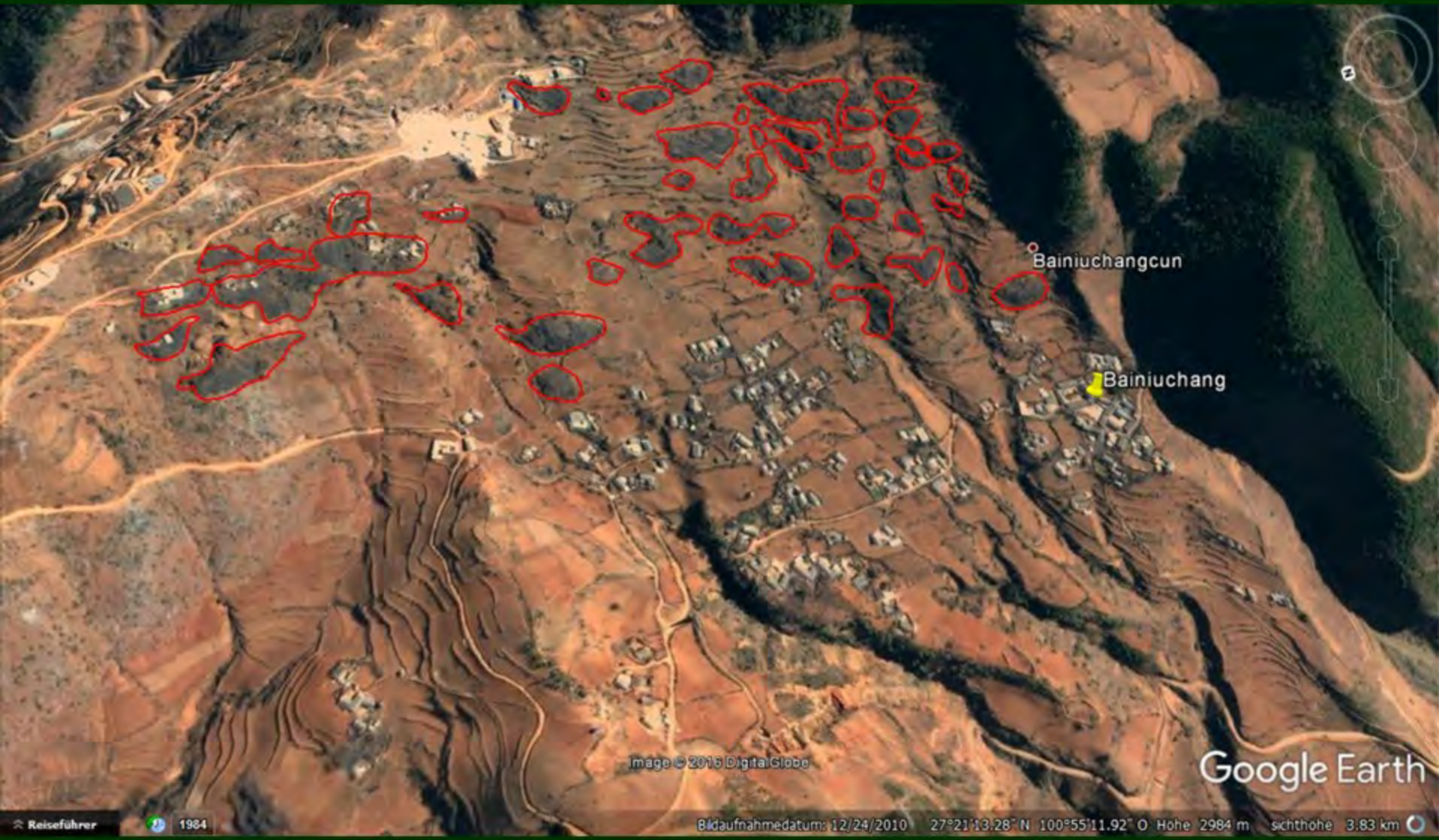
> 如永北银厂，吾友刘春霆云曾办过，昔规模阔大，永北同知，日进陋规大银一锭五十余两，以为常。
> For example the silver mines of Yongbei, which my friend Liu Chunting once ran, formerly were huge. The sub-prefect of Yongbei regularly received a piece of over 50 liang silver per day.

=> 1.85 kg per day = output of about 2,000 tons at the top tax rate of 30%

How can a mine on this order stay invisible?



View of the village and the slope covered in slag dumps

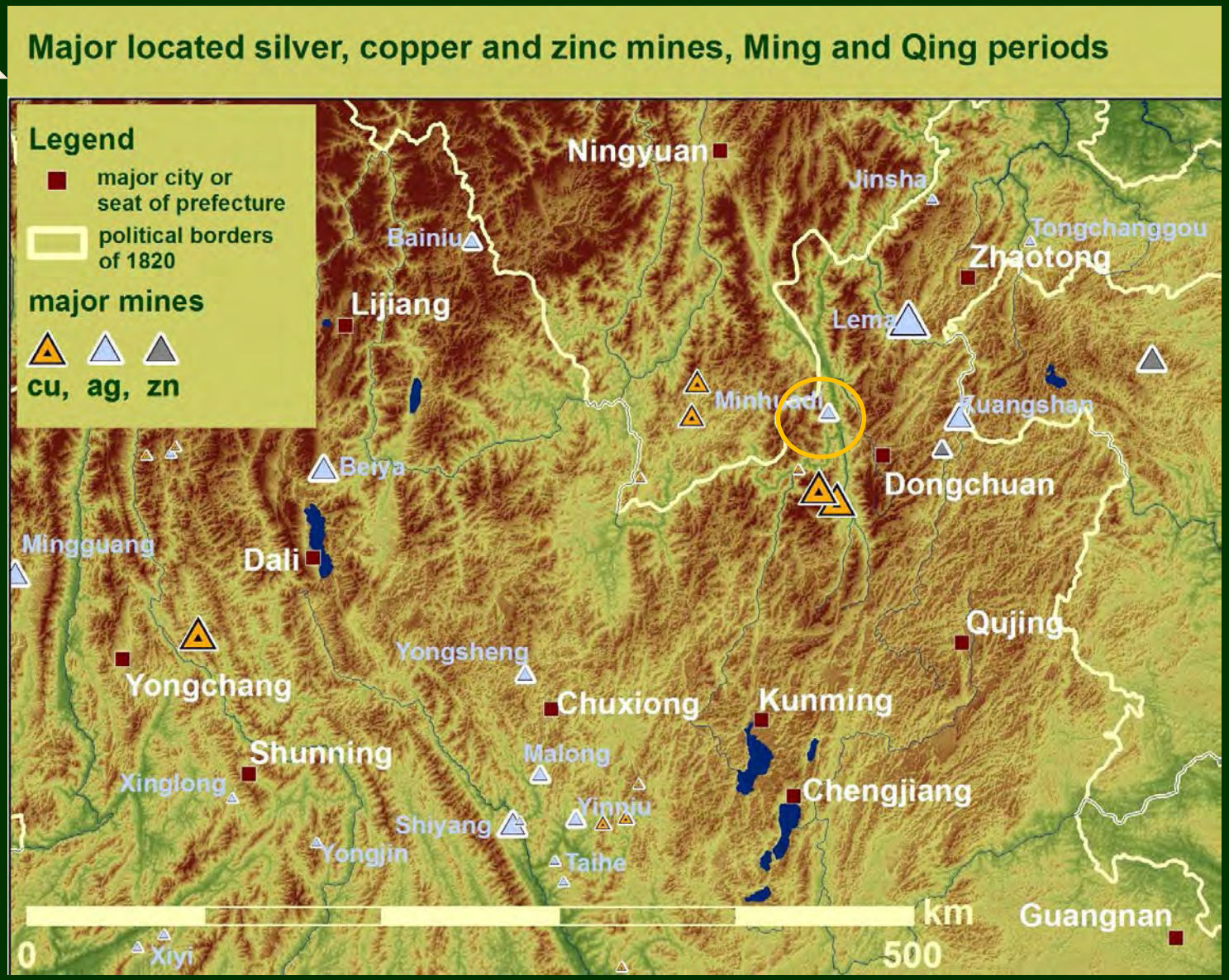


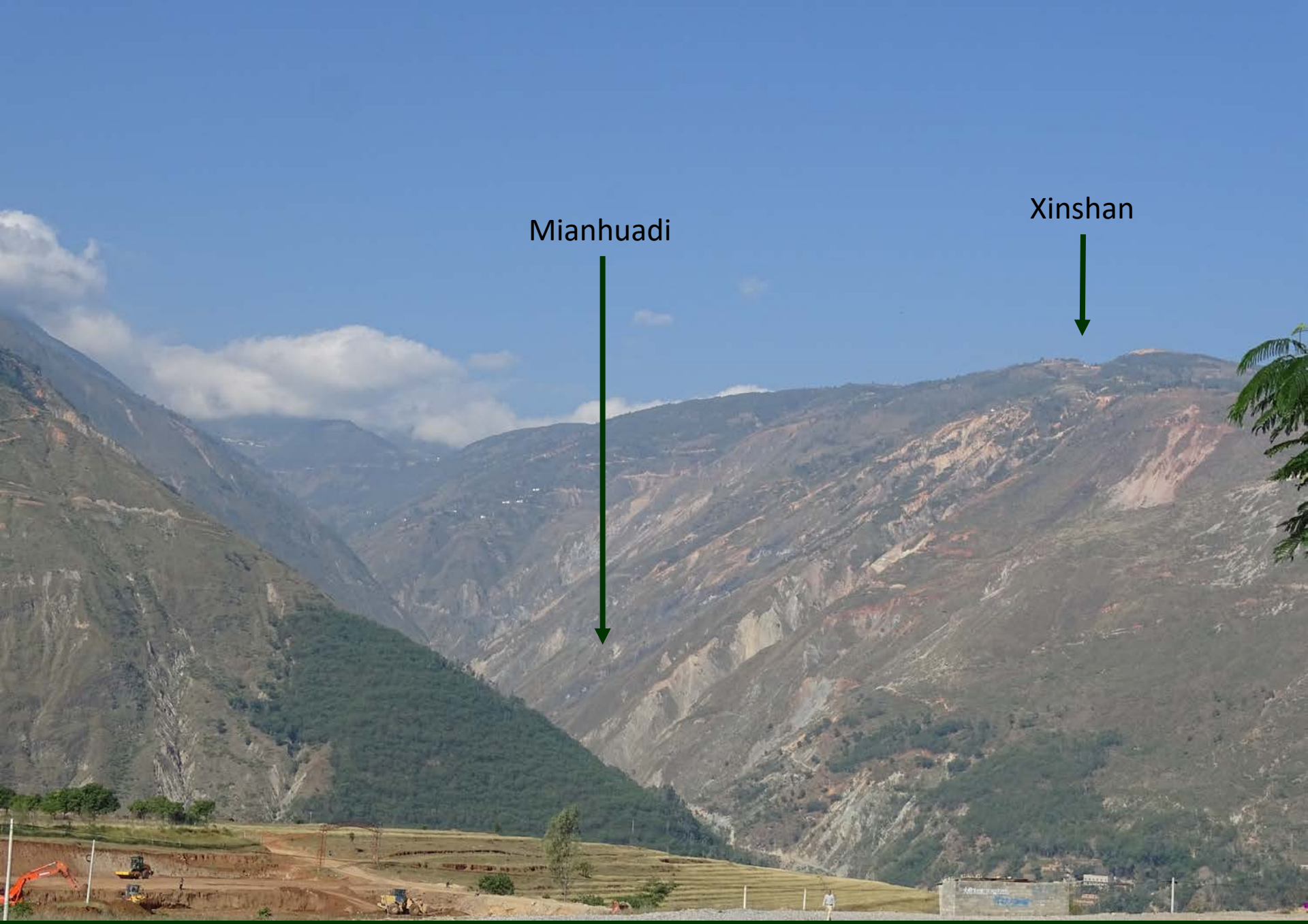
46 slag dumps visible in satellite image of 2010

The Mianhuadi Mines in Huidong District

会东县棉花地厂

Probably quite important for a limited period in the late 18th century





View into Mianhuadi valley from the east bank of the Jinshajiang





Remains of the tunnel gate 嶆门 near the top end of Mianhuadi village

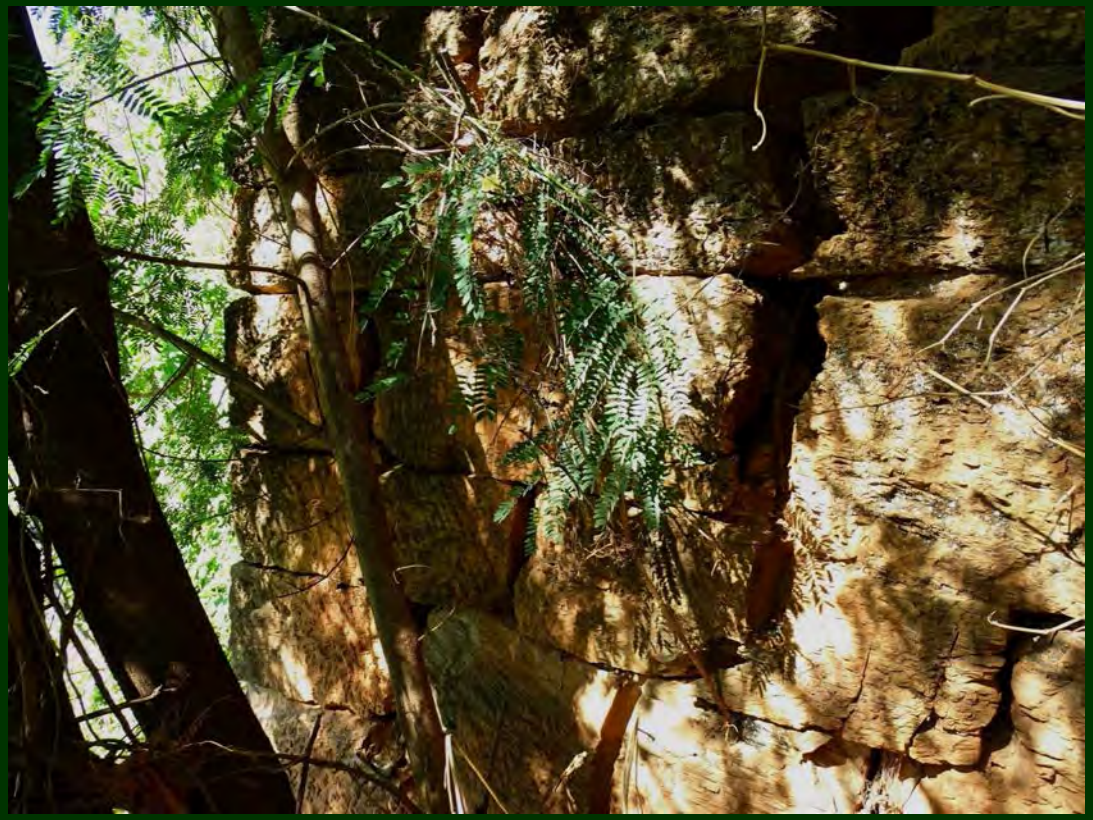
Mr. : Xin Wang 辛旺 pointing out remains



Remains of buildings at Mianhuadi









Mianhuadi village

Orange lines: foundation walls of temples

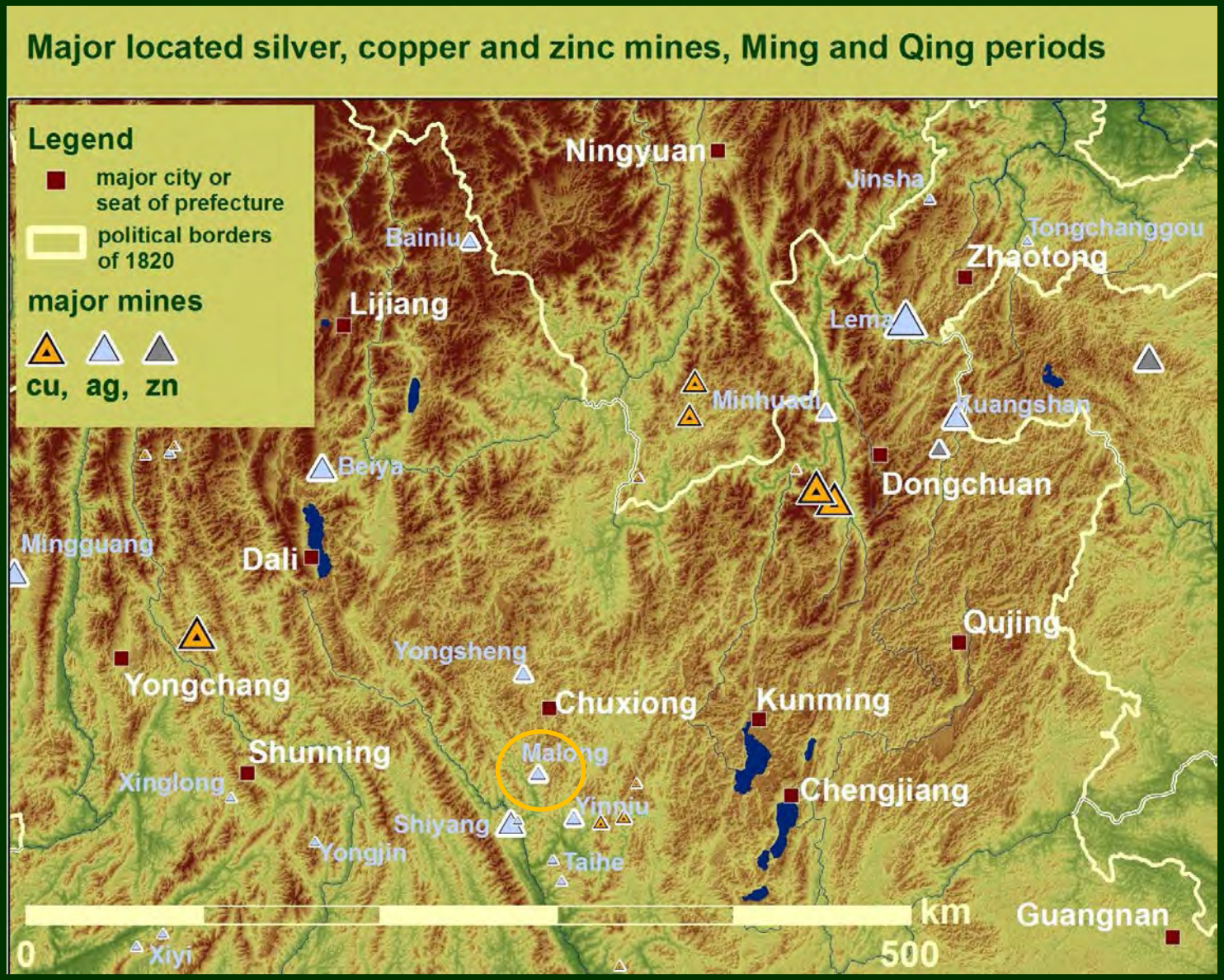
Small red area: slag dump, still on site

large red area: probable max. slag dump

The Malong Mines in Shuangbai District

双柏县
马龙厂

Probably exploited during Ming, scale unknown, still in existence by 1849





Mr. Duan Bichao 段必朝



View of Malong village from the Guanyin temple



Gangue layer behind
new building

The Malong Mines at Malong, Changdacun (Old Mines) and at Majiatian (New Mines)



Red areas: Slag dumps
Orange areas: temple sites
Purple area: Gangue heaps

Green area: graves

Conclusion

19 sites visited,
surprises in every single site.

With 1 expected exception, all sites showed evidence of a scale far above the documented exploitation.

At this point of an ongoing project, we can confirm silver outputs of domestic mining for 1400–1850 of at least 29,000 tons.

We are working on a grading system that takes in slags, gangue heaps, buildings and other remains .

Monetary history may be in for a major revision.



Slags at the Mingguang Mines

Thank you!

Nanny Kim and Yang Yuda

=> http://www.zo.uni-heidelberg.de/sinologie/research/epr

明清时期西南边疆地区的银矿：史料、田野考察、地理分布分析与环境变迁

Nanny Kim/金兰中
Heidelberg University

西南的银矿



复旦大学杨煜达带头的课题，
从2009年合作研究，
2011年以来进行共同田野考察
2014年第一次和李晓岑教授进行田野考察
2015年到2018年德国科研基金会的专职项目

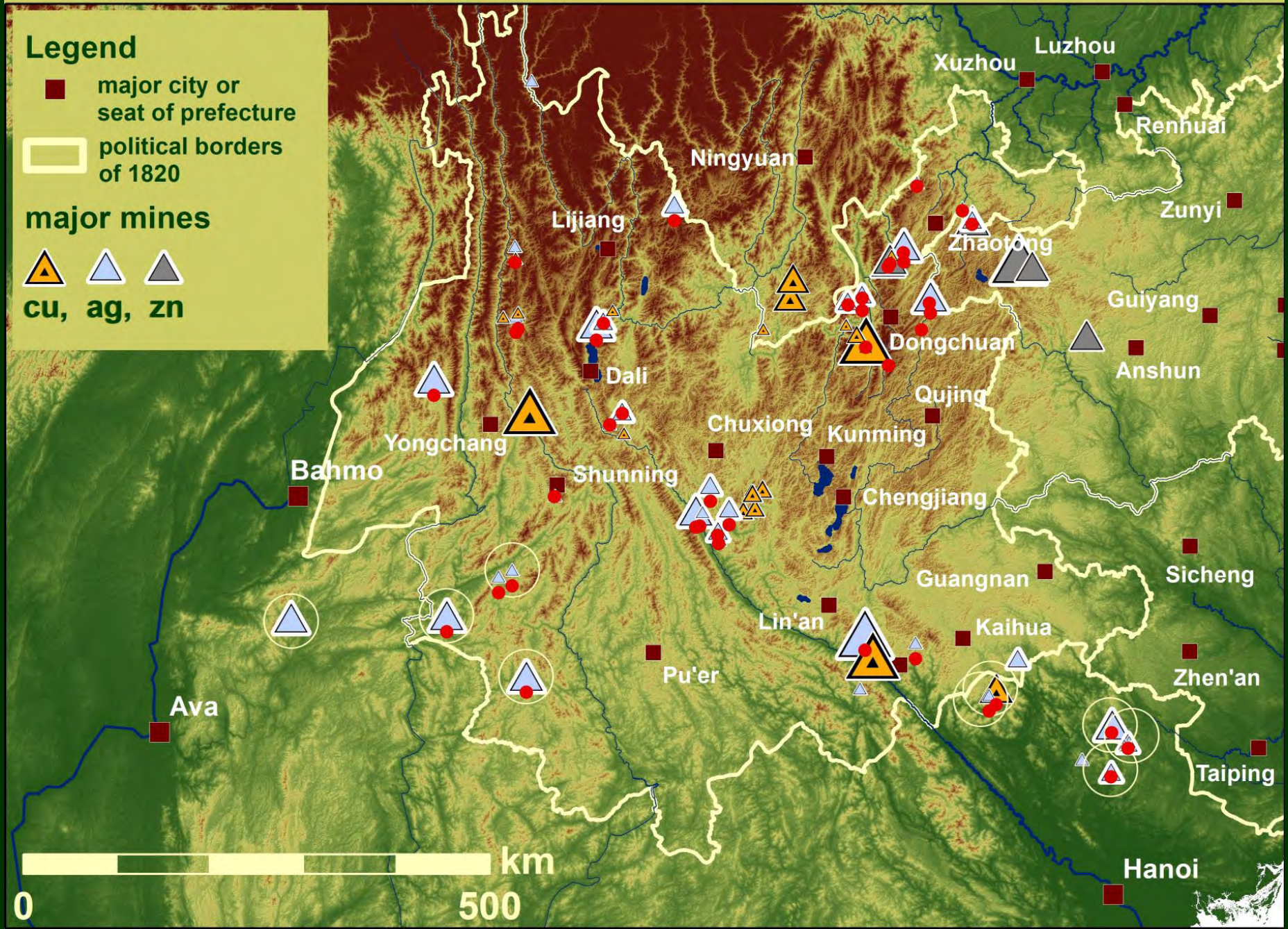
本人的研究兴趣

- 历史地理（包括应用GIS分析）
- 运输交通史
- 社会与环境的关系

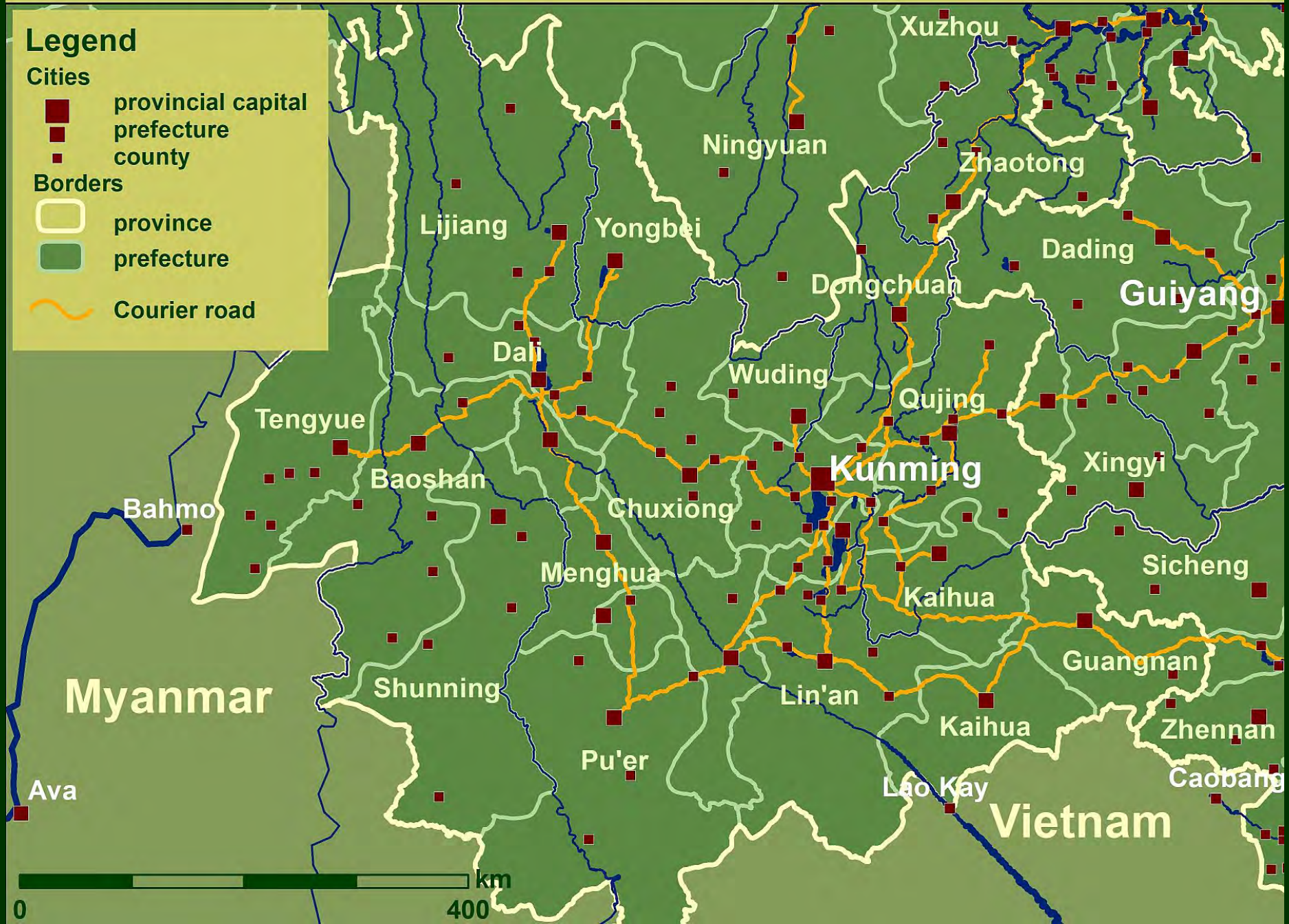
本报告内容

1. 矿山分布与西南人文地理的新认识
2. 矿山的寻，开采规模的分析和矿镇与周围环境的关系——以清代东川府地区为中心
3. 用GIS模型分析大矿对森林的消耗 ——以汤丹厂为例的模型试车

Major located silver, copper and zinc mines, Ming and Qing periods



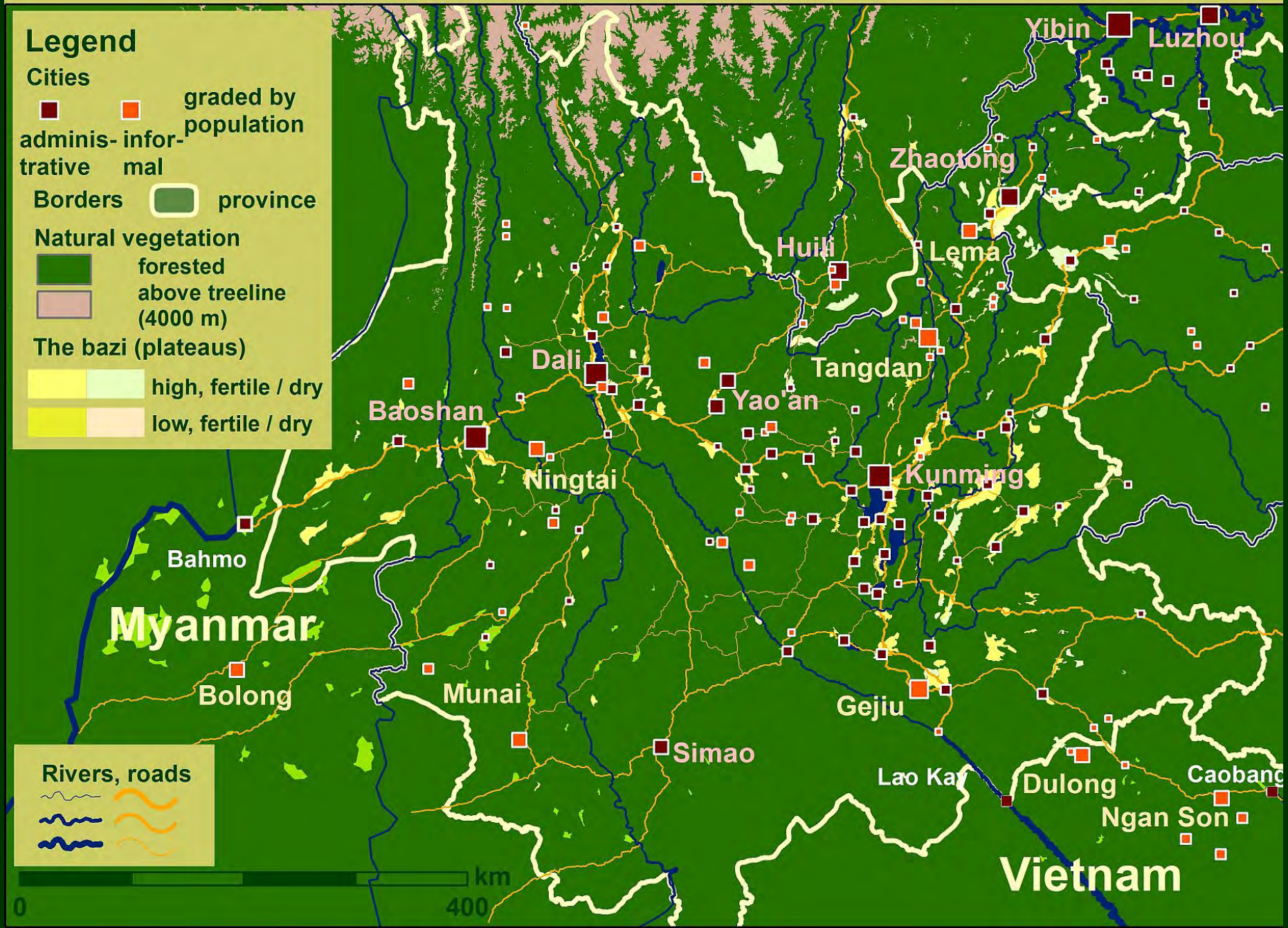
The administrative map of the Far Southwest, 1730-1911



The Far Southwest with cities and towns, mines and roads, ca 1800

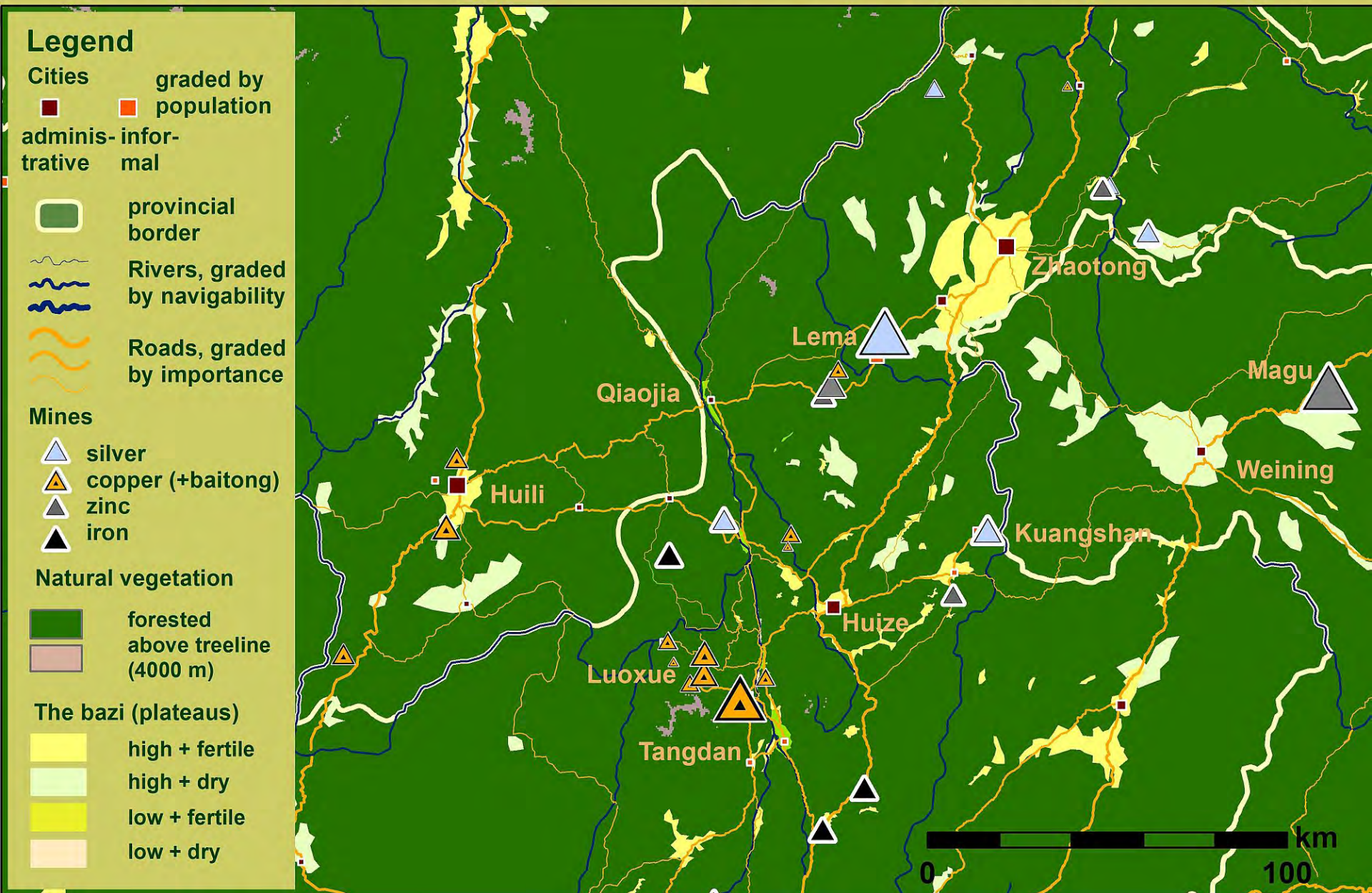


The Far Southwest with cities, roads and bazi, ca 1800

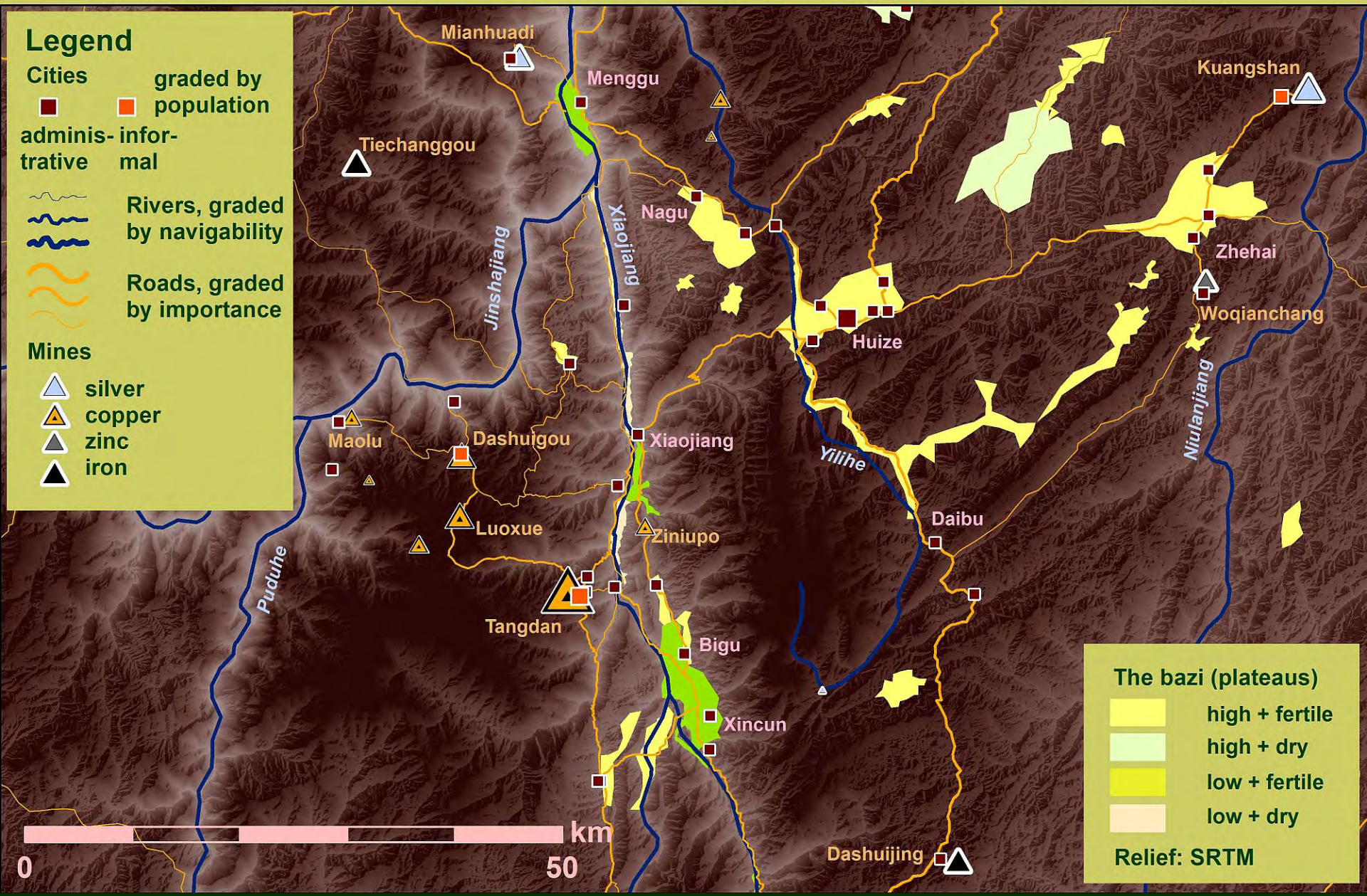


2 滇东北的铜银锌铁矿

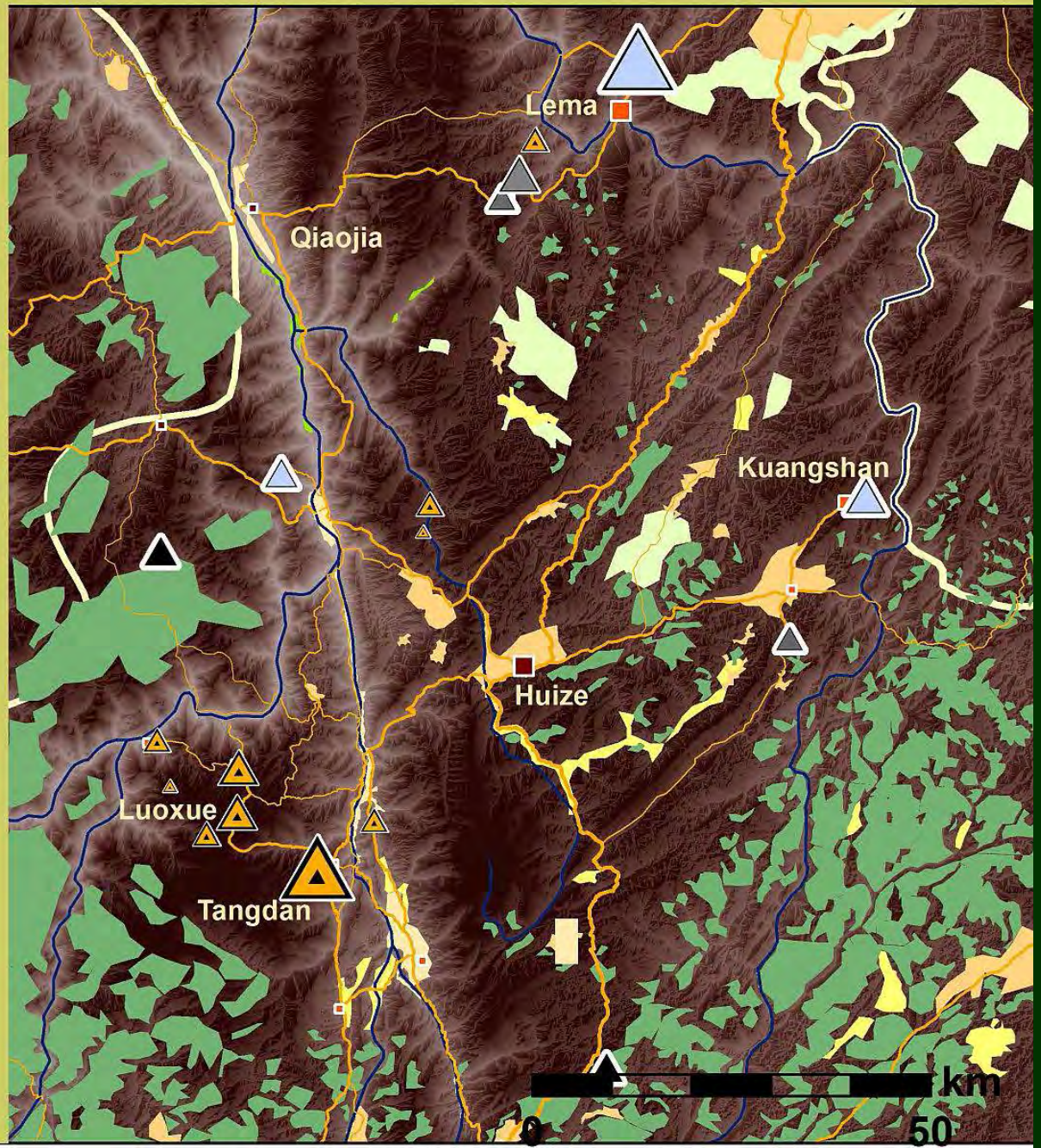
The area of Dongchuan, Huili, Zhaotong and Weining, ca 1800



The area of Dongchuan, Huili, Zhaotong and Weining, ca 1800



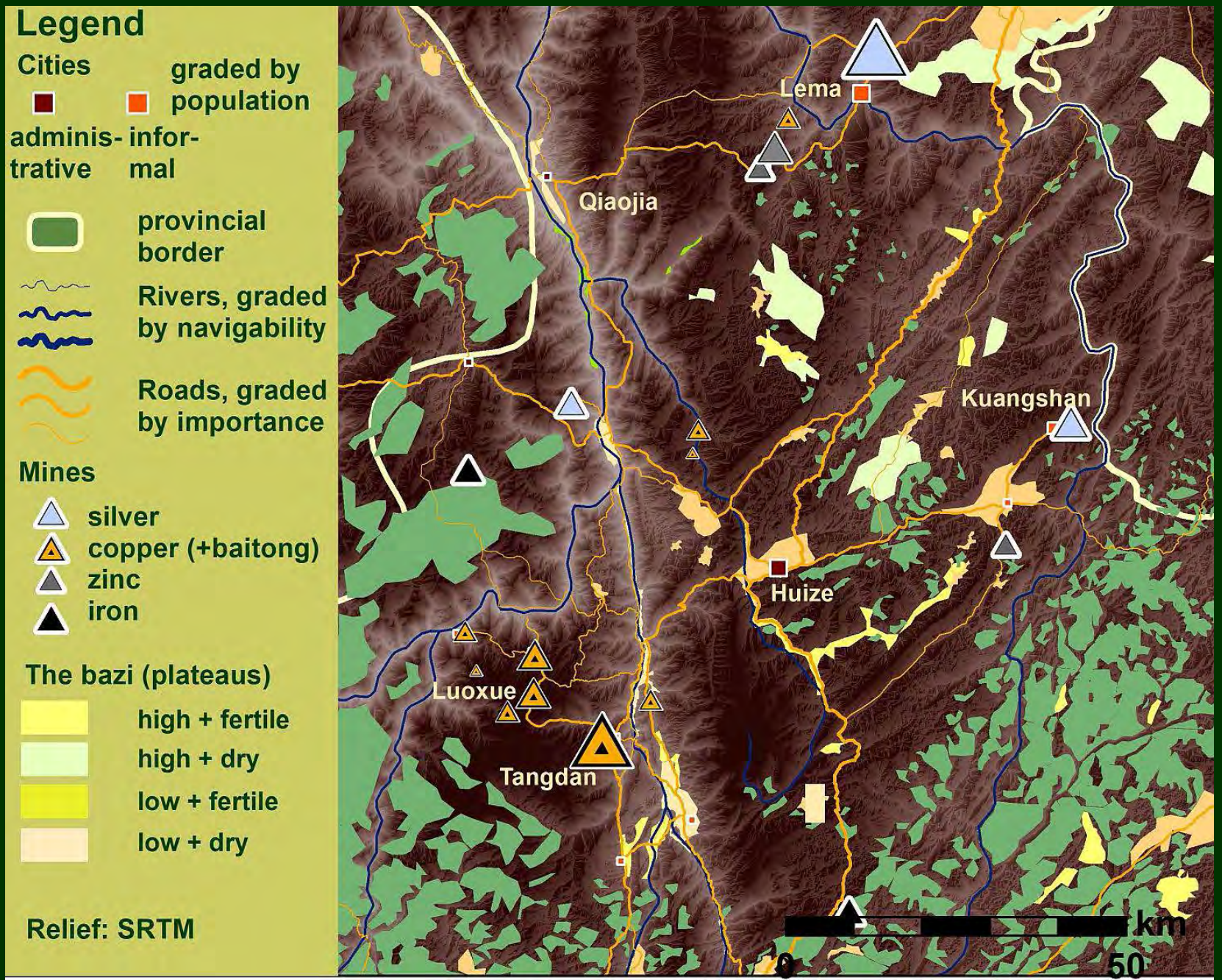
Forested areas in historic Dongchuan, ca 1970



滇东北银矿
清代文献记载与工业资料的出入

厂名	文献记载	现代开采情况
金沙厂	1742年开，铜银矿，1774之前报税达5000两，道光年间税额在1199两	无资料
乐马厂	1767年开，铜银矿，报税高达42,532两，1829年报4,674 ，1800年前称内地第一大银厂	鲁甸矿业公司50年代以来在开采，古炉渣回收量不大
矿山厂、角麟厂倭铅厂	1800年前后开，未定税额 18世纪中叶以来有锌产额，供东川钱局，约300吨	矿山冶炼厂50年代以来到1989年靠古炉渣回收，总量达1,33万吨！
棉花地厂	1794年开，税额达5106两，1800年前缺额	无资料
金牛厂	1798年开，税额为298两（1844年还报税）	无资料
铜厂坡厂	1794年开，税额达1000两	无资料
老彝良厂	道光年间的锌矿	

清代东川府地区城镇、矿山、交通路线、坪坝；加上1970年代树林面积



乐马厂



The Lema Mines in Ludian District

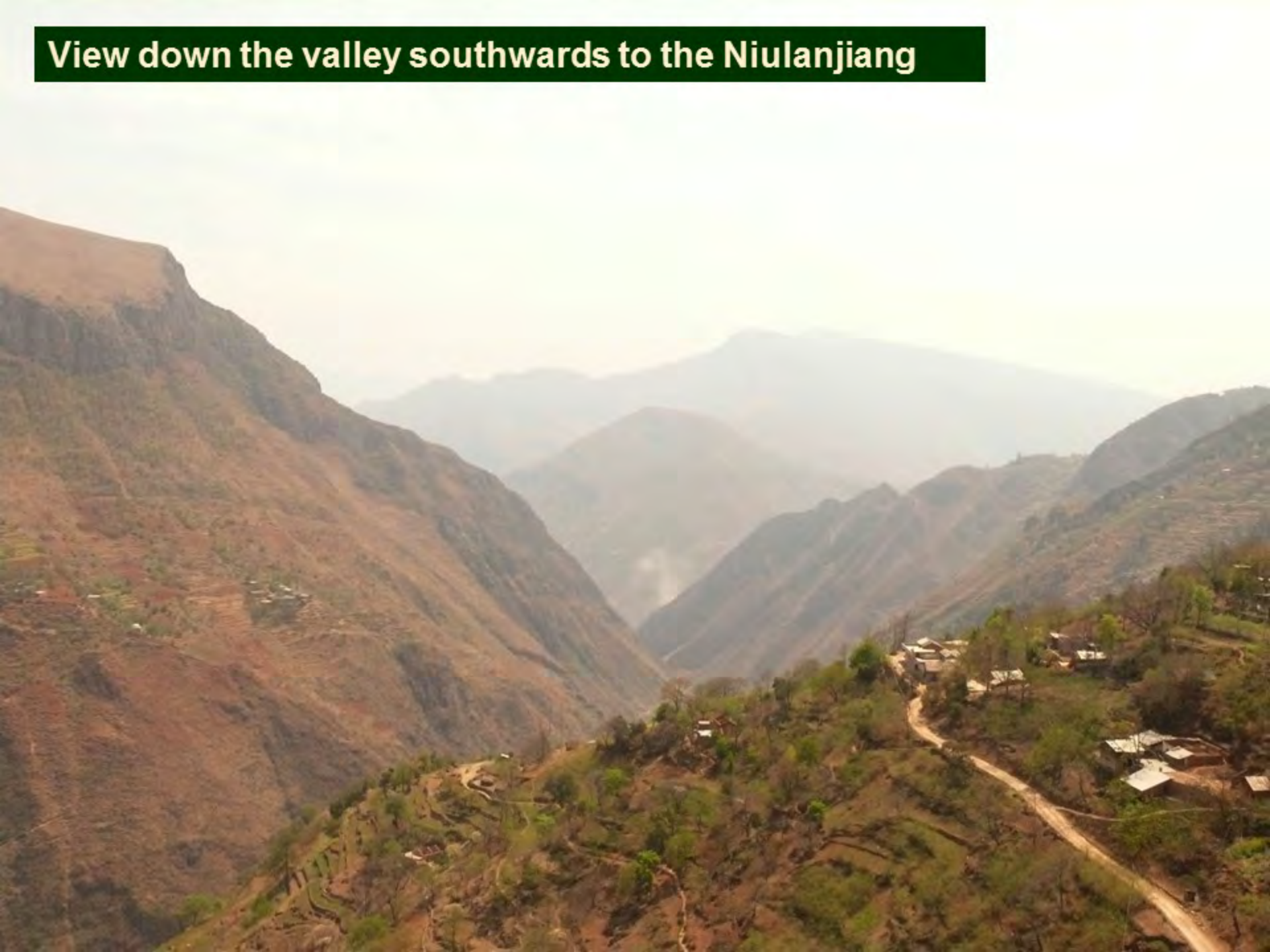
The larger river in the bottom corner is the Niulanjiang.





Right guardian lion, with detail of the bas-relief in the base

View down the valley southwards to the Niulanjiang



Lema silver mountain with a distinct rupture zone seen from the company compound at Litaishang.
Present workings are in the lower zone, existing old workings mostly in the middle zone up to the lower walls on the right of the rupture zone.



永善县金沙厂


GAOFENGXIANG
高峰乡
GUDEXIANG
谷德乡
LIANFENGZHEN
莲峰镇
XIANGLINGXIANG
向岭乡
LUOJUEXIANG
洛觉乡
WANHEXIANG
万和乡
HONGFENGXIANG
红峰乡
DEXIANG
德溪乡
LAOZHAIZIXIANG
老寨子乡
DAXINGZHEN
大兴镇
Shengou
Yimagou
Banchanggou
Mountain
Chagou
Yinhegou
Wooden
Shazhaigou
Sanguozhuang
三锅庄
MAOLINZHEN
Google
Imagery ©2017 DigitalGlobe, CNES / Airbus, Landsat / Copernicus, Map data ©2017

永善县金沙厂

烟房坡上的断层和古洞





永善县金沙厂



金沙厂村一下的山谷，
谷底选矿车间古地名为税房，
据当地人以前是炉渣最集中的
地方

永善县金沙厂



矿洞区（橙红线框）和炉渣区（粉红线框）的初步分布分析

会泽金牛厂



View onto Jinniu from the old road near the saddle (temple area)

会泽金牛厂

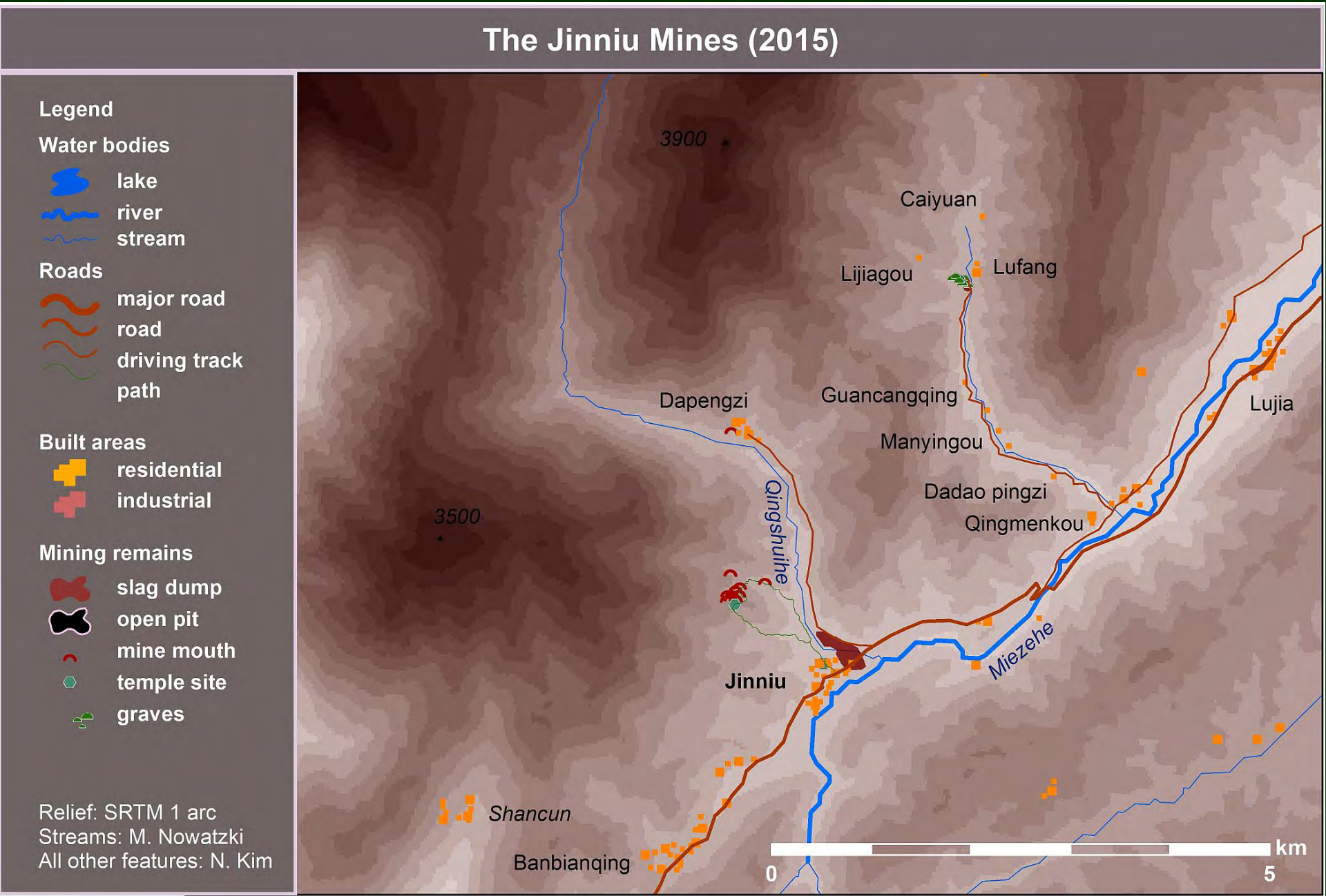
徐东海师傅
矿区的一个矿洞
矿区上端的庙宇遗址







会泽金牛厂


The Jinniu Mines (2015)
Legend
Water bodies
lake
river
stream
Roads
major road
road
driving track
path
Built areas
residential
industrial
Mining remains
slag dump
open pit
mine mouth
temple site
graves
Relief: SRTM 1 arc
Streams: M. Nowatzki
All other features: N. Kim
3900
3500
Caiyuan
Lijiagou
Lufang
Dapengzi
Guancangqing
Manyingou
Lujia
Dadao pingzi
Qingmenkou
Qingshuihe
Miezehe
Jinniu
Shancun
Banbianqing
0
5
km

会泽县者海镇矿山厂

The Kuangshan Mines



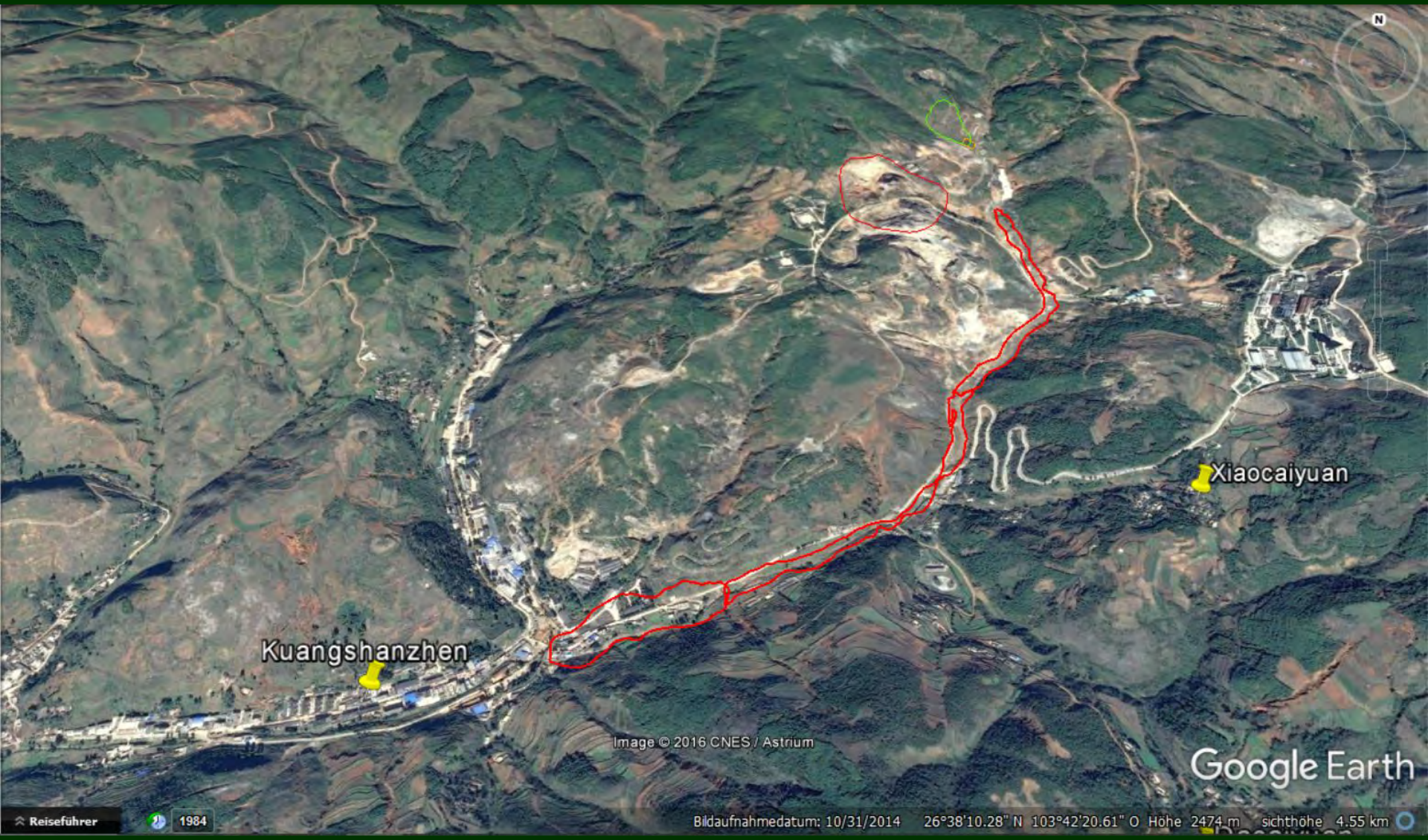




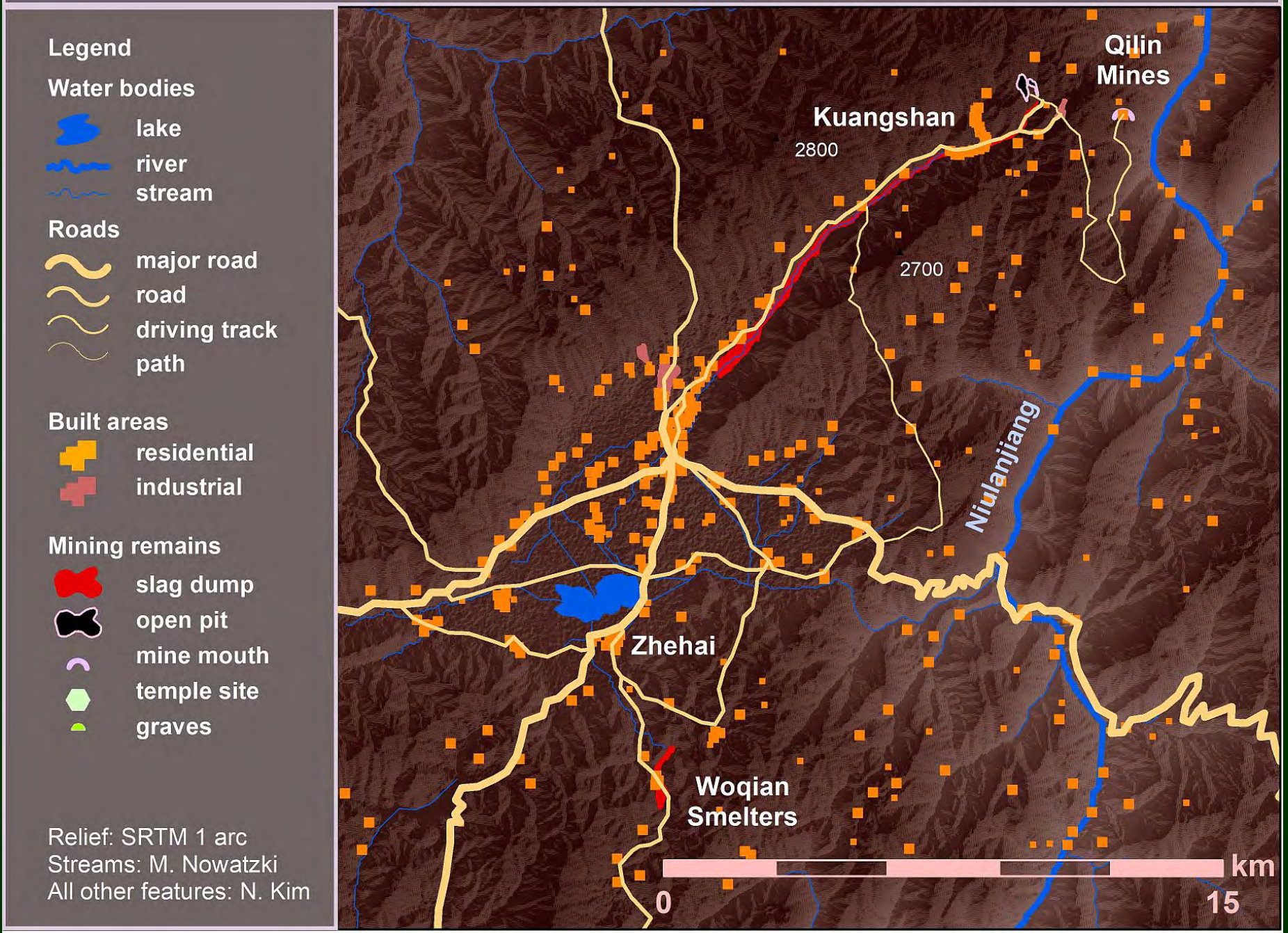
李晓岑教授在
倭铅厂冶炼遗址
上端炉渣层



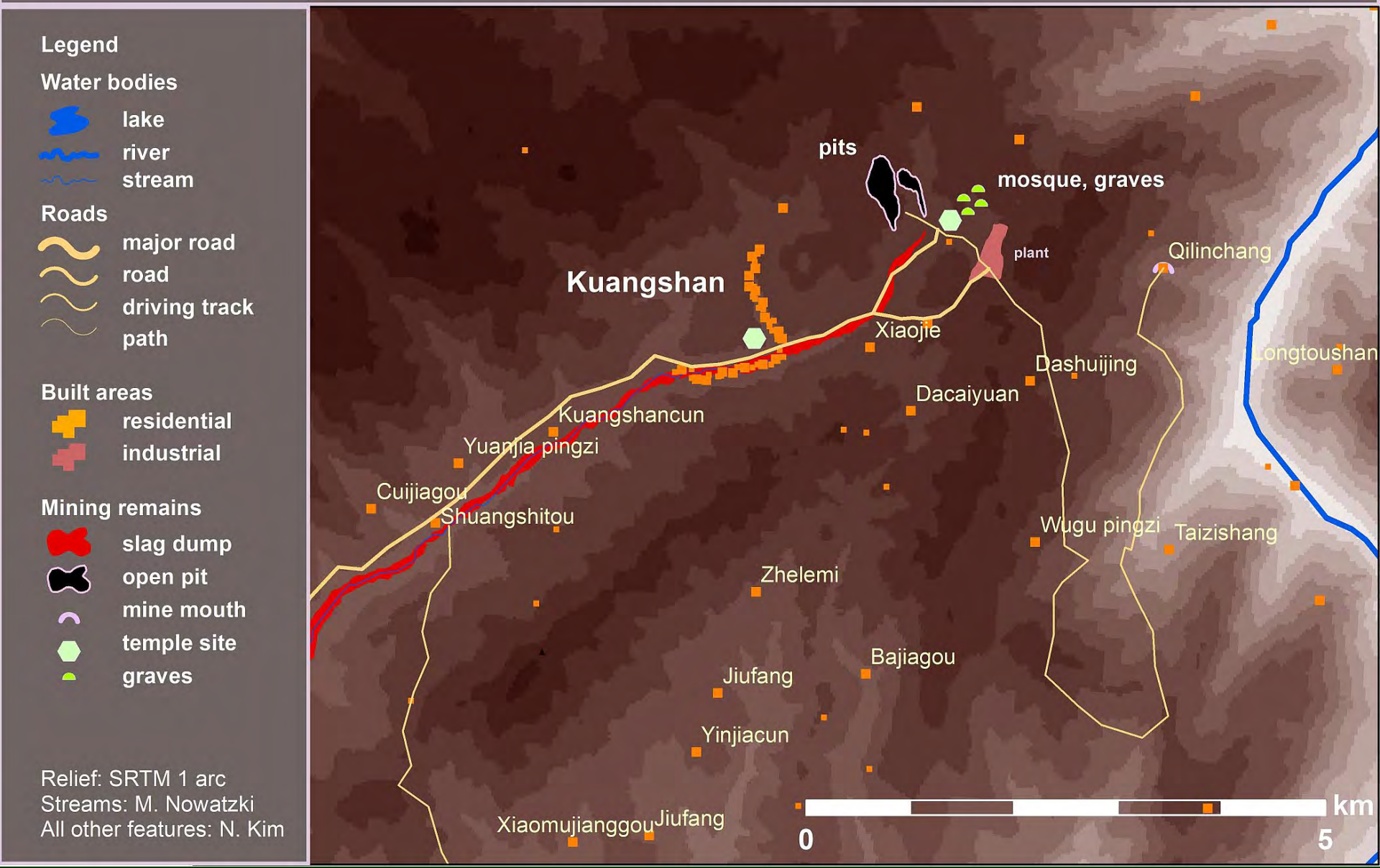
者海镇以上的炉渣沟


Xiaocaiyuan
Kuangshanzhen
Image © 2016 CNES / Astrium
Google Earth
Reiseführer
1984
Bildaufnahmedatum: 10/31/2014
26°38'10.28" N 103°42'20.61" O Höhe 2474 m sichthöhe 4.55 km

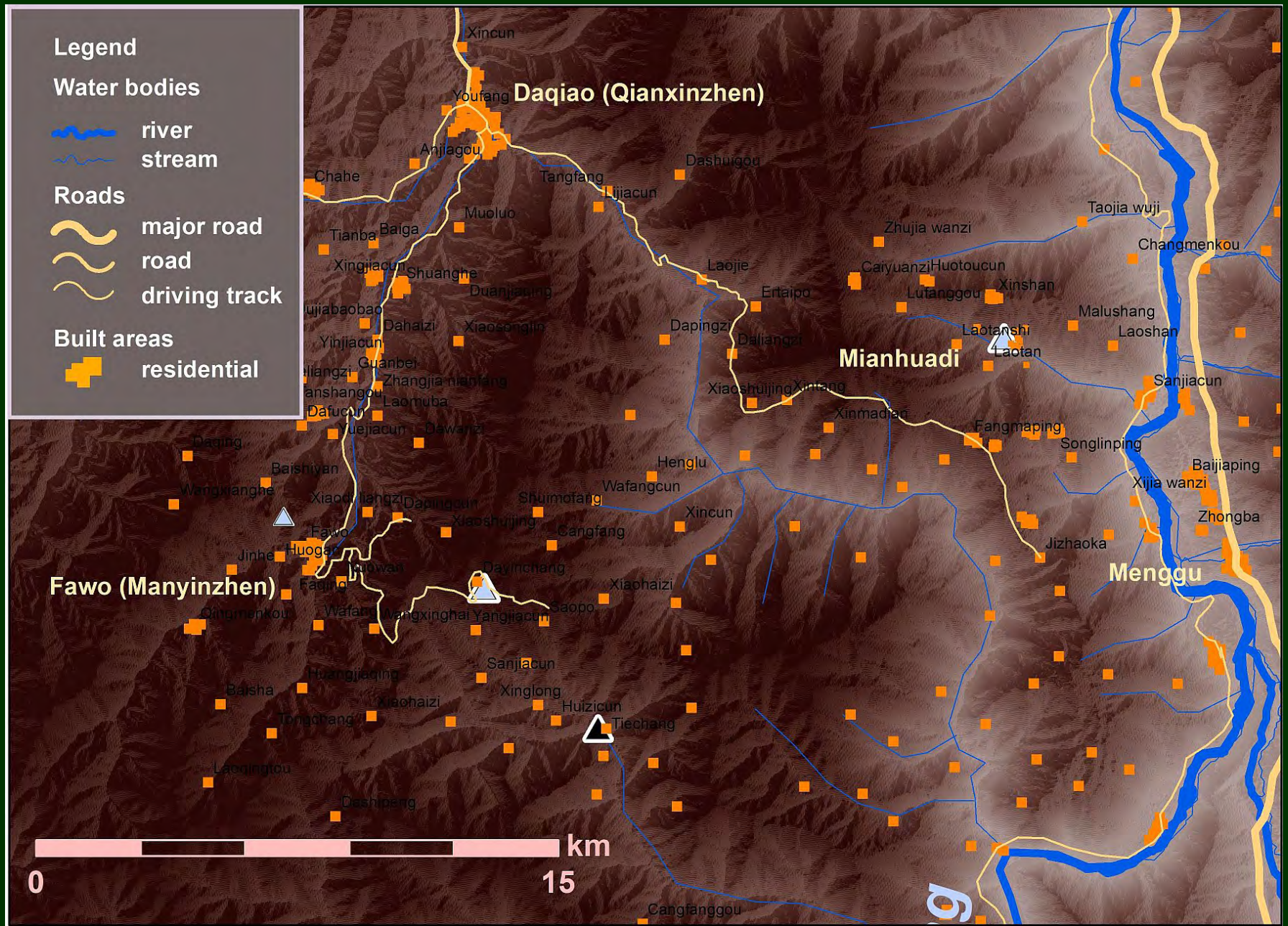
The Kuangshan Mines (2014)

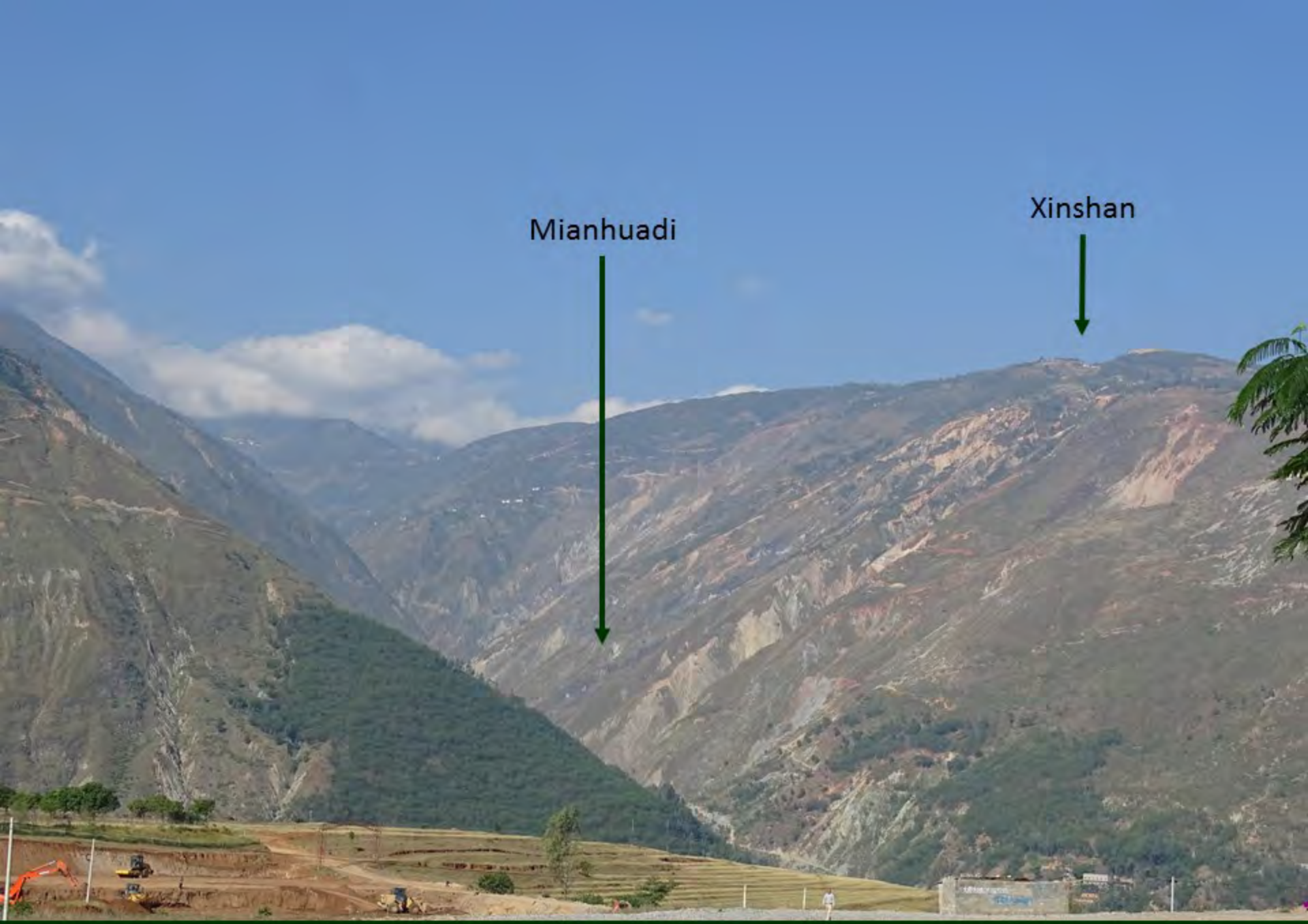


The Kuangshan Mines (2014)



会东（清代东川府江外飞地）的银矿





View into Mianhuadi valley from the east bank of the Jinshajiang


Mianhuadi village
From Laotanshi slope



Remains of the tunnel gate 嘈门 near the top end of Mianhuadi village



Mr. Xin pointing out remains







Old bricks and stone slabs

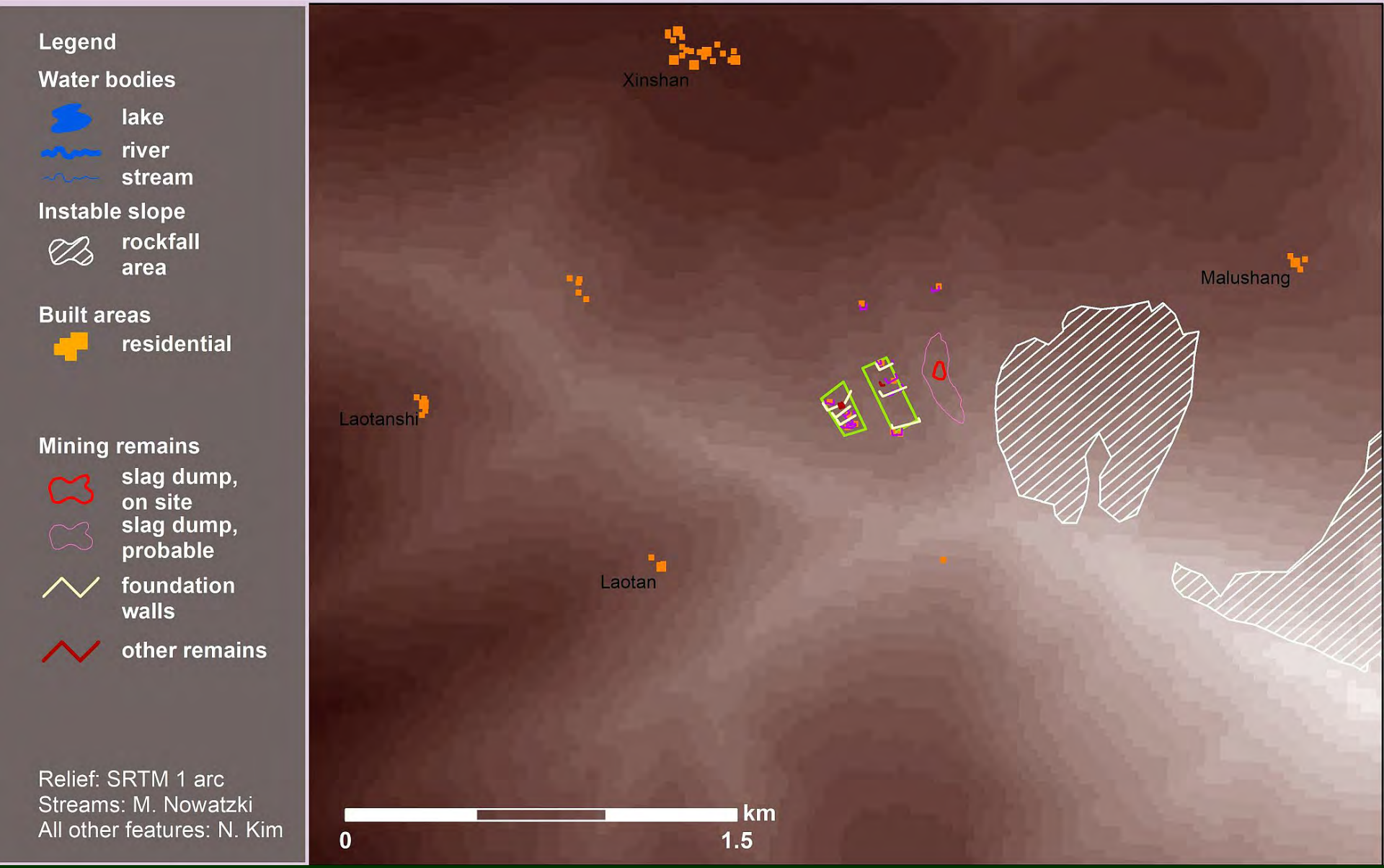


Mianhuadi village

Orange lines: foundation walls of temples

Small red area: slag dump, still on site large red area: probable max. slag dump

The Mianhuadi Mines (2015)



大银厂废村的露天矿



Satellite image (2015) showing the large-scale open pit mining at Dayinchang





Teacher Geng and the primary school

发窝街小学的耿武昌老师

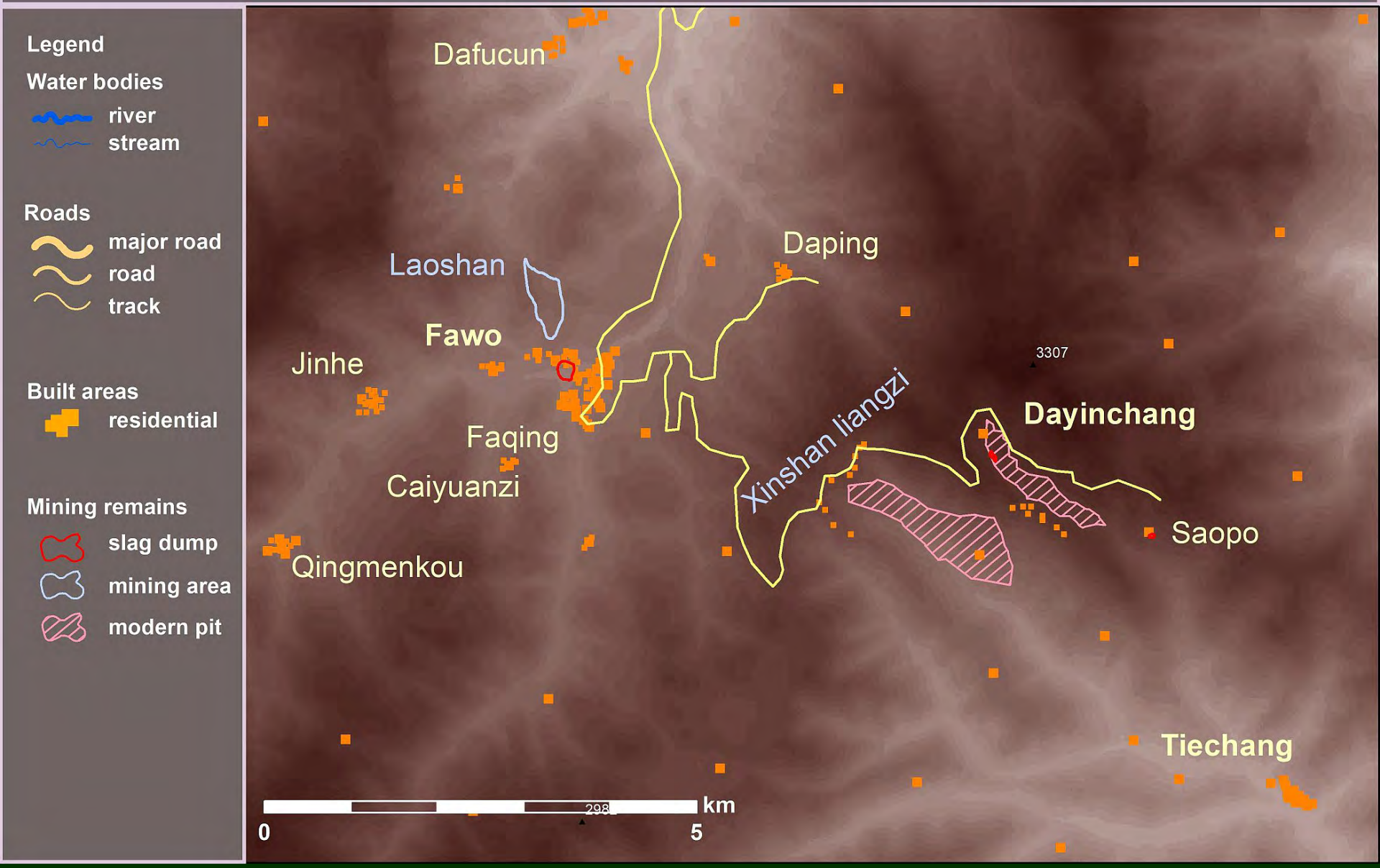


发窝街后山坡上的古矿区，地名称"老山"



大银厂露天矿上端尾矿堆—下小溪冲层中的古炉渣

The Dayinchang Mines (Mile?) (2017)



会东县蛮银沟镇大银厂 = 民代后期会川密勒山？

文献、工业资料和田野考察研究的初步结果



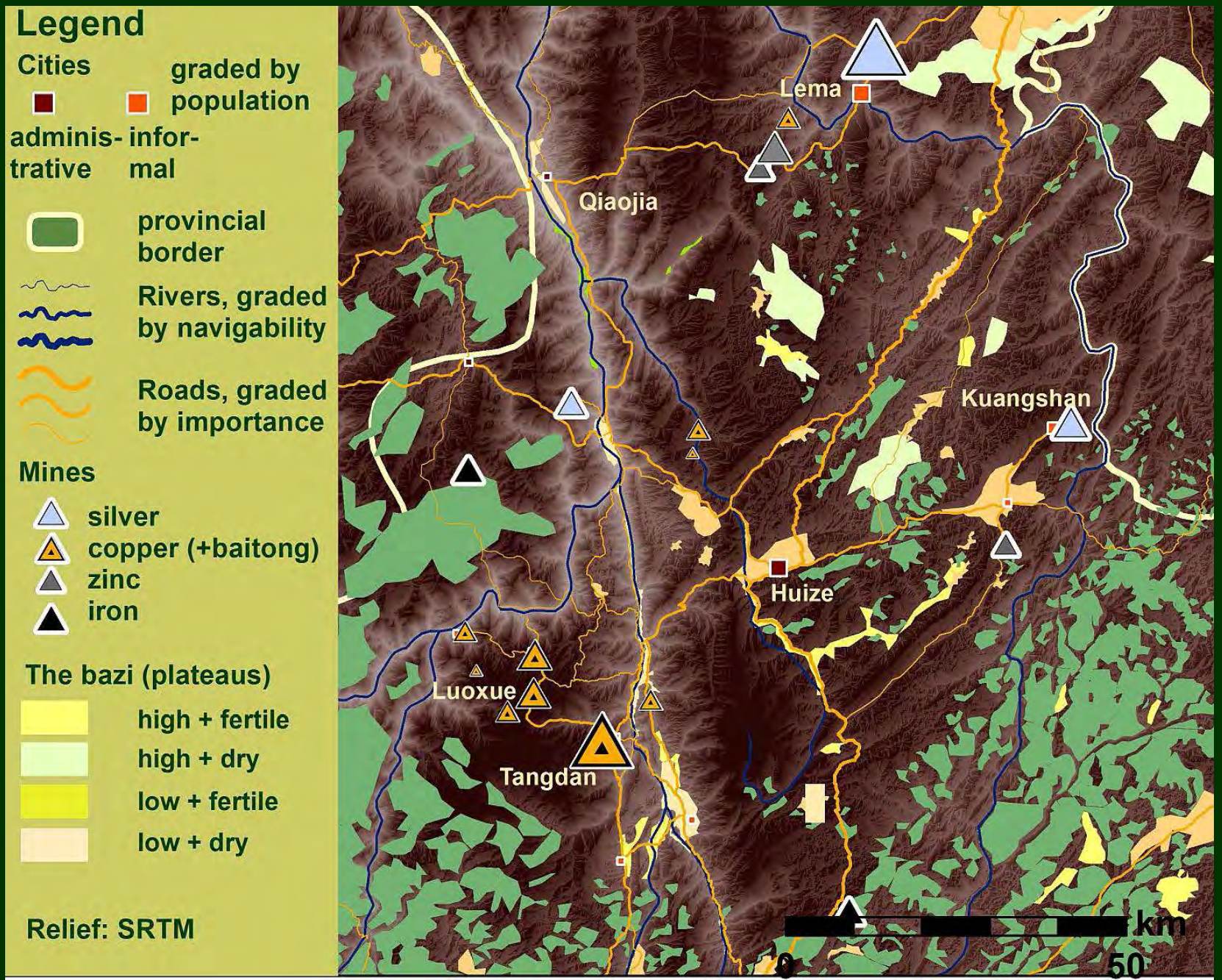
明代矿山文献基本无考，矿山地点的确定都很难，开采规模无从了解

为考古课题

清代文献和实地情况出入颇大，开采时代与规模根据史料判断不准，靠当地口传历史和遗迹以及近现代工业地质资料可以初步了解历史情况

进一步进行考古研究准确度会明显提高

清代东川府地区城镇、矿山、交通路线、坪坝；加上1970年代树林面积



谢谢！

35个进行过考察的矿山资料分析和考察报告请查项目网页

http://www.zo.uni-heidelberg.de/sinologie/research/epm/

The murkiness of mining: Specialists in silver metallurgy in the Far Southwest of late imperial China

Nanny Kim/金兰中
Heidelberg University

WORKSHOP "Unlocking Skills: Gaining and Performing Expertise in Pre-1911 China"
International Consortium for Research in the Humanities (IKGF)
Fate, Freedom and Prognostication
Strategies for Coping with the Future in East Asia and Europe
Erlangen, 21-22 November 2017

Silver mines in the Far Southwest of Ming and Qing China, 1450-1850

joint project with Yang Yuda 杨煜达 (Fudan), since 2011



with Yang Yuda and Vu Duong Luan at the Pia Oac, Northern Vietnam, Nov. 2017

We have a rich abundance of materials on mining and metallurgy in Europe since the late Middle Ages, but we know precious little about this human activity in late imperial China.



Agricola, 1556



《滇南矿产图略》1844年版本

Sources on the technologies and organizational structures of silver (and copper) mining

Chen Baipeng 陈百朋《龙泉志》, ca. 1200: silver smelting in S Zhejiang
Wang Shixing 王士性《廣誌繹》, ca. 1630: organization of silver mines in Yunnan
Song Yingxing 宋应星《天工开物》, 1637: metallurgy, mostly unlocated

3 pp.

Wu Qijun 吴其濬《滇南矿产图略》, 1844: mining and metallurgy in Yunnan
Huang Mengju 黄梦菊《滇南事实》, ca. 1843: silver mines of Huize, NE Yunnan

4 pp.

Emile Rocher, 1871: Mines and metallurgy of Gejiu, S Yunnan
Song Gengping 宋賡平, ca. 1900: Mines and metallurgy of Huili, W Sichuan
Emile Leclère , 1901: Mines and metallurgy of Gejiu
Yamaguchi Yoshikatsu 山口義勝, 1912: copper and silver mines of Dongchuan, NE Yunnan

5 pp.

The most Confucian attitude to mining 礦害

Ni Tui 倪蜕 (1668–1748), quoting
Chen Cha 陈察, in a report on his inspection of the Yunnan mines in 1511:

人睹其利，我睹其害。夫礦開則人聚，人聚則食廣。雲南有限之谷，其能飼此不耕之人乎！

Where others see profit, I see calamity.
When mines are opened, people congregate,
and where people congregate, they consume
food grown in a large area.
But Yunnan has only limited grain,
how can it feed these people who do not
till the land!



Slag dumps

Mingguang Mines, Tengchong, Western Yunnan



Silver separation hearths

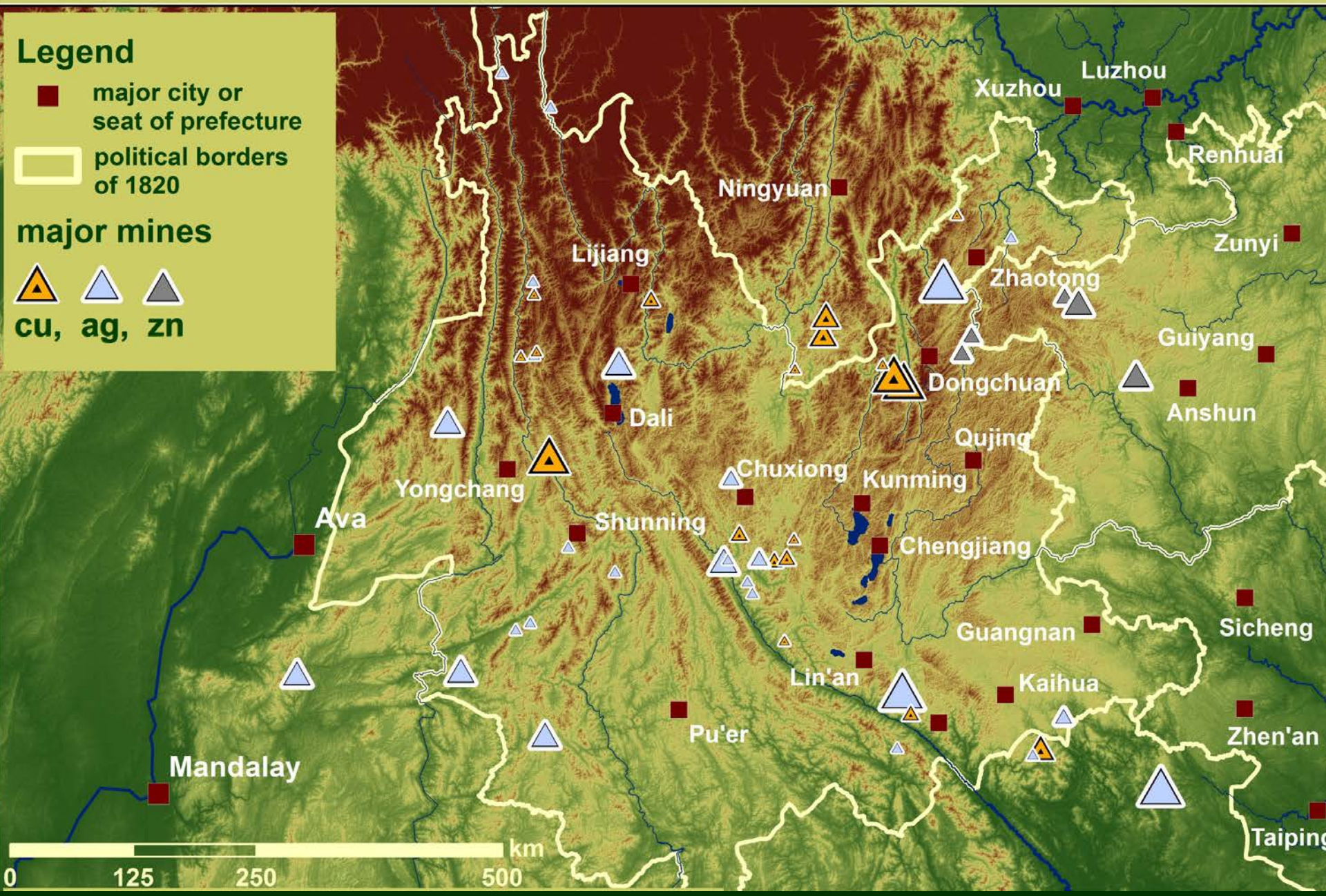




Shiyang Mines, Central Yunnan

photo Kim, 2011

Major located silver, copper and zinc mines, Ming and Qing periods



While at Tali [in 1881] we were waited upon by a deputation sent by a guild of silversmiths who were interested in a silver mine called Yung-pei mine, one of the largest in Western Yunnan. This mine is situated north of the Ting of that name, and east of Li-kiang, about some seven days' journey north of Tali. They brought a most elaborate plan of the shafts, or workings, of the mine, showing in different colours where trials had been made successfully and fruitlessly, and the main and side galleries. Their object was to obtain from us information how to guard against the dangerous gases which blew out their common oil lamps and made working impossible. We indicated the method employed in Europe for the purpose, but counselled their sending through Bamo and Rangoon to Calcutta, in order to get the necessary apparatuses and advice for rendering the working of the mines sage. The cost, trifling as it would be compared with the results to be obtained, and the fact that it was a departure from time-honoured custom, made our proposal unpalatable.

(Archibald Colquhoun. *Across Chryse: Being the narrative of a journey of exploration through the South China border lands fromCanton to Mandalay*. London: Sampson Low, Marston & Searle, 1883, 259-60)

Core information by Colquhoun:

Date: 1881

Location: Yongbei ting 永北廳, 7 days' travel north of Dali

Operators of the mines : Guild of silversmiths(?)

Technical information: Mining operators have a system of mapping the underground workings

⇒ Workings must have been extensive

⇒ Technical specialists existed



Sources on the Mines of Yongbei 1

Yunnan tongzhi provincial gazetteer (1835), list of silver mines and their tax quotas: ---

Diannan kuangchan tulue 《滇南矿产图略》 (1844), 卷下，104-5:
Dongshang Mines 東昇廠， branch mine of Debaoping 得寶坪 Copper Mine since 1835. Opened 1831. Taxation: 13.5% of silver output.

Yongbei tingzhi《永北厅志》(1901), 279:
Mines opened by miners and smelterers 嘈尖爐户 with their own capital 自本采辦, permit by magistrate in 1831.
At first no tax quota 定额, transferred as reported 隨抽報解.

When ores were at their richest, 5-6 "ponds" were roasted per day, each yielding 1.85-2.22 kg of silver, never under 0.37 kg.
Subsequently outputs fell, both in the amounts of ore extracted and in the silver obtained.

當礦砂豐旺時，每日煎礦五六池，每池出銀伍陸拾兩，至少不下拾兩。其後開采年久，出礦渐少，煎礦数池銀數均就减色。

Sources on the Mines of Yongbei 2

Xiong Jiayan 熊家彦《虑患说》 in *Yongbei tingzhi*《永北厅志》 (1901), 480-481, dating to the 1850s:

From every part Han came and settled among the Yi, ploughing and digging for them as what is called adjunct settlers, a system of exploitation. The upheaval of 1830 was because Han encroached on Yi fields and exploited the Yi. At the time, the Dongsheng mines were worked, and vagrants heard the news and streamed in as if they were ants occupying the bees nest. The local lord was unable to restrain them therefore a supervisor was stationed to prevent crime.

...

some were criminals fleeing from justice, some are impoverished seeking food far and wide, some are vagrants without regular occupation, some are bandits, ...

... 各處漢民遷移與夷民雜處，相為耕鑿，名曰寄住户，專事盤剝，此道光元年之變，因爲漢占夷地，盤剝夷民也。迨至東昇廠開采，流民聞風四入，蟻聚蜂屯，土司不能彈壓，故移駐經理守備，防防奸宄也。

生聚日多，案牘日煩，鬼蜮百出，莫可穷究，审訊之下，或因本藉犯事而來逋逃，或緣窮困覓食而遠出，或為無業之游民，或為窩聚之匪党，撞騙招搖，呼朋引類，目無法紀，永北幾為盜賊薮矣。

Sources on the Mines of Yongbei 3

He Zongzhang 賀宗章 *Huanjing tan* 《幻景談》(undated, ca. 1900), reprinted in *Yunnan Shiliao congkan*《云南史料丛刊》, 卷 12, p. 142:

My friend Liu Chunting was in charge of the silver mines of Yongbei, which in the past were huge. The Yongbei magistrate received a customary income of over 1.85 kg per day, on a regular basis.
The mine entrance and the galleries are still in place, and the houses and structures still stand. Old men of 80 to 90 in the vicinity, who worked as miners when young, can point out everything and still know the underground paths.

如永北銀廠，吾友劉春霆云曾辦過，x昔規模闊大，永北同知，日進陋規大銀一錠五十餘兩，以為常。
礦門苗路如昔，廠屋器物犹存，附近有數老民，年八九十，壯時曾充礦丁，尚能逐一指點，仍循原路掘入。...

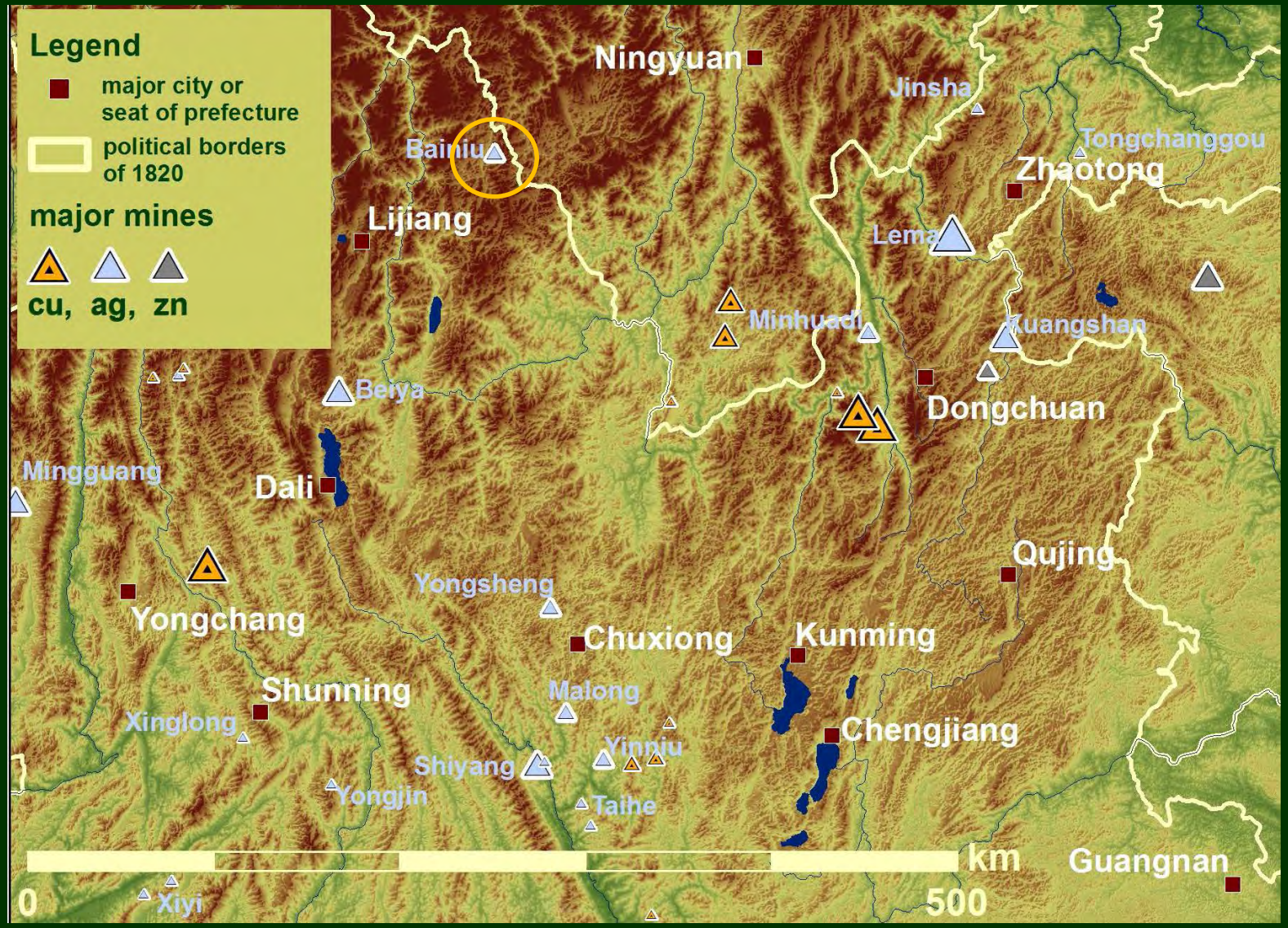
Sources on the Mines of Yongbei 3

He Zongzhang 賀宗章 Huanjing tan 《》(undated, ca. 1900, reprinted in Yunnan Shiliao congkan《云南史料丛刊》卷12, p. 142:

... The story goes that the mines were richly productive when operations ceased. One day, hundreds and thousands of monkeys came down from the opposite ridge, screaming and yelling. The miners came out of each gallery to watch, several thousand of the, and as they were gazing in astonishment, the mountain collapsed, and all galleries and adits were buried. **When the names were called from the rolls**, over 700 men were found to have lost their lives, and operations ceased immediately. The miners who were trapped, were sometimes discovered by later workings, they looked alive, but rotted as soon as they were explosed to fresh air.

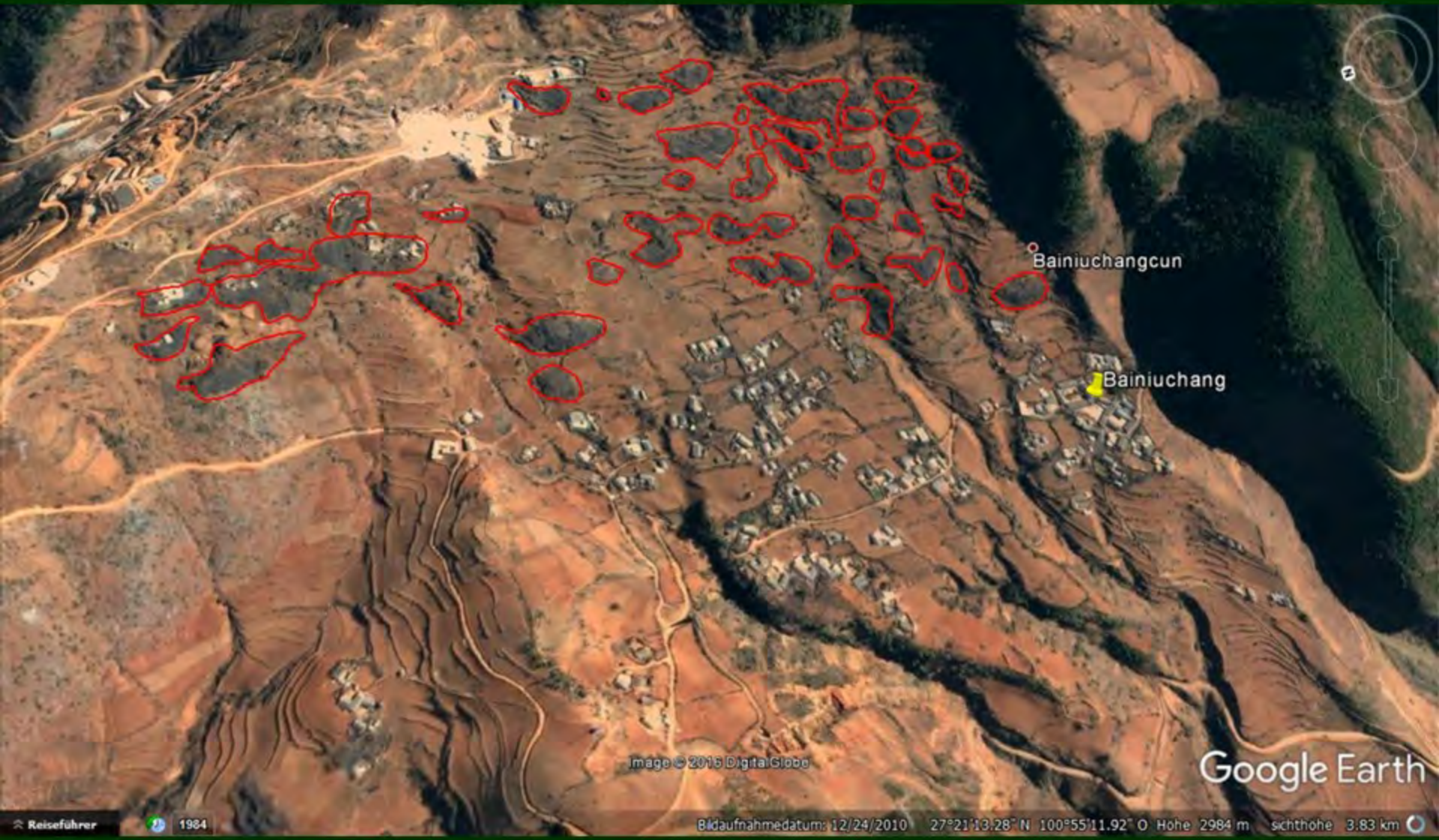
聞停辦時苗 x 旺，一日，忽聞對山之上，有猿猴千百成群，呼号奔逐負，礦砂丁出入各洞，众至數千，互相驚異，紛紛出洞瞻望，山忽坐崩，各洞門路，概為土石堆壓，**按名点驗**，尚有七百餘人未出，立即停辦。在内砂丁，其後開窿時，間一遇之，面目如生，見風則腐云。

The Bainiu Mines in Ninglang District
白牛厰（東昇厰），宁蒗县





View of the village and the slope covered in slag dumps, 2011



46 slag dumps visible in satellite image of 2010

Mines in operation by 1830, large-scale exploitation ca. 1830-1850

Major mining accident probable before 1850: Name rolls reflect organization and written documentation

Intensive exploitation ceased with civil wars of 1850s

Colquhoun, 1881: most elaborate plan of the workings of the mine, showing in different colours where trials had been made successfully and fruitlessly, and the main and side galleries.

Map of the mines highly probably was common practice in large-scale exploitations, to document existing workings for safety and to settle conflicts between adits run by different groups or companies.

Large silver mines with thousands of workers and organized as cooperatives (the brotherhood system) are safely documented for Yunnan by the late Ming (Wang Shixing). The scale and the duration of successful exploitation are indirect evidence of technical specialists, accountants, and managerial entrepreneurs.


Thank you!

Silver mines in the Far Southwest, 1400 to 1850: Historical geography and landscape change

Nanny Kim/金兰中
Heidelberg University

Silver Mines in the Southwest



since 2009: joint research with 杨煜达
German Research Foundation project, 2015–2018

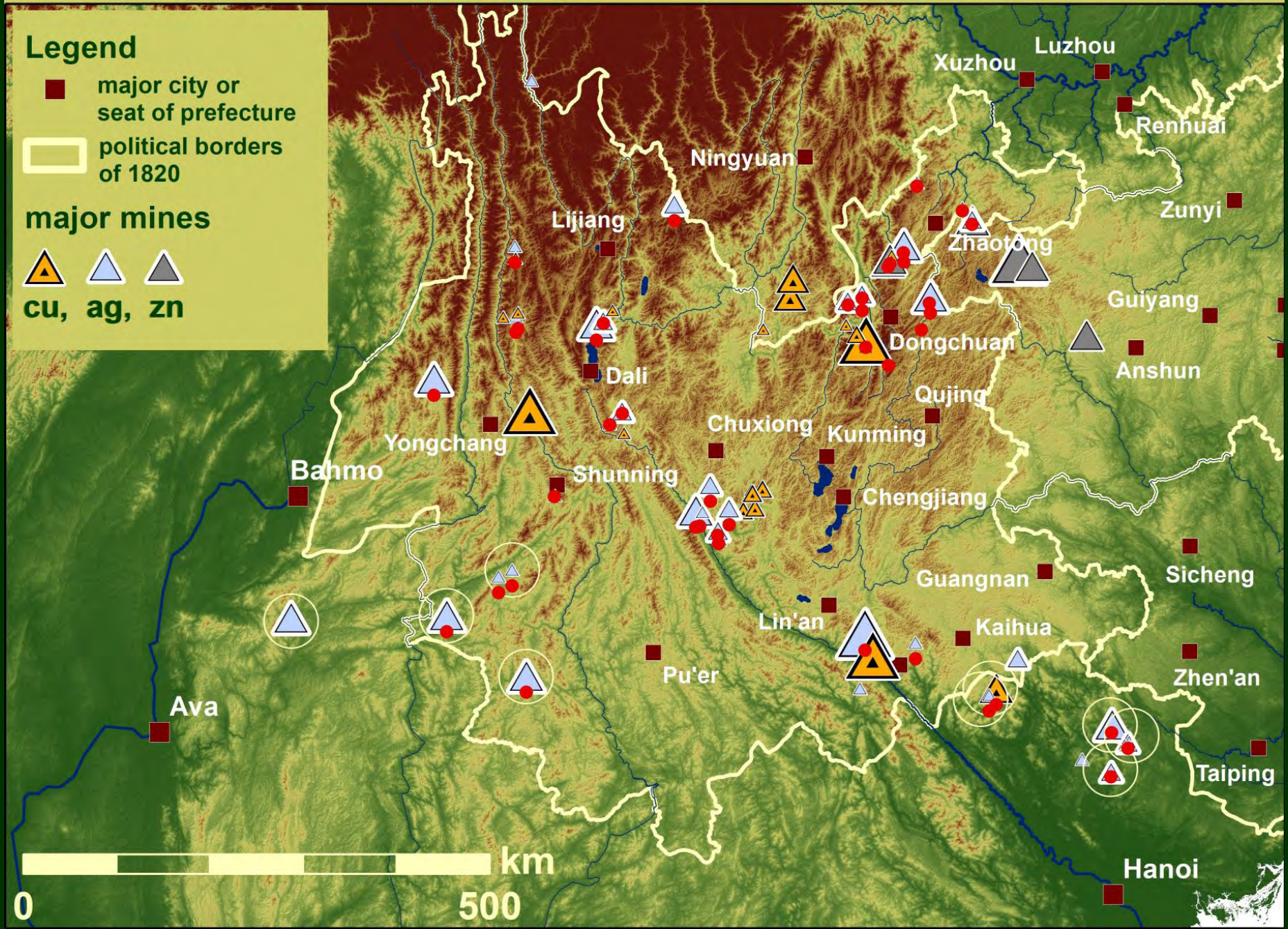
Nanny's research areas in the project:

- historical geography using GIS
- environmental history

Topics today:

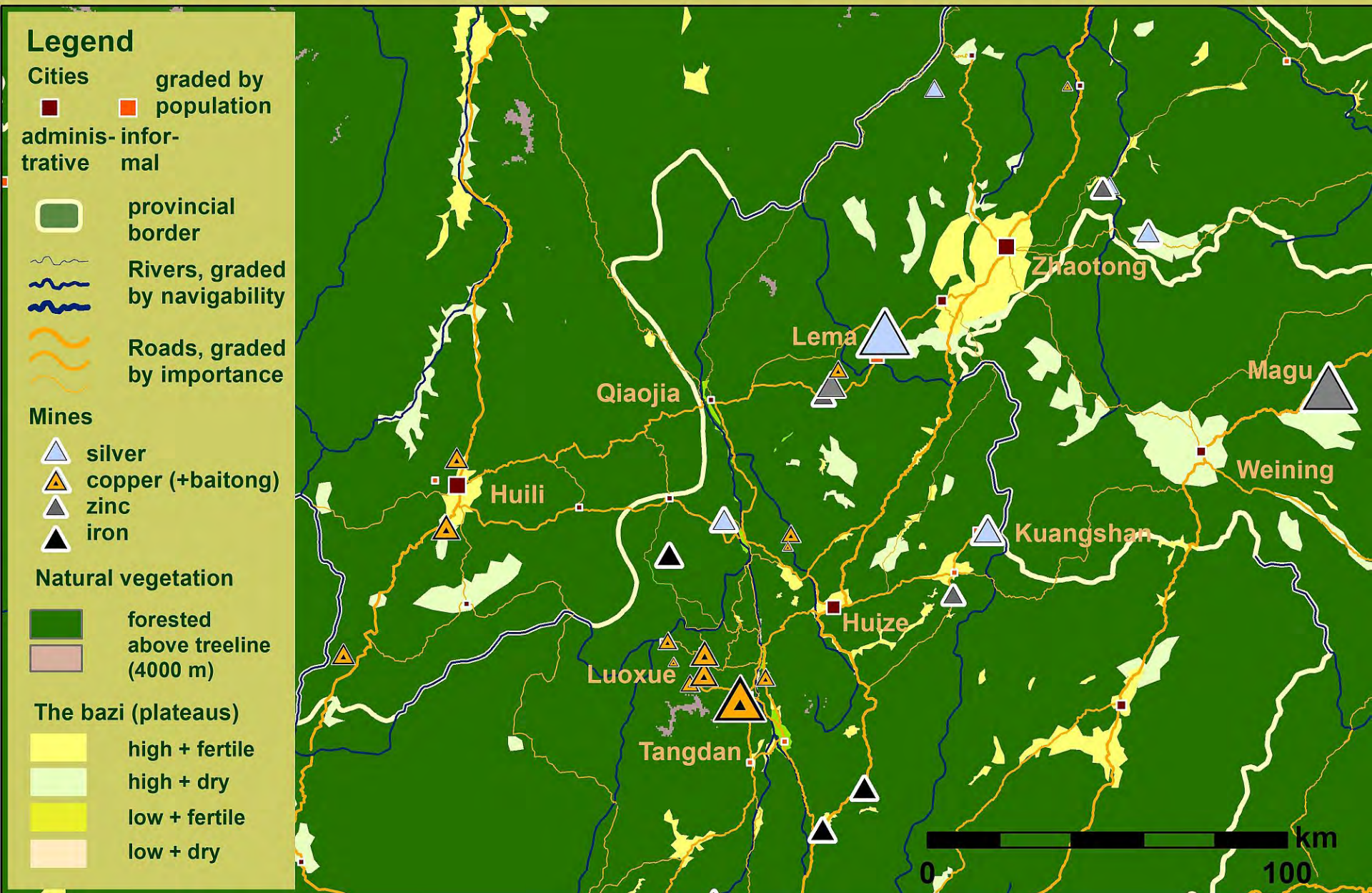
1. How mines change the human geography of the Southwest
   矿山分布与西南人文地理的新认识
2. Finding mines in and around Qing period Dongchuan, assessing their scope and their impact on landscapes
   矿山的寻，开采规模的分析和矿镇与周围环境的关系——以清代东川府地区为中心
3. GIS modelling of the forest consumption caused by mining
   用GIS模型分析大矿对森林的消耗

Major located silver, copper and zinc mines, Ming and Qing periods

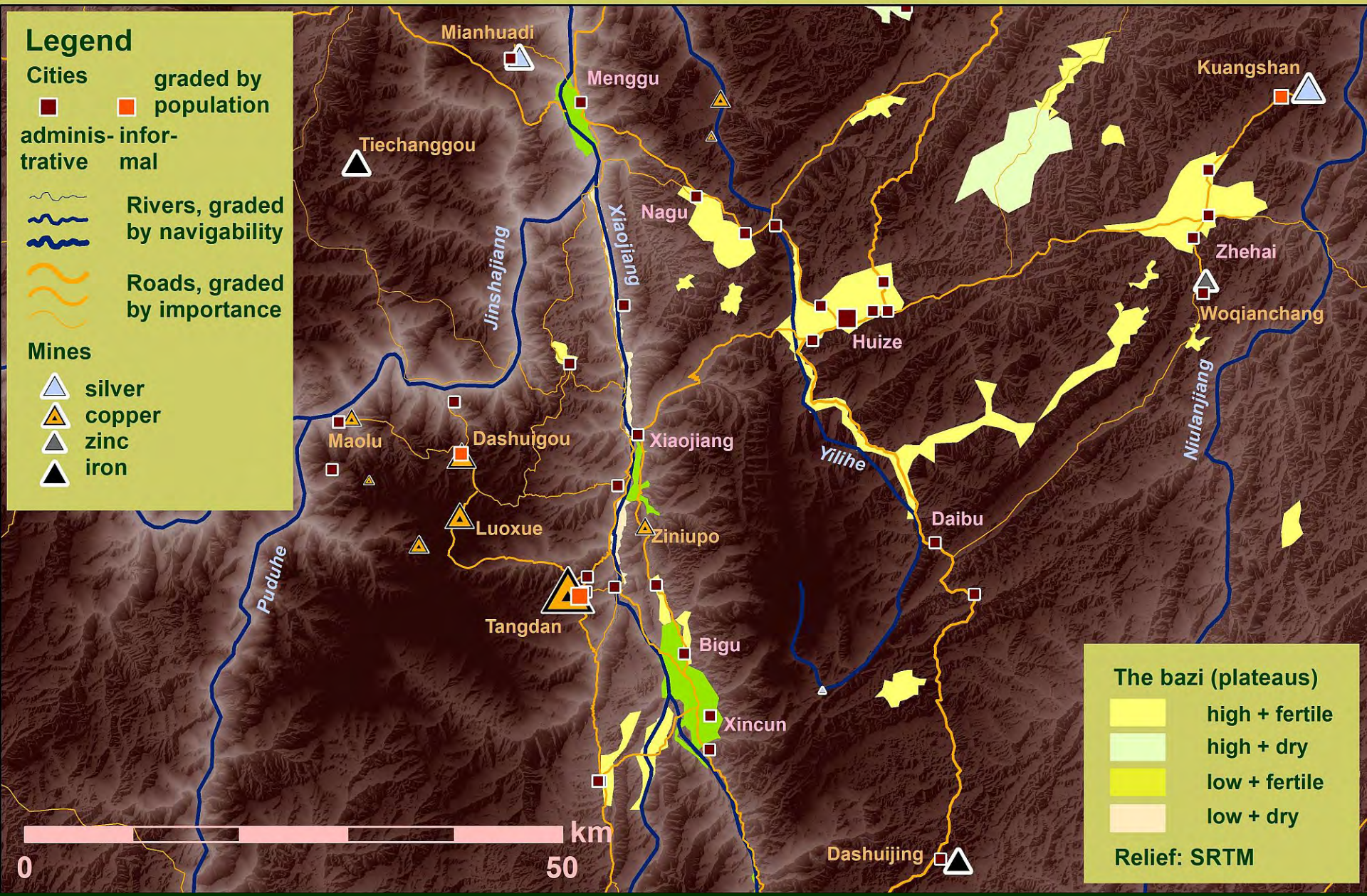


2 滇东北的铜银锌铁矿 Mines in northeastern Yunnan

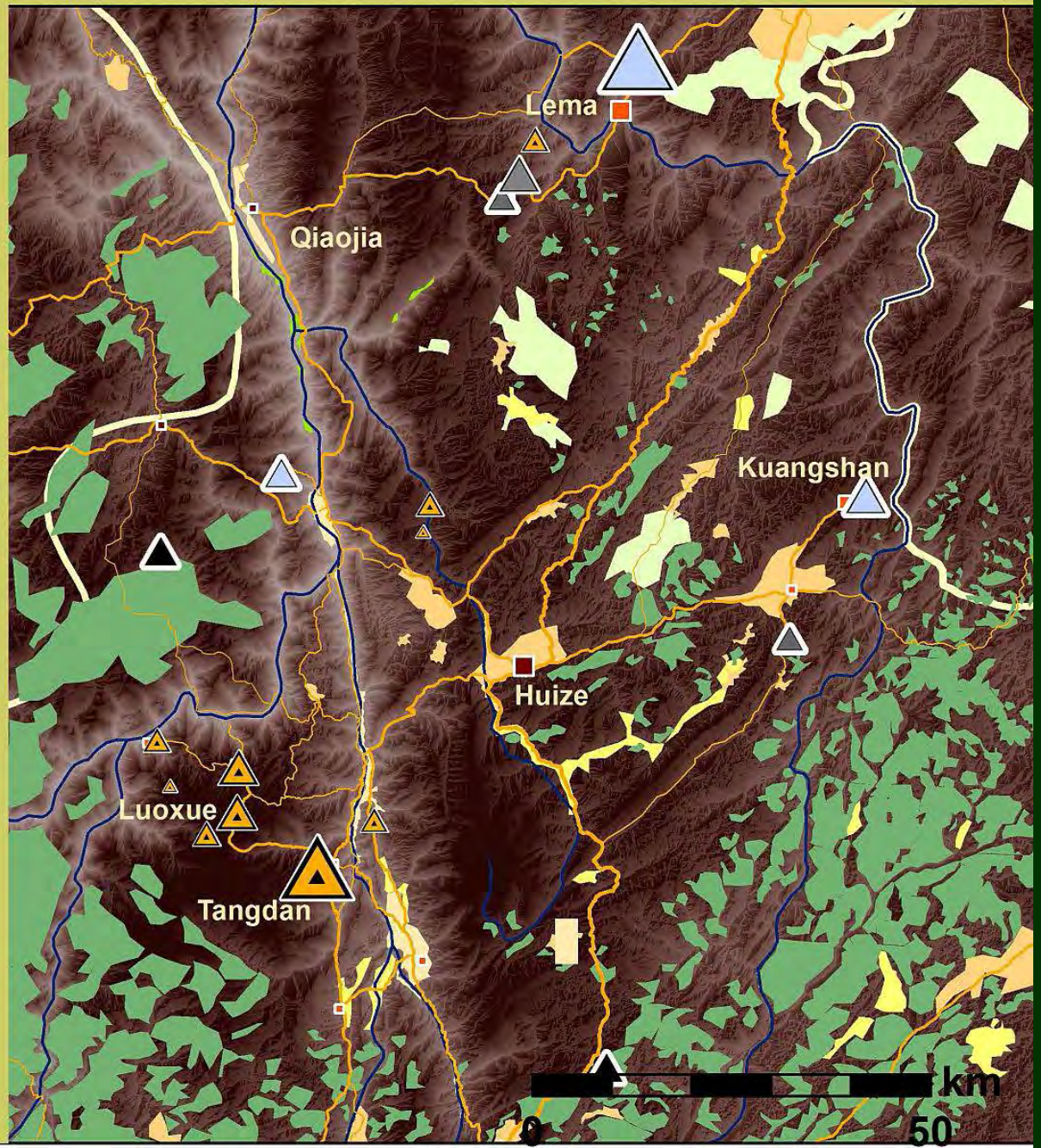
The area of Dongchuan, Huili, Zhaotong and Weining, ca 1800



The area of Dongchuan, Huili, Zhaotong and Weining, ca 1800



Forested areas in historic Dongchuan, ca 1970





The Lema and the Kuangshan Mines

滇东北两大银矿
鲁甸乐马银矿和会泽矿山银矿

The mining mountain at the Lema Mines
乐马银矿老君山



Historic mining area at Kuangshan
矿山厂古开采区

会泽县者海镇矿山厂 The Kuangshan Mines



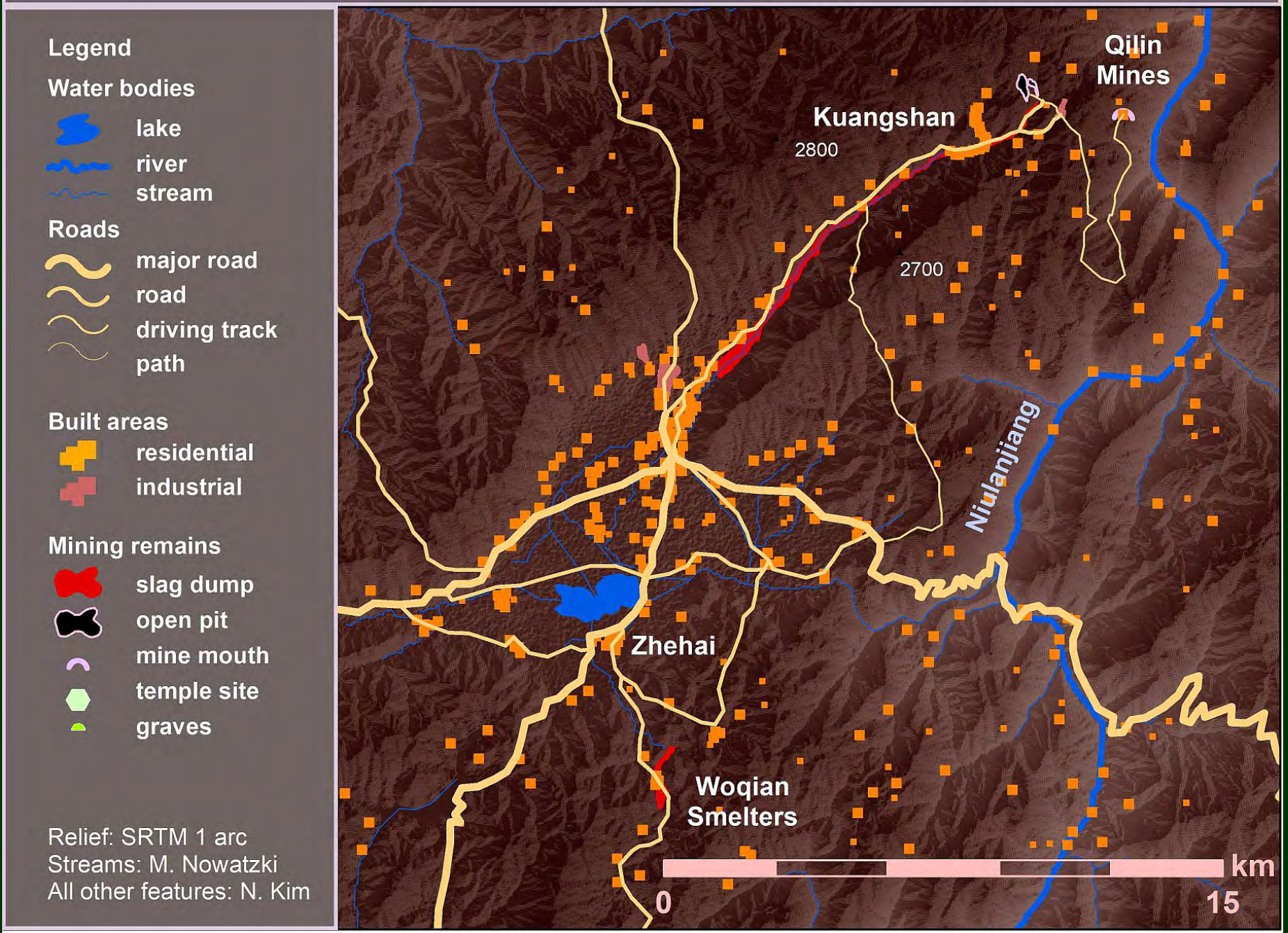




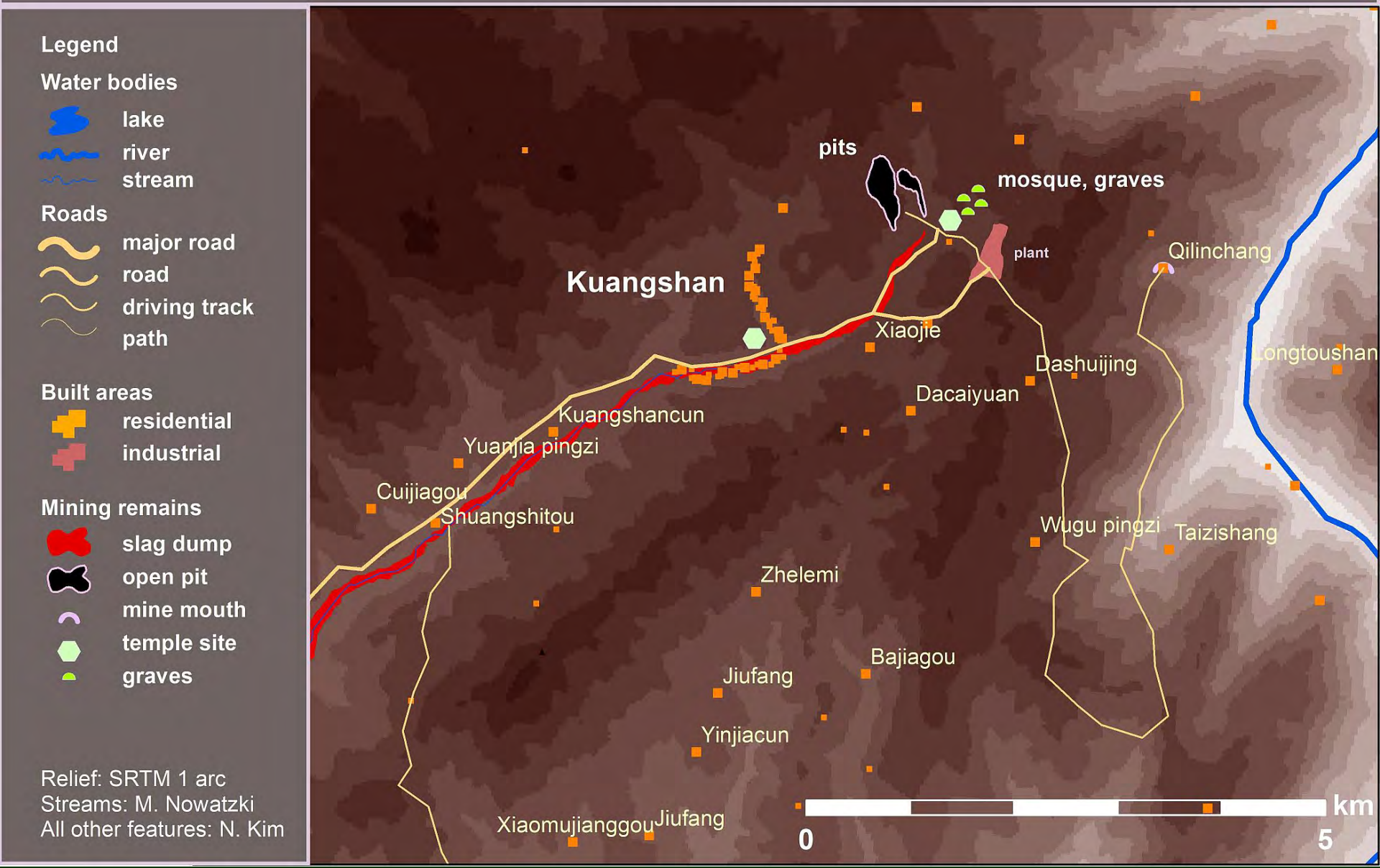




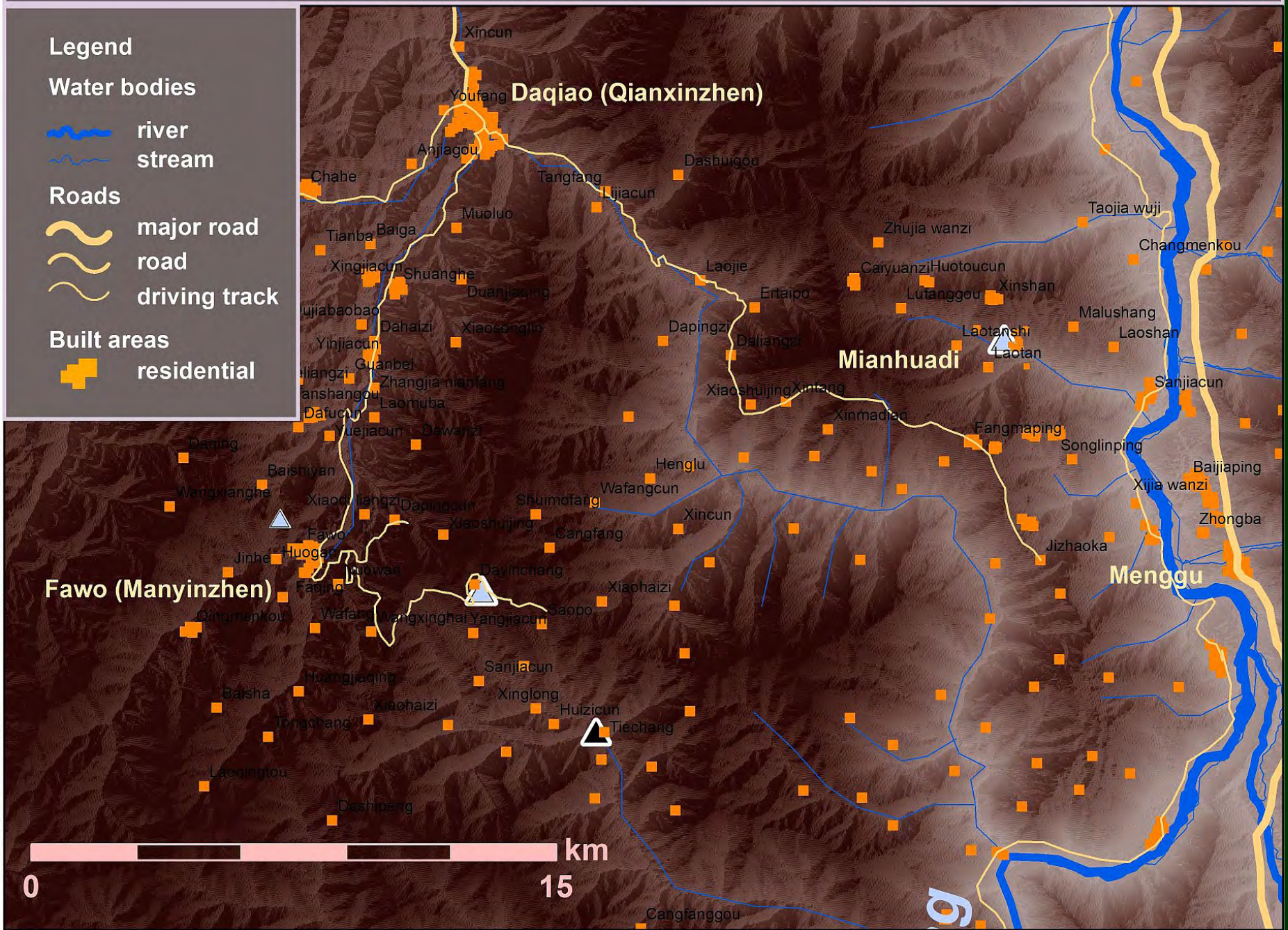
The Kuangshan Mines (2014)

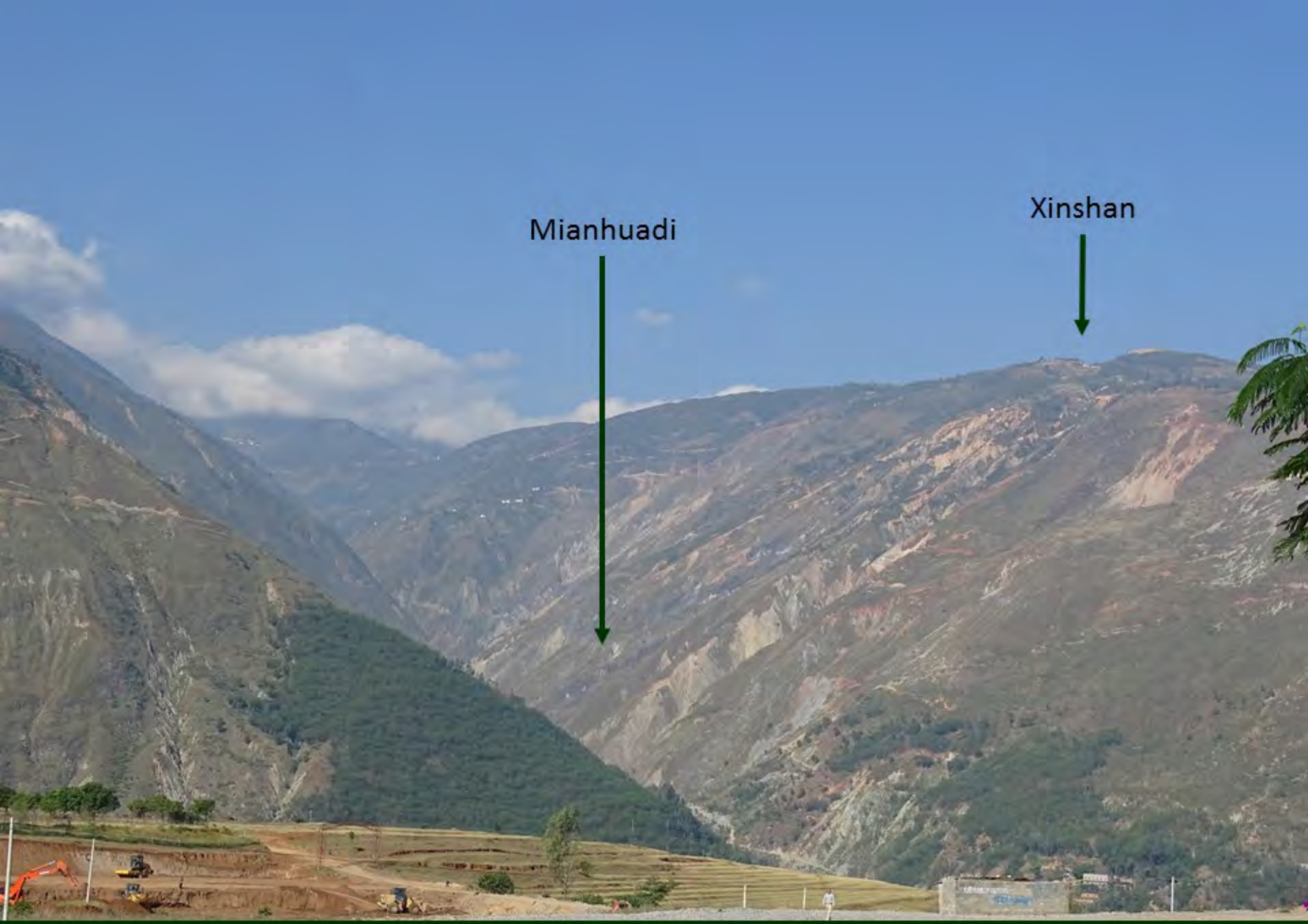


The Kuangshan Mines (2014)



The Mines of eastern Huidong





View into Mianhuadi valley from the east bank of the Jinshajiang


Mianhuadi village
From Laotanshi slope



Remains of the tunnel gate 嘈门 near the top end of Mianhuadi village



Mr. Xin pointing out remains







Old bricks and stone slabs

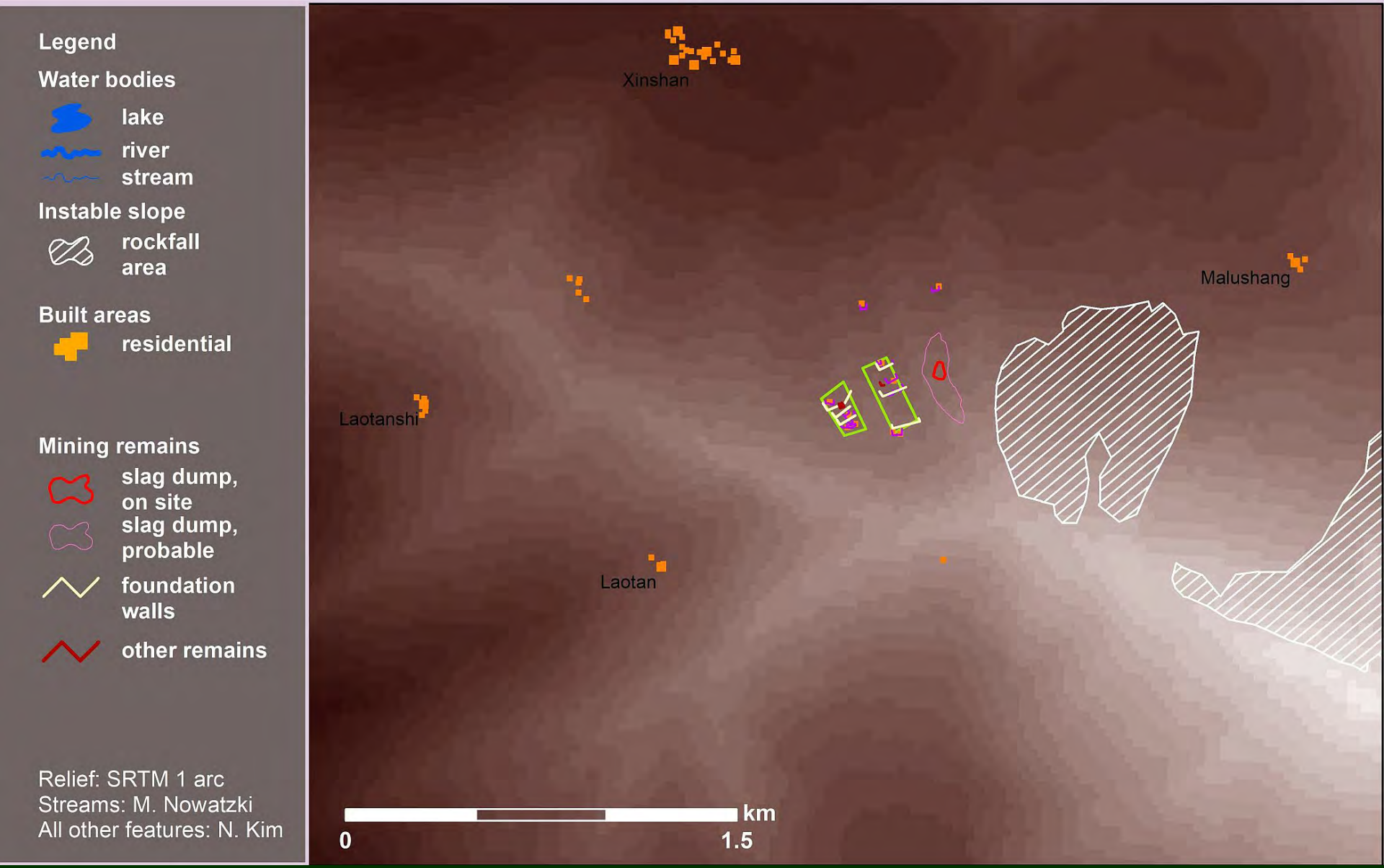


Mianhuadi village

Orange lines: foundation walls of temples

Small red area: slag dump, still on site large red area: probable max. slag dump

The Mianhuadi Mines (2015)



会东县蛮银沟镇大银厂 Dayinchang



Satellite image (2015) showing the large-scale open pit mining at Dayinchang





Teacher Geng and the primary school

发窝街小学的耿武昌老师

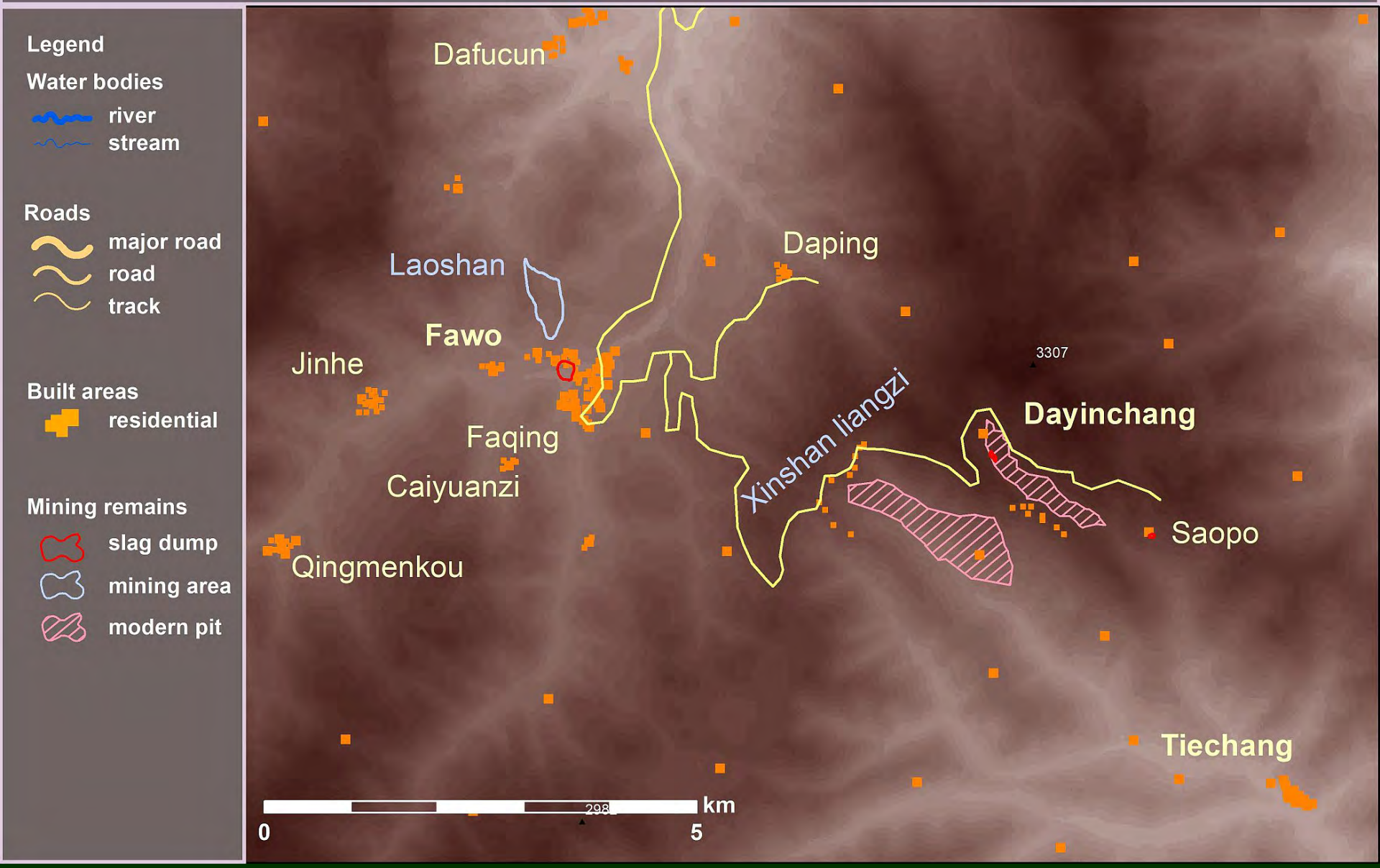


The Laoshan mining area, dug up with heavy machinery for lead oxide



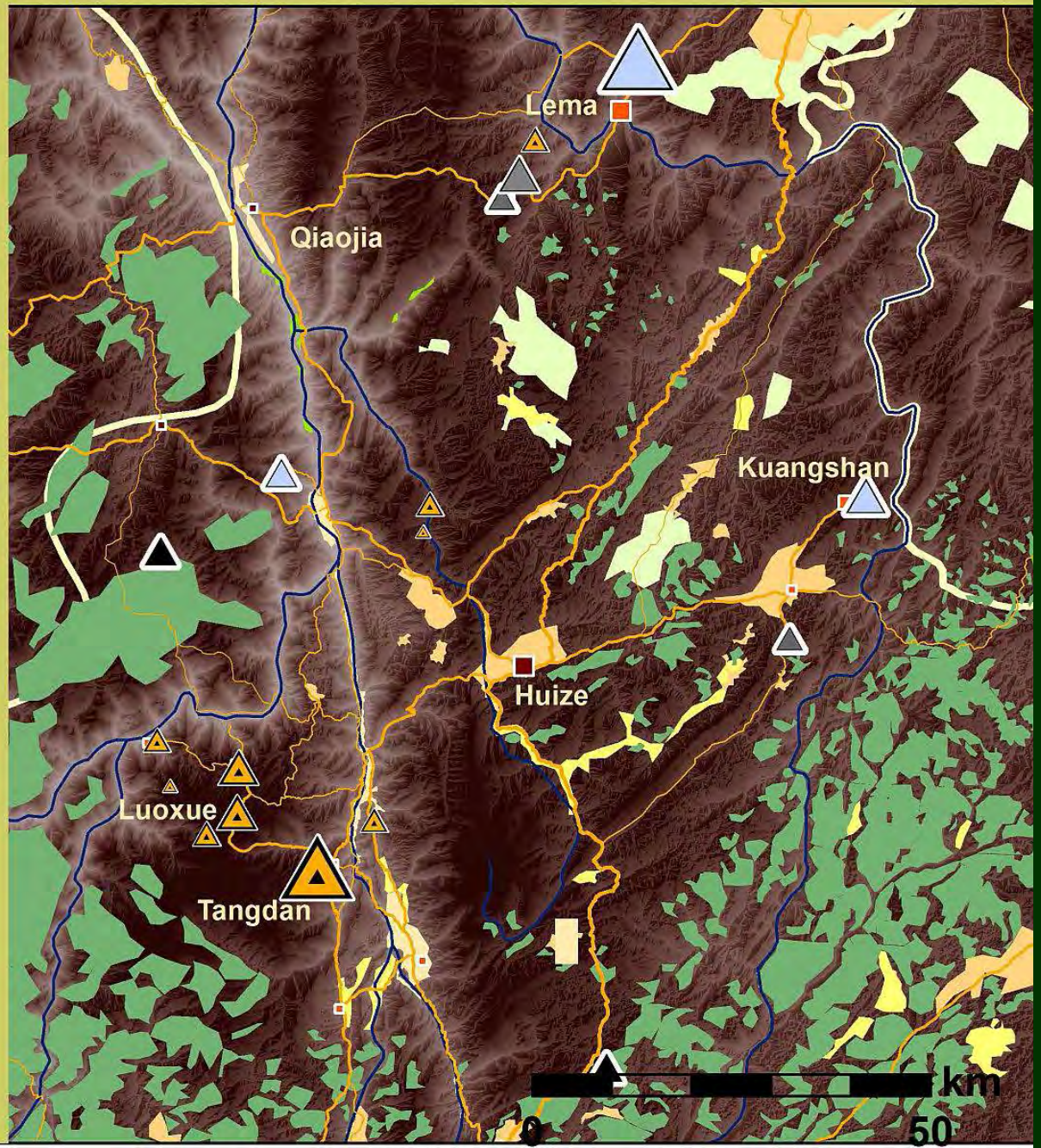
Upper end of worked pits at Dayinchang: historic slag layers under recent dumps

The Dayinchang Mines (Mile?) (2017)



会东县蛮银沟镇大银厂 = 民代后期会川密勒山？

Forested areas in historic Dongchuan, ca 1970



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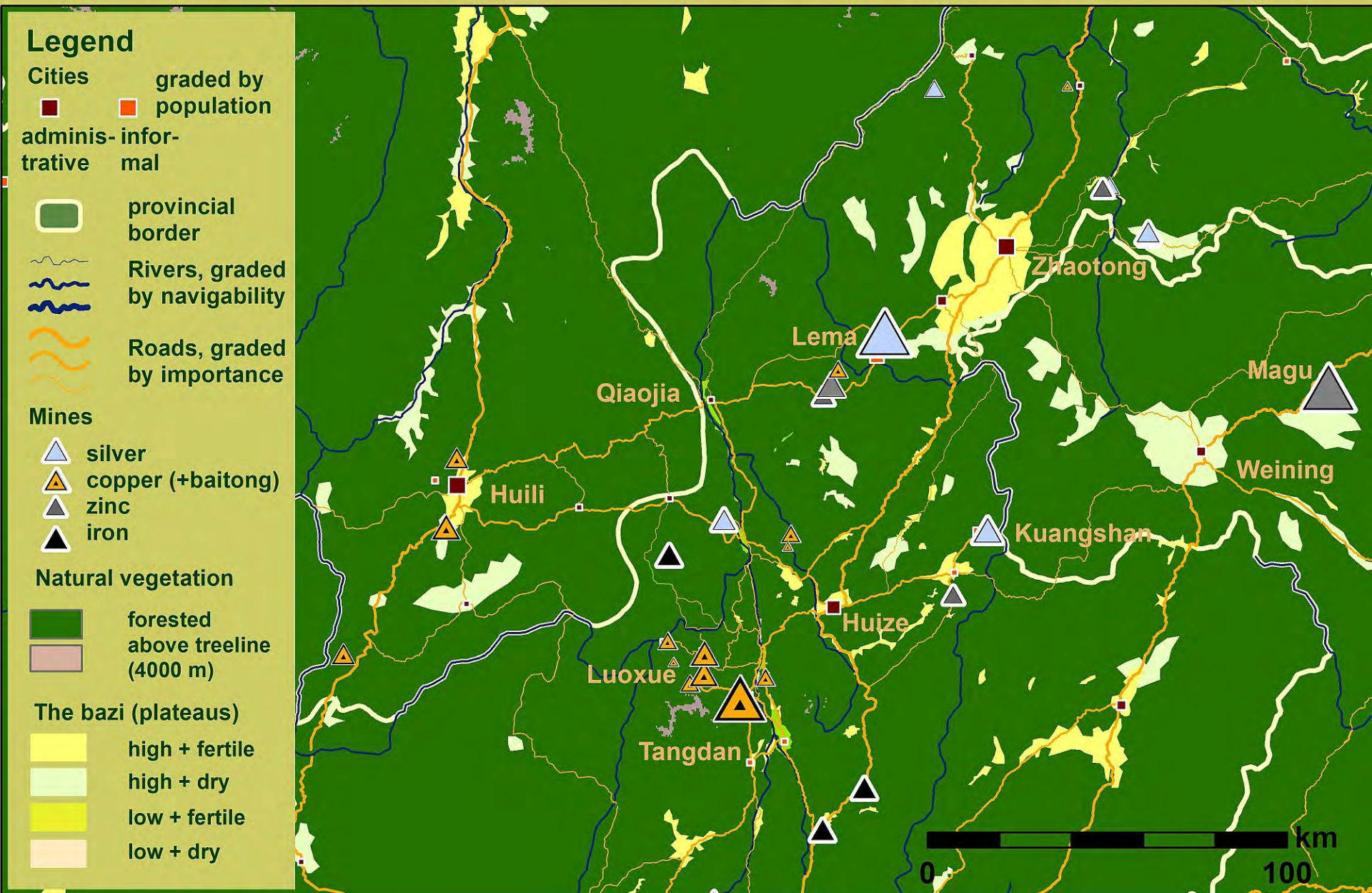
The area of Dongchuan, Huili, Zhaotong and Weining, ca 1800



Thank you!

Project homepage
with field reports including discussion of materials and analysis
of findings:

http://www.zo.uni-heidelberg.de/sinologie/research/epm/

Nanny Kim

"Calamities of mining" (矿害) in Ming and Qing writings: Environmental and moral concerns

(明清文献中的"矿害"：环境意识和儒家社会道德观念)

Preliminary draft, 2017.09.25. NOT FOR CITATION

Introduction

This paper was proposed with the intention of analysing and comparing attitudes to mining and environmental problems associated with this activity in elite writing, government reports, and oral histories. It turned out not to be feasible in the intended form. The two groups of sources, elite writings and government records on the one hand, and oral histories on the other, look at mining from two perspectives that are so far apart that they appear to be talking about different phenomena.

For this reason, this paper begins by separately presenting the two perspectives. To proceed chronologically, the first begins by an overview of records in written sources of the Ming and Qing period. The second presents oral histories, with a few records dating to the late Qing, some to the period after 1950, and some collected in fieldwork in Yunnan by Yang Yuda and myself between 2011 and 2016. For a manageable geographic and environmental focus, the specific quotes used for this presentation refer to silver mines Yunnan. The final discussion analyses the different topics as expressions of different mentalities and different perspectives on the environment.

1.1 Ming and Qing written sources: The social environment

In the traditional body of sources on the Ming and Qing periods, such as the veritable records (實錄), essays on statecraft (經世文), and private notes (筆記) mining for coal, metals and other minerals is rarely touched upon, and when writers mention the topic, it is mostly to deplore problems. A systematic search for keywords related to mining (礦、洞、場、冶) in the veritable records produces only some 500 entries, with under 100 entries dating to the Ming. Around 80% of these focus on social problems caused by mines.

These were caused by the miners (礦徒, a term with negative connotations that implies unlawfulness), perceived as vagrants who would turn to banditry when given a chance or when the mines were exhausted, caused problems of social unrest to the surrounding villages, and caused problems of grain deficiency as large groups who had left agriculture.

A typical entry in the records, dating to the Jiajing period (1507-1567) reads:

福建巡按御史白賁言：建寧境内故有坑礦數處，浙江温處，礦徒流聚其中，盜鑄而居，民為之接濟藏匿以故充斥山谷有司不能制.

It records the anger of the Fujian intendant about problems caused by groups of miners (礦徒, a term with negative connotations that implies unlawfulness) who took over small mines, cast illicit cash coins, and were protected by the surrounding villages.

In other words, administrators were overwhelmingly concerned with social effects of mining. They perceived the activity as dangerous because it involved groups of uprooted men that could become bandits or insurgents, and because it had a damaging influence on local morals and customs, luring peasants from their fields in search of quick monetary gains.

Another set of problems was raised from the late Ming, which also concerned local societies but were caused by the administration, especially of silver mines. Taxation had gradually become a quota system that was set for the administrative area in which the mine was located and had become disassociated with the actual sites of exploitation and their productivity. As a result, when outputs fell or ceased, the entire population of the district was made to pay high surcharges to raise the mining tax.

A few writers brought up other issues, including environmental concerns.

In 1597 Yao Enren 姚思仁[1], first minister (zaixiang) of the Wanli emperor, submitted a memorial that enumerated eight aspects of concern in silver mining:

中原八郡，實天下樞機，臣自入境以，來巡行郡邑，問民病苦，其開礦之大可慮者。有八礦盜嘯聚召，亂可慮，一也。**礦頭**累極土崩，可慮二也。**礦夫**殘害流亡，可慮三也。雇民糧缺噪呼，可慮四也。礦洞徧開浪費，可慮五也。礦砂銀少逼買，可慮六也。民皆開礦失業，可慮七也。奏官强横激變，可慮八也。今礦頭以賠累死，平民以逼買死，礦夫以傾壓死、以爭鬬死，自初開至今，已踰八月，而所解不過四千。及今不止恐禍起蕭墻變生肘腋雖傾府庫之藏竭天下之力亦無濟於存亡矣。

The first and foremost was unrest, the second were landslides, the third were injuries, deaths and vagrancy of miners, the fourth grain deficiency because of a too high proportion of people in an area hired for work, the fifth the waste of capital in opening too many mines, the sixth low silver contents in the ore, the seventh that people left agriculture and eventually lost their fields because they turned to mining, and the eighth were abuses by officials that caused insurrections.

The single purely environmental problem that Yao included were landslides or smaller movements of waste products of mines. The other problems were social and administrative, although the health risks in underground mining are indirectly addressed (殘 could cover accidents as well as other bodily harm, such as lung conditions that were frequent in pre-modern mining due to stone dust, gas and poor ventilation).

Qing writings are overall similar in the overwhelming focus on miners as a source of unrest and on the “pollution” of local morals.

Ni Tui 倪蜕 (1668-1748), a painter and scholar who spent his life in Kunming, records problems of mines and the mining administration of the Ming in his chronology of Yunnan. He singles out a single official for praise. Chen Cha, who served as provincial judge in the early sixteenth century resolutely opposed a proposal to increase taxes of silver mines in the province in order to raise funds for the troops. He argued:

『此兵之端、食之囊也。人睹其利，我睹其害。夫矿开则人聚，人聚则食广。云南有限之谷，其能饲此不耕之人乎！谷细则民馁，民馁则甘盗。度支之费未佐，军事之供益迫矣。独平见括苍之已事乎，』遂罢议。

(滇雲歷年傳 (A chronology of Yunnan). Orig. 1846. Interpunctuated ed. by Li Yan 李埏. Kunming: Yunnan daxue chubanshe, 1992, 359, referring to 1511. The proposal was rejected.)

The key phrase is: “They see profit, I see disaster. When mines are opened, people congregate, and where people congregate, they consume food grown in a large area. But

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[1] 字善长。浙江秀水（今嘉兴）人。明代宰相。

姚思仁初时授行人，后升任御史等职。不久巡按河南。天启二年（1622）， 姚思仁官至工部尚书，位居宰相之职。次年以才老致仕。姚思仁去世时年九十一岁。

Yunnan has only limited grain, how can it feed these people who do not till the land! When grain is scarce, people will go hungry, and when people go hungry, they will be prepared to turn to banditry. While the provincial expenses will not have received any support, there will a military emergency to cover."

The argument involves the environment but it is environmental in the Confucian agriculturalism (農本). It employs the direct linear causality between the necessity of having almost all subjects of the empire working the land as peasants and food security and the fact that professional miners are no peasants and hence burden the region as "unproductive consumers." The concern is not irrational, as Yunnan in fact has very limited arable land and a low population density. On the other hand, there are no indicators of a structural subsistence crisis in the province. The logic to the argument is immanent to agriculturalism rather than empirical.

An early eighteenth century document replicates the concern:

粤东开采一事，言之者甚众，联殊不以为然。盖缘粤省不比滇黔，一者民俗善盗，二者米谷不敷，开采虽获矿砂之利，然寒不堪衣，饥不堪食，而聚集数十万不耕之人于荒山穷谷之中，其害不独有误农业而已也。纵云穷黎糊口资藉，终非养民之上策。砚据金铁亦有开矿之请，尚未议定，俟试行后再降谕旨。

(《朱批谕旨 j;.第 4 函，第 19 册，页 10，王士俊》, quoted in Qingdai de kuangye, 28)

The concern again is with mining as an activity that turned subjects away from agriculture (误农业) and led to "congregations of several ten-thousand men who tilled no fields" (聚集数十万不耕之人), thus causing poverty and subsistence problems to the miners themselves but also to the surrounding area. The agriculturalist perspective on mining was focused on an insoluble problem and the permanent worry of the Confucian ruler of feeing his subjects and keeping them content (养民).

1.2 Ming and Qing written sources: The natural environment

A handful of records mention the natural environment.

In the mounting criticism to the expansion of mining in Yunnan in 1511, He Mengchun 何孟春（1474－1536）[2], a high-ranking metropolitan official raised the issue of earthquakes in the context of mining:

奏：聞外天下近年地震之變，雲南獨多。雲南地方地震之變，銀場尤甚。實由銀礦採穵深酷有傷地脉以致陰道不寧故也。變必有應，患當預防。今螳螂、母喜、龜山一帶盜賊出沒，人民饑窘，萬一勢激利動結構召集重貽境内大患。(何文簡疏議)

Based on reports to the throne, He was aware the earthquakes were frequent in Yunnan. He also found that frequency coincided with mining areas and deduced that deep mining caused disruptions in the earth veins and hence was responsible for the disasters. It may be added that he is not geographically specific beyond old and loosely defined areas. These in fact contained mines, but also covered large areas. The connection between earthquakes and mining was an argument rather than an observation.

Shen Rilin 沈日霖, who held positions in the supervision of the examination system in Guangxi province in the early 19th century, provided a more specific and nuanced view in his private writings:

[2] 字子元，湖廣承宣布政使司郴州（今湖南省郴州市）人。明朝政治家，官至吏部左侍郎。

愚按，开矿之役，其利有三，其害亦有三。上而裕国，下而利民，中而惠商，比三利也。然而开山设厂，每不顾田园庐墓之碍，而且洗炼矿砂之信水，流入、河中，凝而不散，腻如脂，毒如鸭，红黄如丹添，车以粪田，禾苗立杀，其害一。叉开矿之役，非多人不足给事，击者、挖者、捶者、洗者、踪者、奔走而挑运者、董事者、帮闲者，每一厂不下百余人，合数十厂，则分布数千万游手无籍之人于荒岩穷苦中，奸究而托迹，么么得以乘机，祸且有不可知者，其害二。叉开矿者，每在山腰及足，上实下虚，势必崩塌。昔年回头山穿穴太甚，其山隆然而倒，数百人宅罗其中，长平之坑，不加其酷。况乎砂非正引，土性松淫，随掘随塌，更属可危，则矿而家也，匠而鬼也，利可祸坑也，不亦大可哀乎?其害三。吾愿当事者留?于此，踏勘得踏实在旺盛，方准承开，否则宁封禁，息事宁人。于后国以太道，利民以本富，惠商以宽政，将见天不爱道，地不爱宝，而无形之矿，有百千万倍于粤山者，何区区铅铁之足云!

(Yuexi suoji 粤西瑣記 (Miscellaneous Accounts of Guangxi Province, excerpted in QDDKY, 49–50)

Shen recognized three benefits of mining: the generating of revenue for the state (裕国), allowing the population of reaping benefits (利民), and benefiting the merchants (惠商). The wording is classical, but the tone noticeably different from all preceding texts, especially in the inclusion of the merchants or the entrepreneurs who operated the mines as members of society who had a positive role.

The three benefits were however offset by three calamities (害). The first was the mines encroached upon and dug up fields, gardens, houses and graves, while the water used for washing the ores ran off into streams and rivers, causing pollution and remaining poisonous for a long time.

The second was the large workforce that amounted to at least a hundred men per mine and for a mining area of several ten mines reached several thousand or even ten-thousand men without local registration who might become a scourge to the area.

The third were the destabilisation of mountains. Because mines were located on mountain slopes, large-scale mining could lead to collapsing cavities and in on known example had caused a landslide that buried several hundred houses. Shen added that galleries in loose rock were frequently caved in, killing those who worked them for a living.

Shen is more specific on the calamities than on the benefit, which he obviously regarded as outweighing the benefits. His view is opinioned, yet evidently based on specific information, probably including personal experience.

His description addresses factual pollution and environmental problems caused by mines. The first concerned the surrounding area and included the occupation of arable land, the pollution of water bodies with heavy metals and other toxic sediment, while the second were more localized, comprising collapsing underground cavities and underground accidents.

A very late Qing collection of notes was left by He Zongzhang 贺宗章, an otherwise unknown writer who appears well-connected in Yunnan and took down his memories around 1900. He mentions the silver mines of Yongbei:

“如永北银厂，吾友刘春霆云曾办过，x 昔规模阔大，永北同知，日进陋规大银一锭五十余两，以为常。 矿门苗路如昔，厂屋器物犹存，附近有数老民，年八九十，壮时曾充矿丁，尚能逐一指点，仍循原路掘入，办理二年，迄不得手，闻停办时苗x旺。一日，忽闻对山之上，有猿猴千百成群，呼号奔逐，负矿砂丁出入各洞，众至数千，互相惊异，纷纷出洞瞻望，山忽坐崩，各洞门路，概为土石堆压，按名点验，尚有七百余人

未出，立即停办。在内砂丁，其后开窿时，间一遇之，面目如生，见风则腐云。” (*Huanjing tan* 《幻景谈》, undated manuscript, reprinted in *Yunnan Shiliao congkan*《云南史料丛刊》卷12，第142页)

He obtained his information from “his friend Liu Chunting”, who had served as magistrate in the sub-prefecture and hence knew precisely about the income derived from customary taxes. He also records that at mines and buildings were still in place, and old men of 80 to 90 years of age would remember details from when they worked the mines as young men. The dating is uncertain. We have no dates and little further information on He Zongzhang; there is no known gazetteer of Yongbei and hence no means of dating the term of office of the otherwise also unknown Liu Chunting; and the time of writing is uncertain. Based on the time, when the old men would have been young an assuming the time of writing between 1900 and 1912, we would expect that the flourishing period that ended in the fateful accident certainly predates the mid-19th century civil wars. The mines can be identified as the Baijiu mines in present-day Ninglang, which flourished roughly between the 1830s to 1850.[3]

According to He Zongzhang, mining ended in a frightful accident, probably caused by an earthquake, during which the mountain flank collapsed. The account adds an event that turned out to foreshadow the event, with hundreds of monkeys running past, screaming loudly. Most workers in the mines, several thousand in number, came out to watch, whereupon the mountain shook and all galleries caved in, killing over 700 miners who had still been at work.

一日，忽闻对山之上，有猿猴千百成群，呼号奔逐，负矿砂丁出入各洞，众至数千，互相惊异，纷纷出洞瞻望，山忽坐崩，各洞门路，概为土石堆压，按名点验，尚有七百余人未出，立即停办。

The story records and oral tradition that Liu or He had heard on location. It links natural disasters with foreshadowing events that in fact were a warning in saved many lives.

The late Qing *biji* records provide a new perspective on mining and on environments. They show little interest in integrating nature with a moral and political worldview but were more interested in the local and the specific.

2 Oral histories

Oral traditions that Yang Yuda and myself encountered during fieldwork on 19 silver mining and five copper mining sites across Yunnan province typically contain elements that often closely resemble each other.

They cover three aspects of environmental problems caused by mining:

(1) Air pollution: At many sights, we were told that birds used to drop dead from the skies when the smelters were in full operation in the past.
(2) The notion that in opening the mines, originally mobile underground veins or animals had to be fixed in place.
(3) Stories of major mining accidents with premonitions, typically and old lady turning up out of season to sell peaches, making the men to come out of the mountain before galleries collapsed. The old lady is often identified as Guanyin.

Discussion

The written sources show a perception that with few exception is exclusively concerned with the realm as a human geography that has to be administrated in terms of ordering and channeling the lives of subjects for stability.

[3] Lin Zexu.

In the oral traditions of Yunnan, we find virtually no overlap with the written sources. He Zongzhang's account, although appearing a text that can be regarded as literary, is a record of an oral tradition.

Oral traditions mention air pollution but no problems with water pollution or damage to arable land. This may be due to the fact that all mines were located in mountain areas where agricultural development followed the mining settlement but was little established before.

The stories on the discovery and fixation of orebodies and on major accidents that involve magic appear to be part of a mentality that linked the human and the natural world by magic that remained inexplicable or only half-explained by saviour deities, such as Guanyin. It was worlds apart from the human-centered worldview of Confucianism.

The study provides an assessment of environmental and moral concerns and hazards of mining in the late imperial period.

明清时期西南和边疆地区的银矿和冶炼技术研究

Nanny Kim/金兰中
德国海德堡大学

明清时期西南和边疆地区的银矿

与复旦大学历史地理研究院杨煜达教授的合作项目

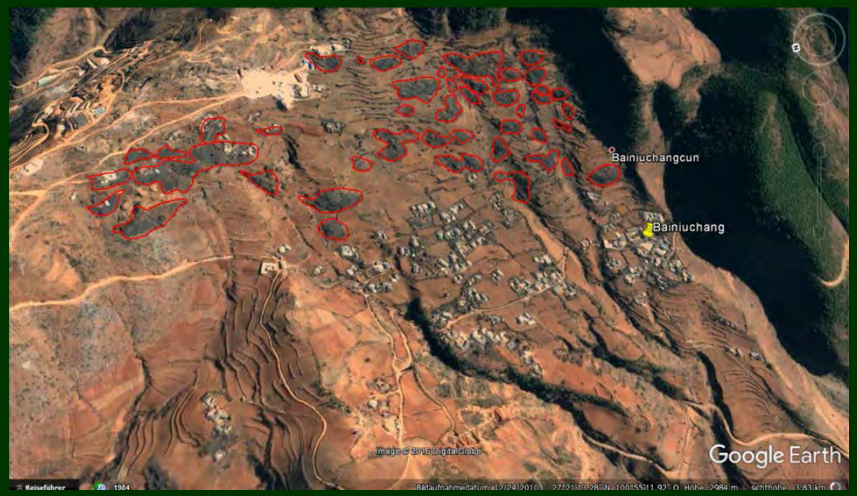
杨煜达多年关注准备
2009年开始合作
2011年第一次进行田野考察
2015年正式立项

明清时期西南和边疆地区的银矿

本报告内容：

1. 问题与背景
2. 方法：文献记载与田野考查
3. 冶炼技术

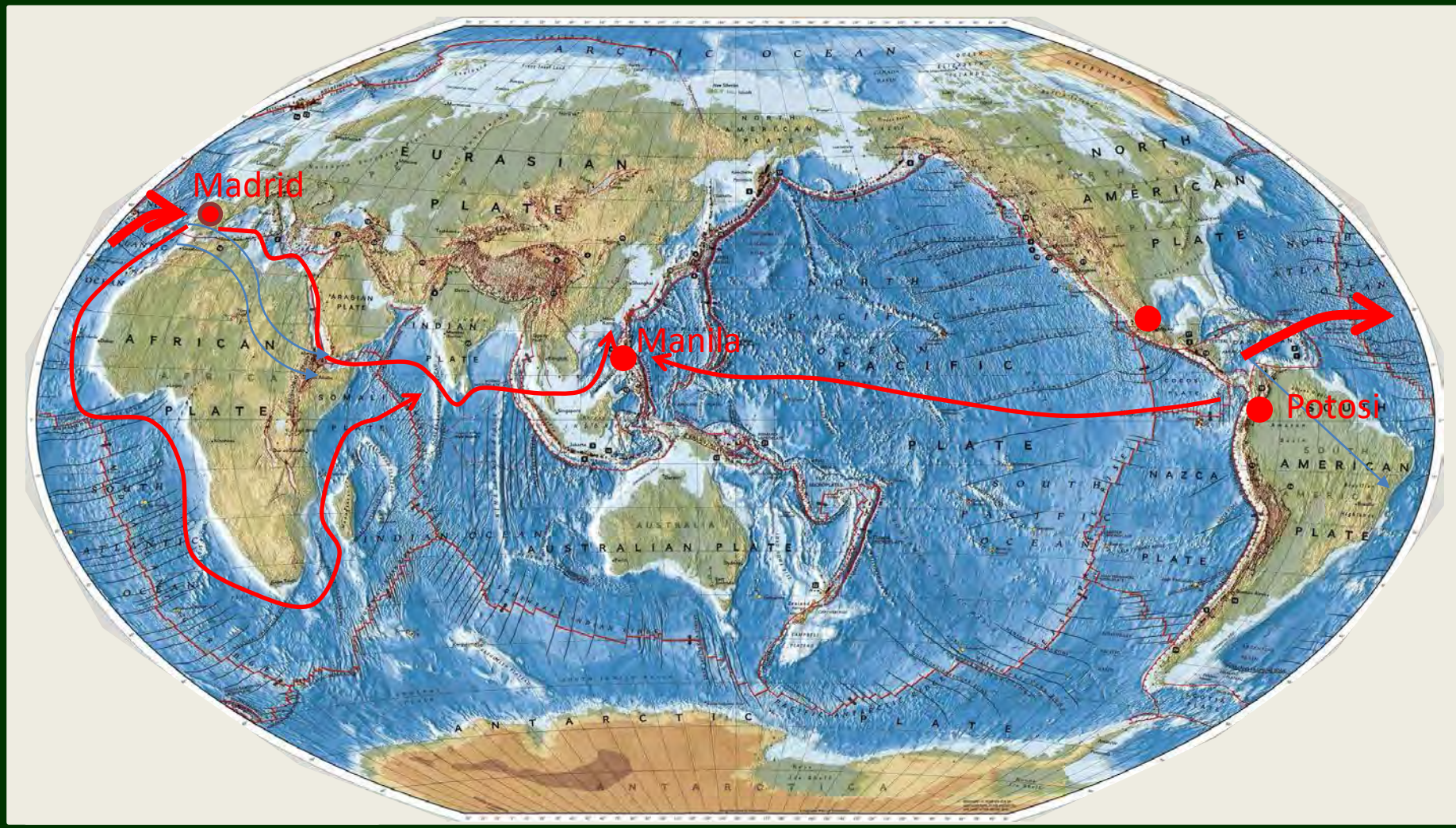






白银与16世纪后期以来形成的全球贸易网

中国为白银流的汇流地　　the global sink of silver



Dennis O. Flynn and Arturo Giráldez：Born with a “Silver Spoon”: The Origin of World Trade in 1571.（*Journal of World History*, 1995, pp. 201-221）
诞生以来白银为伴侣”：全球贸易网的起源可定在1571年

André Gunder Frank：*ReOrient: Global Economy in the Asian Age*.（Berkeley: University of California Press, 1998）
以东方为中心：全球经济网络的亚洲世纪

全球化要定创立年，应该是1571年：
西班牙在菲律宾的Manila（吕宋）建城，全球贸易网完成。

1571年到1830年代全球产量最旺的银矿是波托西和墨西哥银矿总产量在10万吨以上。
通过间接贸易渠道**美洲白银的3分之2流入中国**。

明清中国为全球白银流汇流之地（ global sink）

明清中国为全球白银流汇流之地之谜

先后过程矛盾

宋代:古代矿业高峰，开采重点在江西、浙江和福建山区
元代:银矿从华东转到云南，大量白银流出中国
明清时期:矿业萧条，云南为唯一银矿区域

1436年:华东地区纳税允许折成白银:白银的货币化完成
1567年:海禁取消，日本和美洲白银开始流入

疑惑问题

(1)盛明时期的商品经济白银流通量始终稳定不变吗？
(2)明清时期的经济能带动全球贸易网，引进大量白银，反而不能推动国内银矿的开采吗？

重新研究西南与边疆地区银矿

史料缺乏

全汉升先生40年前已完成根据中央政府有关税额记载的估算，确定反应的产量不大、边疆土司地区的银矿税额和产量无关。

→ 方法和资料方面创新才有可能得出结果

从边疆地区银矿入手

(1)有关产量的直接记载虽然没有，但在几次危机情况下进行考查并留下的资料间接反应具体情况。

(2)偏僻边疆地区里，工业开采比较晚，留下炉渣和遗迹比较多，田野考查条件比较好。

→ 搜集炉渣的地址报告等资料
→ 进行田野考查
→ 用比较方法研究冶炼技术
→ 进行系统地理分布分析

欧洲中世纪后期以来银矿业史料丰富

我们对矿工的工作，收入，
生活条件了解相当详细

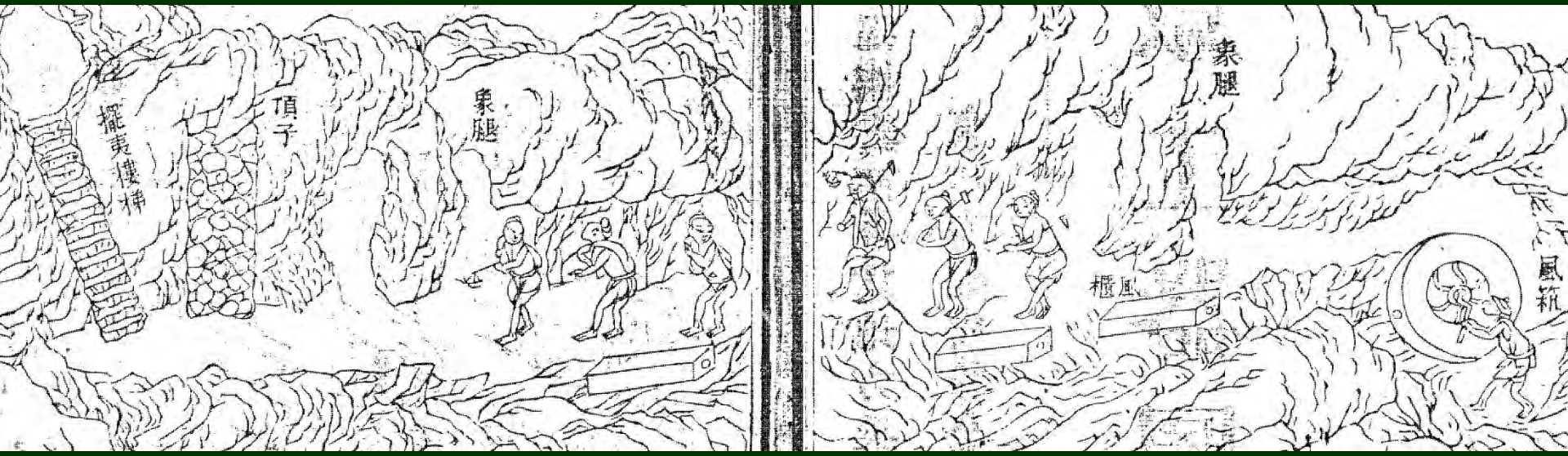


德国Agricola，1556年



明清时期银矿业的史料极少





《滇南矿产图略》1844年版本

西南地区的重要银矿

准备工作:

确定位置
初步判断规模

例如:金沙厂

《永善县志略》(1803年):1773年之前每年额收课银五千[两]有奇。
(《滇南矿产图略》(1844年):額課銀1199兩餘



《金沙江全图》，据西南大学李鹏研究1752年绘制：金沙厂与河口铜店

西南地区的重要银矿

彝良铜厂坡厂：
《滇南矿产图略》：
額課銀1119兩餘

Garnier(1868): Mines on river Co-kouy near Sin-cai-tsé "famous throughout China. Before the war, these mines employed over 1200 men just to work the drainage pumps."

Co-kouy　戈魁河
Sin-cai-tsé 新街子



民国时期地图：
昭通市彝良县毛坪乡
的银矿和锌矿遗址

西南地区的重要矿山，1700年到1850年



田野考查

内容：
找开采、冶炼遗址
找其他遗址，如庙宇、坟墓、交通路线、村落等
搜集口述历史

目的：
确定地点
分析分布
对开采时期和规模有所判断
探讨技术变迁

鹞嘉石羊厂的硐口
2011年金兰中摄影



遗迹：炼渣

鹞嘉石羊厂



庙宇与会馆遗迹





兰坪县福隆厂，2011年摄影


碑文与坟墓
耿马县悉宜厂刘氏合葬墓碑

口述历史







分布分析

开采规模判断与地理分布分析



会泽县金牛厂，2016年考查

1 km



会东县棉花地厂，2016年考查

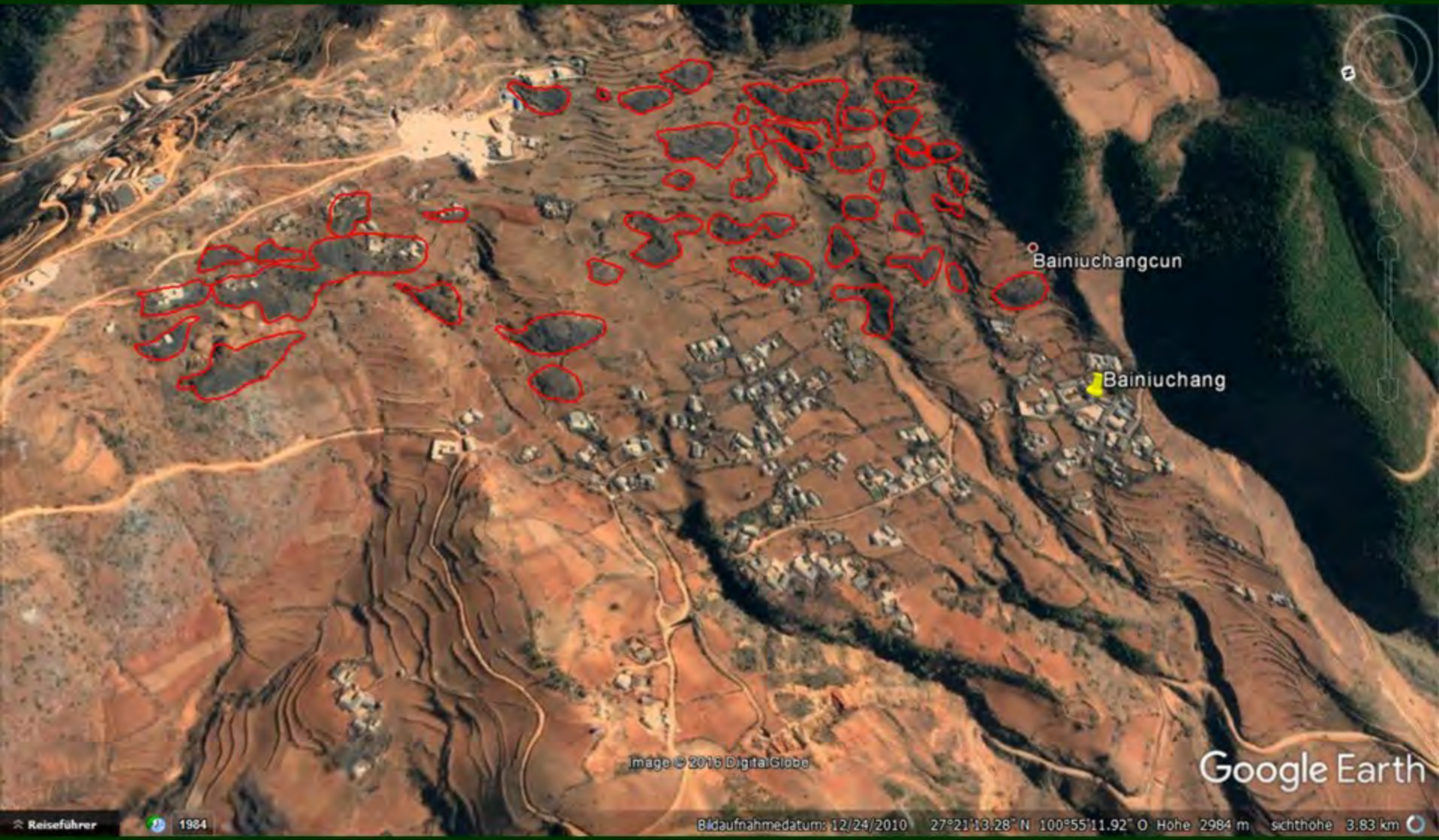
庙宇遗址

现存炉渣堆，据说以前分布

50 m



宁蒗县白牛厂村，村后坡上几十个炉渣堆，2011年摄影



2010年卫星照片上的46个炉渣堆

分银技术





石羊厂 分银炉 （2011年摄影）

文献

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陈百朋《龙泉志》，1200年前后浙江矿区的冶炼技术
明清时期：
宋应星《天工开物》，约1637年
吴其濬《滇南矿产图略》，1844年刻印
黄梦菊《滇南事实》，1834到1836年任会泽知县时的记录

近现代：
Emile Rocher，1871年个旧等矿的情况
宋赓平，1900年前后会理银矿的情况
Emile Leclère ，1901年个旧和会理的情况
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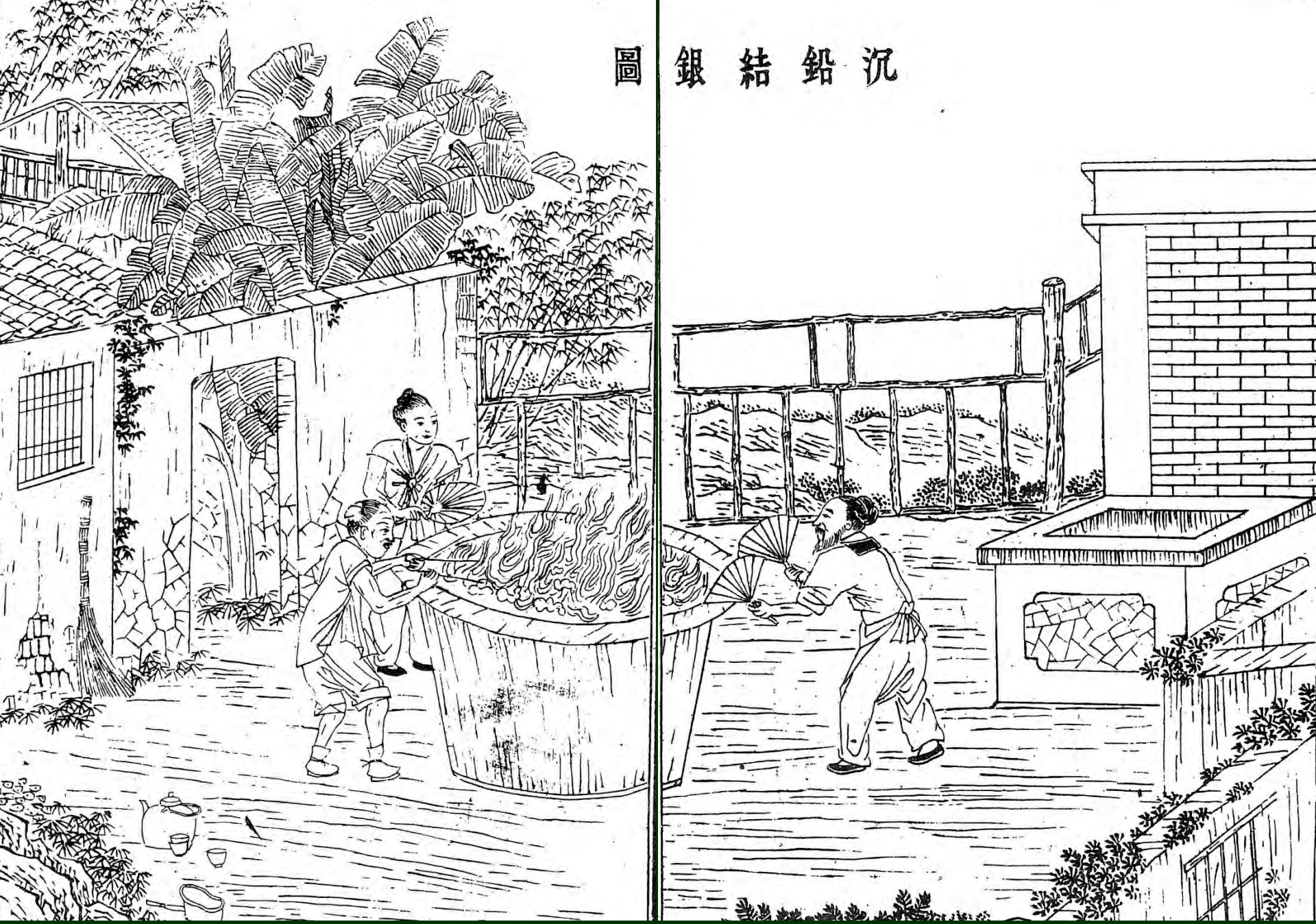
张石庵 《募乃厂的一般情况 》，民国时期慕乃厂的情况
2011年、2014年、2015年杨煜达和金兰中的田野考查
和俊忠和和小丽父子，兰坪县富隆厂的情况

分银技术

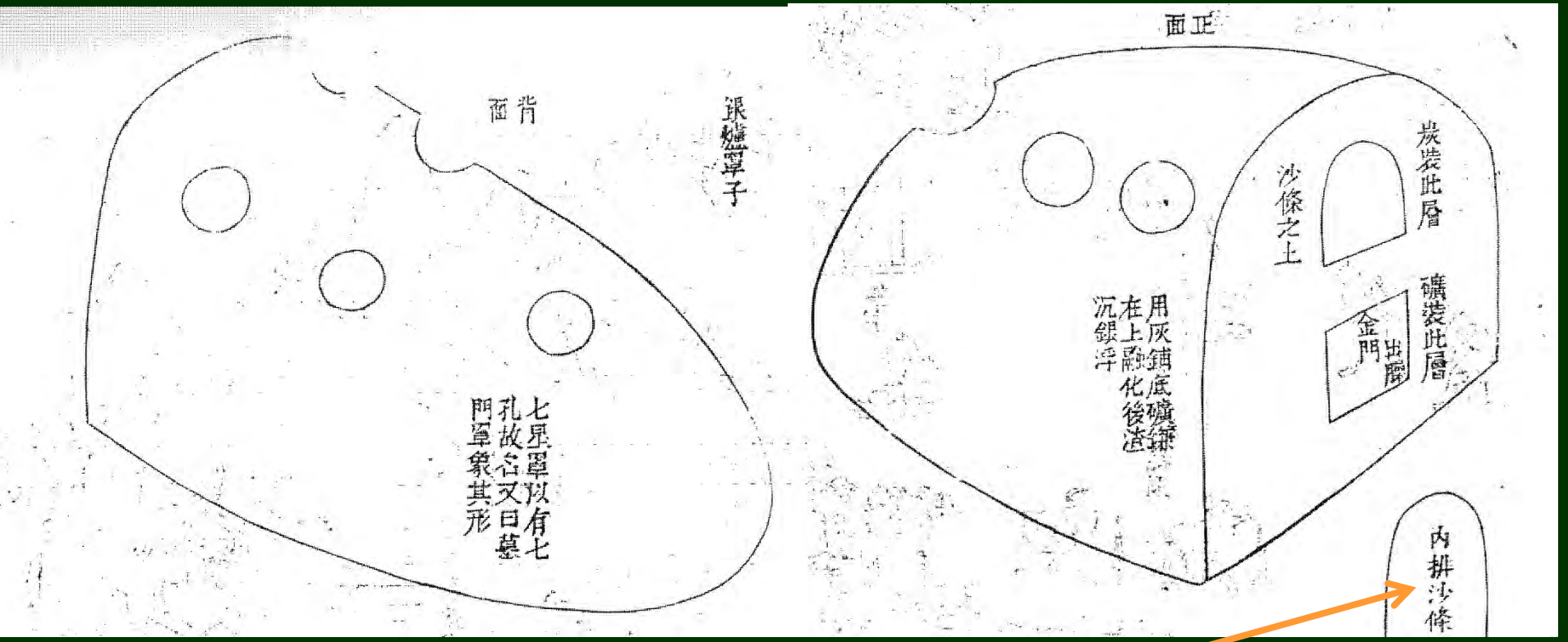
宋代到民国时期：灰吹法

资料	炉的名称	入炉材料	分银炉的容量	氧气供应器	技术特点
陈百朋	灰巢	铅驼	根据铅淀而定	鞴鼓	
宋应星	分金炉，一名虾蟆炉	铅团	礁百斤、铅二百斤	风箱、交箑	
吴其濬、黄梦菊	大曰七星罩	粗铅	宽约1 m、长约 2 m、前高约64 cm	风箱	可连续添炭和铅
	小曰蛤蟆罩	粗铅、炸矿	髖约32 cm、高约32 cm	风箱	富矿直接入炉，根据精矿量修罩子
Rocher	罩子	粗铅	直径约 1.5 m、高约 1 m， 铅七百斤	风箱	一次分银约3日，炉子清洁修补后继续使用
山口義勝		粗铅	铅八百斤、炭一百二十斤	风箱	一次分银34个小时



宋应星《天工开物》(1637):蛤蟆罩？？？

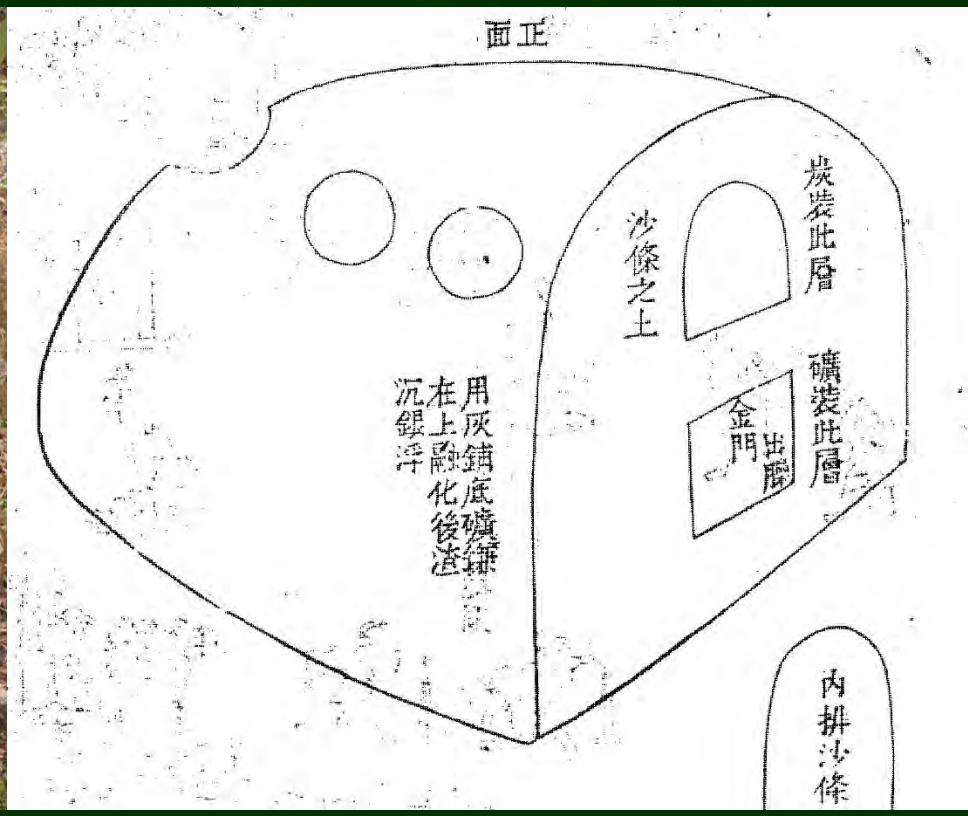
《滇南礦廠圖略》1844年刊本：七星罩



內排沙条

遗迹:分银罩子





石羊厂，2011年杨煜达和金兰中考查　　七星罩

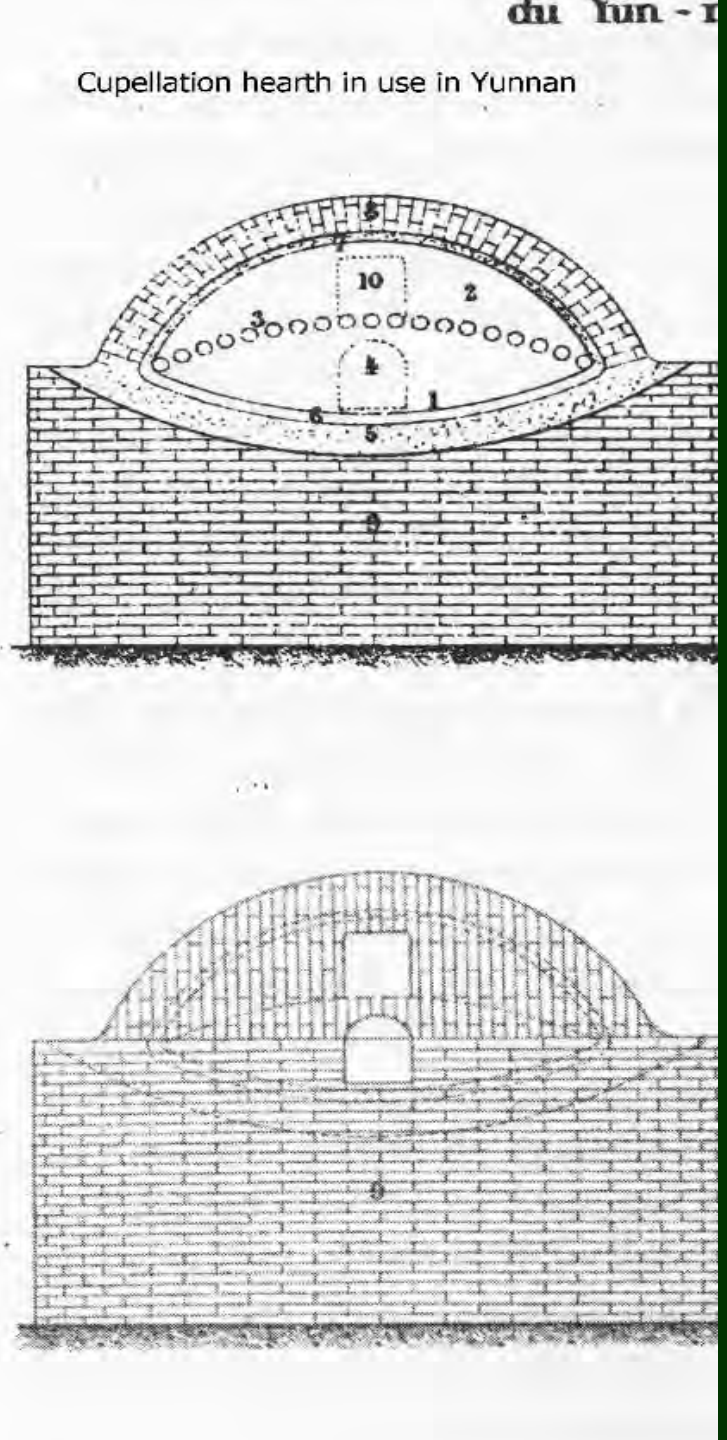
《滇南礦廠圖略》(1844)

分银罩子

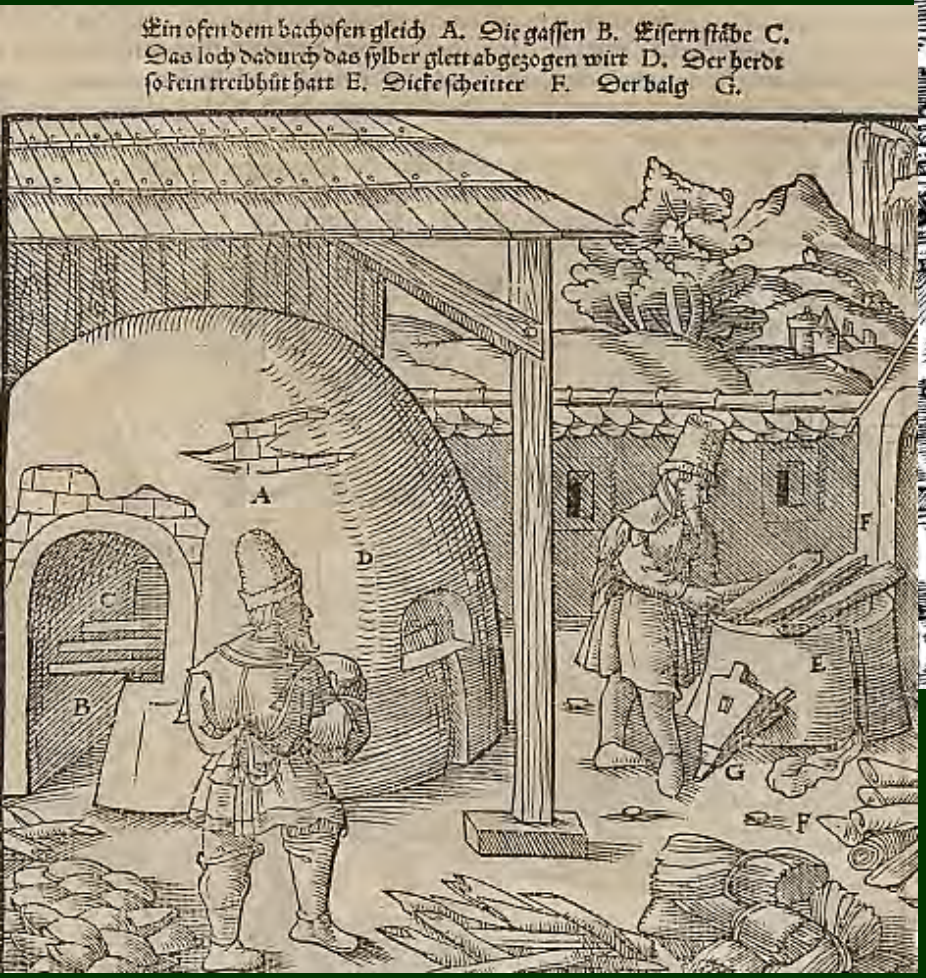


石羊厂的罩子，2011年杨煜达和金兰中考查

Emile Rocher, 1871



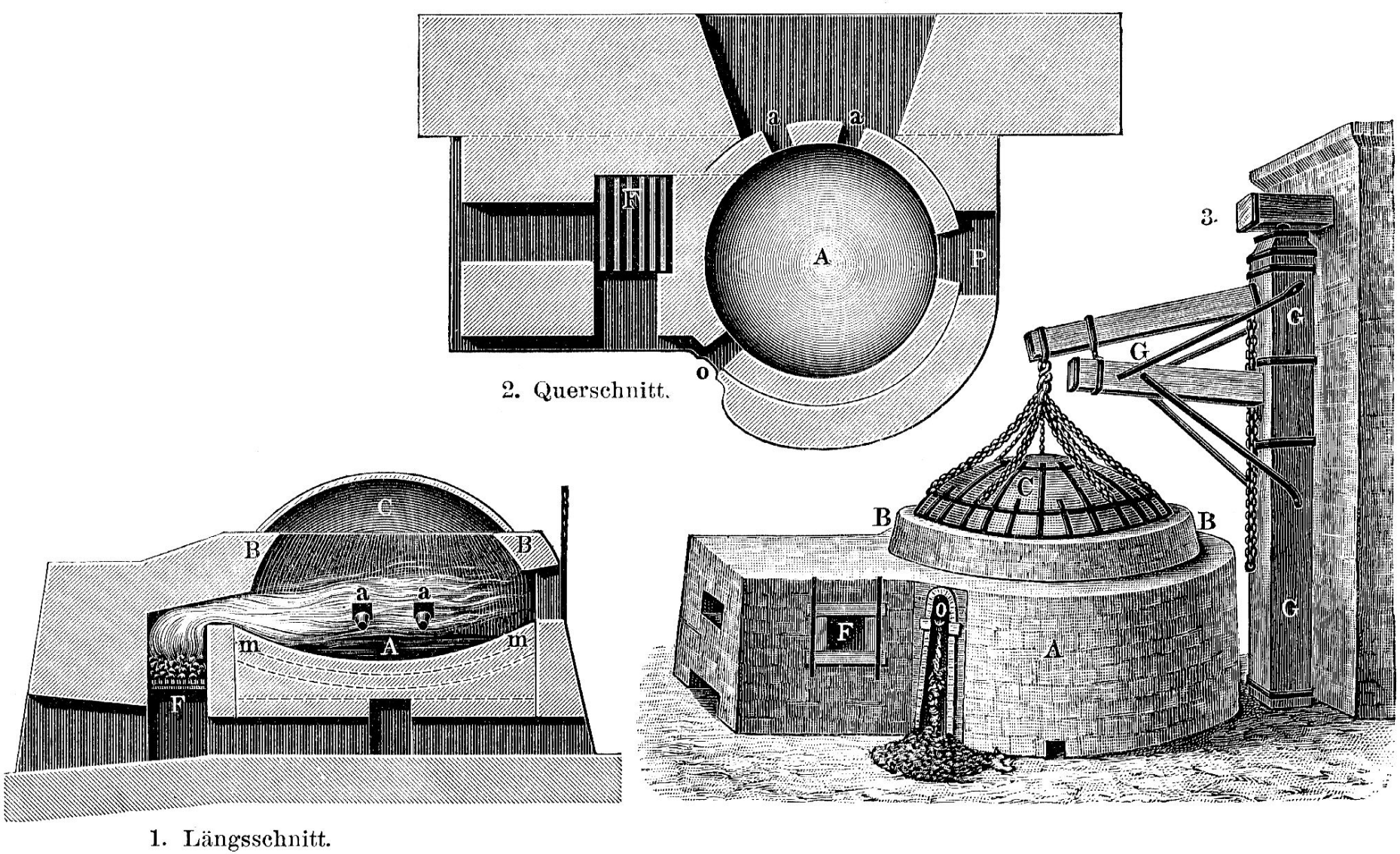
欧洲中部16实际以来的“德国分银炉”





Agricola, 1580刊本

欧洲中部16世纪以来的“德国分银炉”



Meyer百科全书, 1800年前后

冶炼遗址的常见废物：沙条



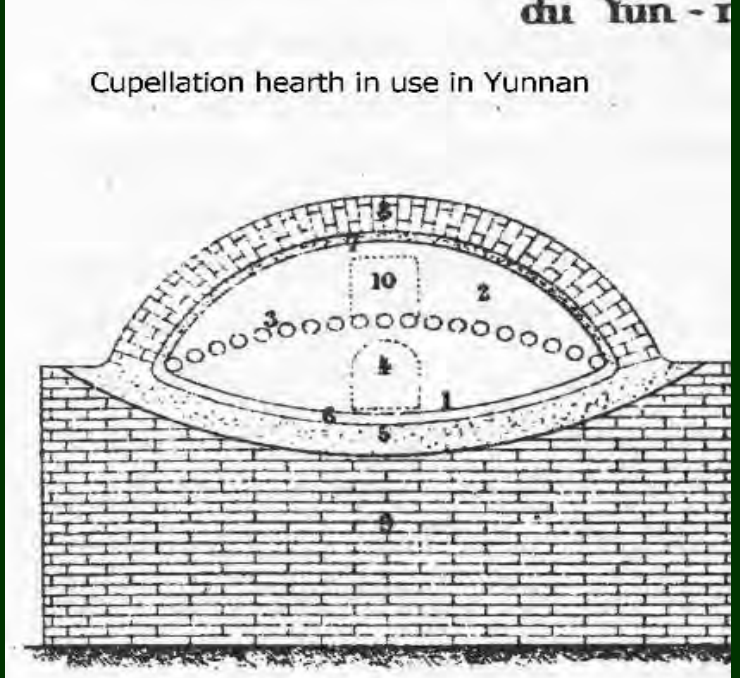


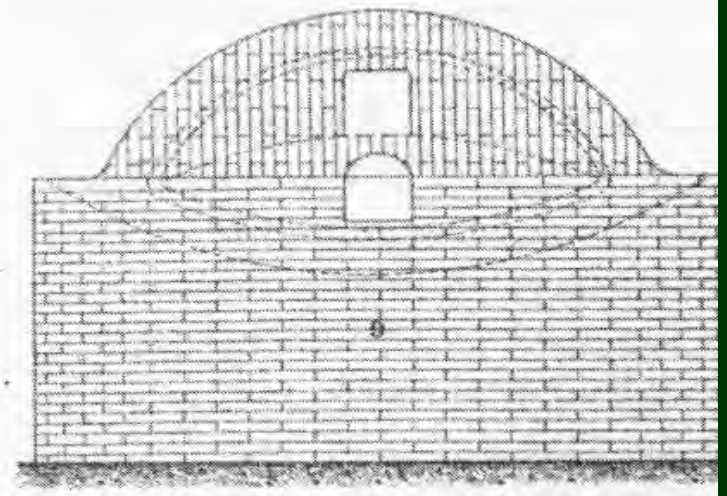
沙条



山口義勝，
1912年

和俊忠，2011年：
下面的炉略似锅底，大约深30厘米，在大锅底的上面收起，放置龙骨。龙骨用沙石做成的。一排排放置，上面放炭。从放龙骨的地方到炉顶大约高70公分。





Emile Rocher, 1871年

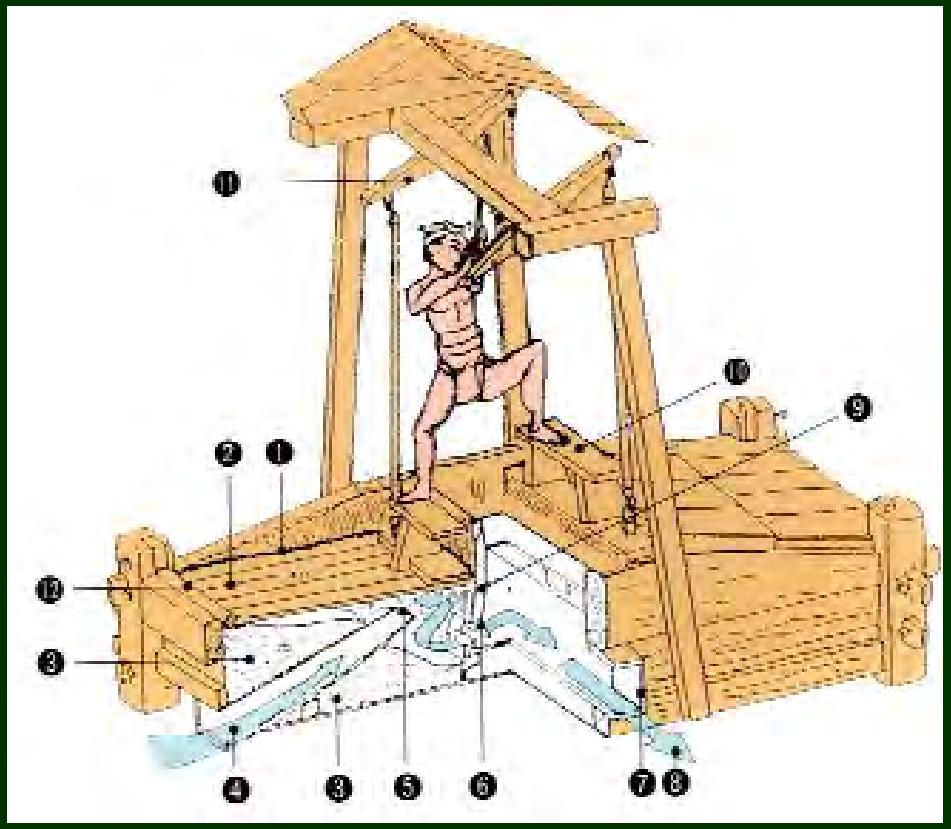
分银罩子

据《滇南矿产图略》和遗迹，最晚1840年有，19世纪后期云南以及西南边疆地区普遍应用的罩比明末《天工开物》描述的蛤蟆罩大4倍，一次加工含银铅约800斤(480 kg)。
据Rocher的记载铅饼融化之后连续加料，总共入炉粗铅应该更多。

初步推测尺寸变大决定因素是通风技术，即“鞴鼓”、“交箑”逐渐由风箱代替。
此外是燃料与粗铅的隔开，及龙骨和纱条。

风箱



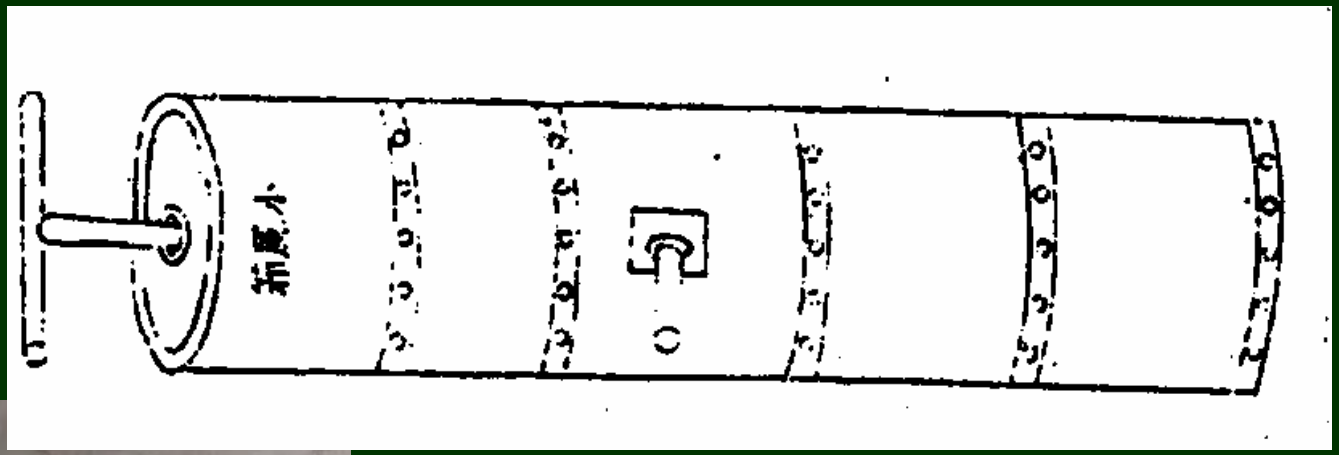


日本德川时代大鞴图形。

http://club.ap.teacup.com/hagi/1145.html

http://www.wakou-museum.gr.jp/spot5/

风箱





《滇南矿产图略》中的“小风箱”:

兰坪富隆厂村和俊忠家锯成两段的风箱，直径约60 cm。2011年摄影。

腾冲明光六厂遗址



2016年考查4个炉渣堆：

陶管



腾冲明光六厂遗址

陶管：
外直径约6到8公分
内直径约2到3公分





只有在烧坡一个
遗址发现纱条

日本灰吹法分银技术图画中的线索



Iwanami 银矿，18世纪（？）

分银技术的初步结果：

- 宋代后期灰吹法成熟。
- 灰吹法原来是灰窝。
- 罩子将燃料与粗铅的位置倒过来了：燃料在上，粗铅在下。
- 明代后期蛤蟆罩、清代中后期的七星罩、近代穹形罩子应该是一个原理。
- 清代道光年间大罩子比明末大四倍，用于加工函银不高的粗铅。同时还用蛤蟆罩，专门加工富矿。
- 风箱的广泛应用、纱条结构在罩子变大过程中起到关键作用。
- 近代回收老炉渣的分银技术尺寸变大，劳动投入变低、回收效率也变低。


谢谢！

明清时期西南边疆地区的银矿：史料、田野考察、地理分布分析与环境变迁

Nanny Kim 金兰中

本报告介绍的研究是2009年以来和复旦大学杨煜达老师一起进行的银矿考察项目的一部分，同时介绍去年以来和李晓岑教授，刘培峰老师合作学习的部分成果。报告内容首先分析文献史料的局限性以及对云南省根据不同视角对历史地理的不同认识，第二部分介绍滇东北地区田野考察的几个案例，探讨田野考察对具体矿山搜集的信息以及认识的局限，第三部分初步探讨矿业与植被变迁的GIS模型研究。报告中从不同视角研究矿业、社会与环境的历史地理关系。

报告概要（部分报告的草稿!）

今天介绍的研究是2009年以来和杨煜达老师一起进行的银矿考察项目的一部分。研究内容主要通过文献考证、田野考查以及口述历史研究明清时期西南地区的银矿，重点为矿山具体位置、开采冶炼技术、聚落构造、交通网络以及环境各方面的历史变迁。本人在项目中的重点领域是应用GIS的历史地理分析研究兴趣是交通运输与环境史。

今天原来准备将三方面的内容：

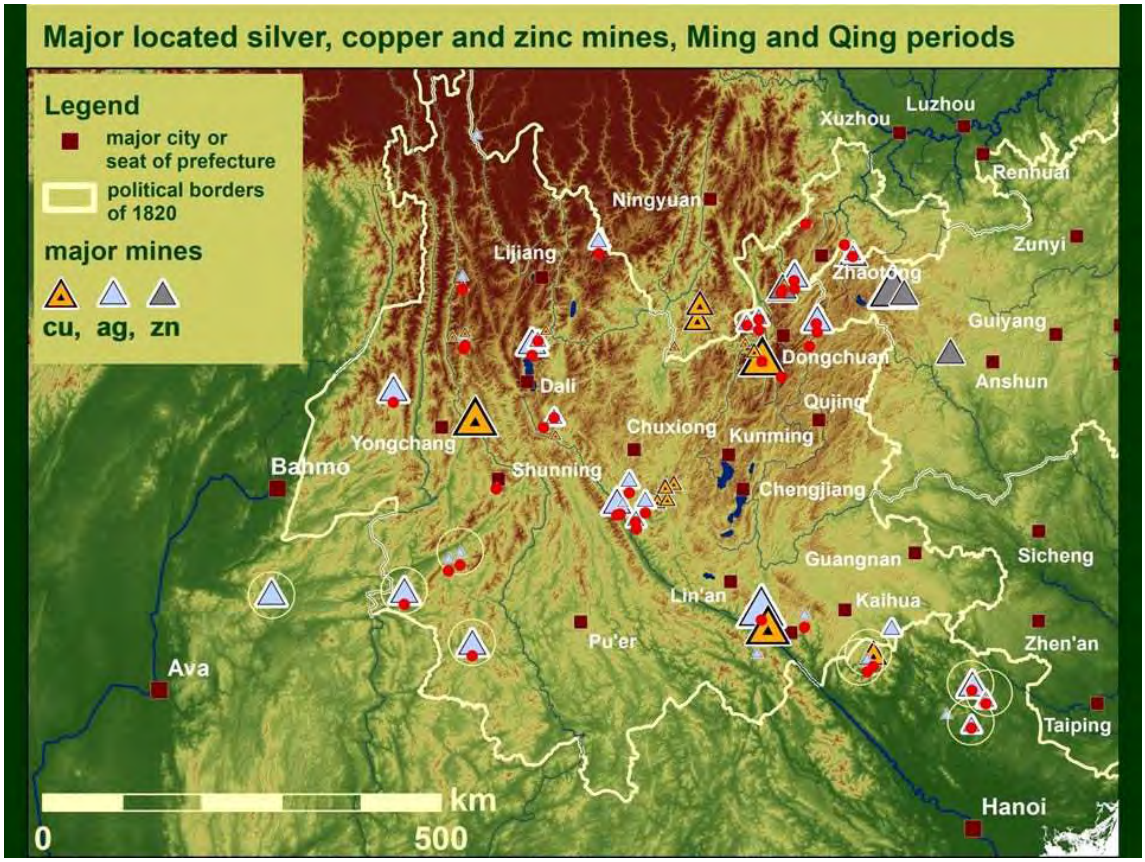
1. 矿山分布与西南人文地理的重新认识
2. 矿山的寻找，开采规模的分析和矿镇与周围环境的关系——以清代东川府以及周围地区为中心
3. 用GIS模型分析大矿对森林的消耗（Maike Nowatzki 的报告）

因书面稿子第一部分比较全，本报告因时间的关系省略，仅讲第二部分。第三部分本报告作为导言，Maike Nowatzki 的报告仔细介绍。

一、 矿山分布与西南人文地理的重新认识

第一幅地图是银矿研究项目迄今的初步结果的概要。可见西南以及边疆地区除了铜矿以外，其他金属矿的大矿数量比我们以前认识要大。迄今对33个大银矿3个小矿进行过田野考查，简单的说，没有一个考察地点不让我们吃惊。有根据文献判断很次要的矿山遗迹很大，也有原来认为相当重要的矿，实地情况只不过反应有限的开采，总的来说第一种情况绝对占多数。

///////（云南省区域分析暂略）///////

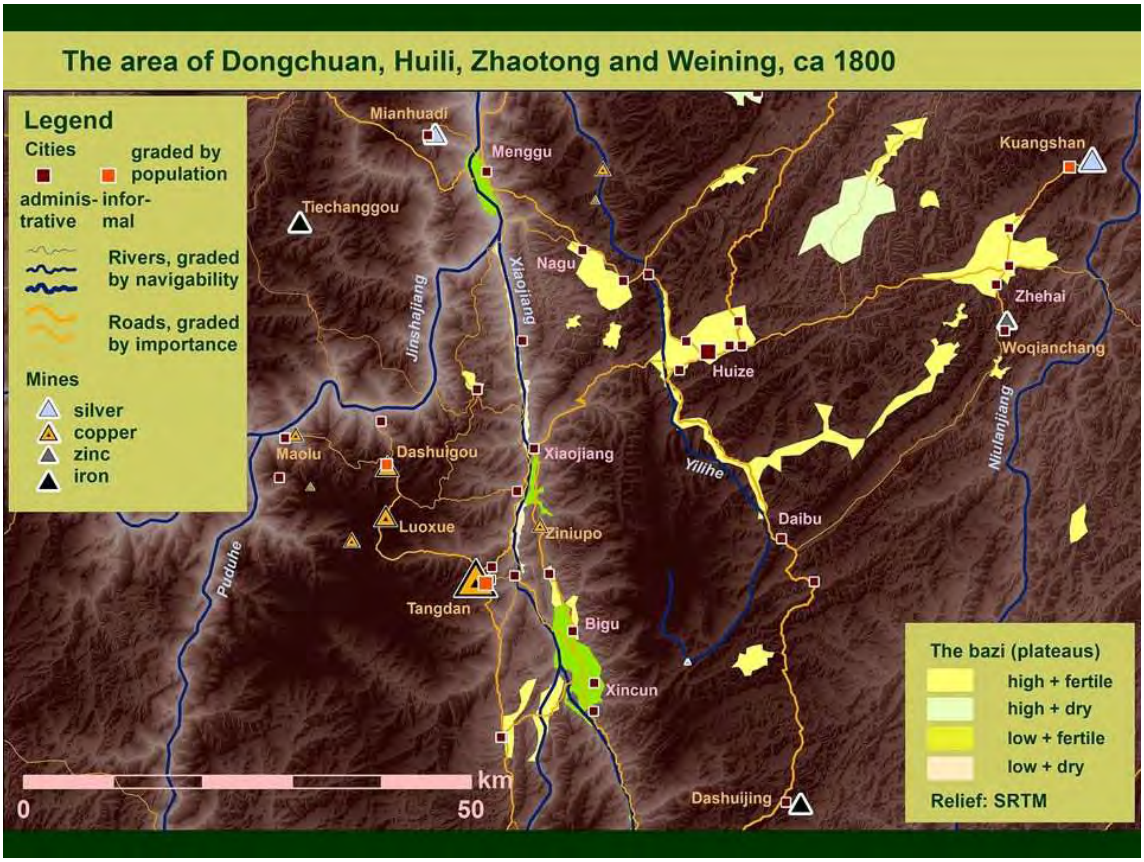


二、 矿山的寻找，开采规模的分析和矿镇与周围环境的关系——以清代东川府以及周围地区为中心

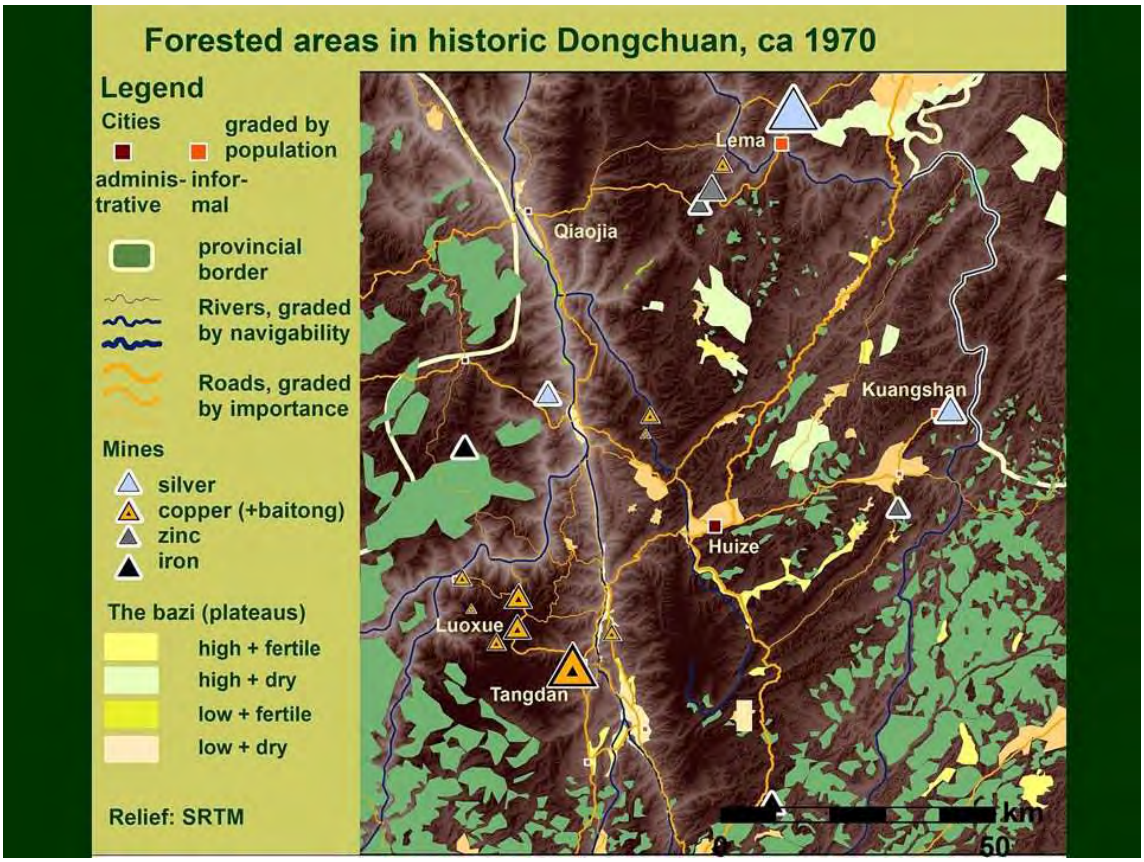
滇东北是雍正后期归云南的地区，由昭通和东川两个府组成。在乾隆、嘉庆、道光三代一百多年间东川成为“铜都”，以供北京两个铸钱局的铜闻名全国。近几年专门对银矿进行研究才发现，滇东北除了著名的乐马银矿以外，还有六个重要银矿，其中三个在清代东川府辖区。



第二幅地图介绍清代东川府以及周围地区的基本人文地理，包括城镇（相对有规模的居住区，根据人口估计反应大小）、道路网络、坪坝以及矿山。东川碌王山的铜矿十分著名，不需介绍。不过除了铜矿以外的银、锌、铁矿，我们以前不太重视，部分没有文献记载，有个别我一直到去年秋天首次到巧家县还不知道的。



第三幅地图加了地形，同时范围缩小。可见矿山离坝子有距离，一般不甚远，影响到供应运输，也说明坝子上的城镇与大部分矿镇基本环境情况有区别。



第四幅地图加了大约1970年代植剩下的森林和树林。当时被退化严重，可见树林面积不大，大矿基本在植被不好的山区。不过仔细看，地区南部树林比较好，还靠近矿区，西北巧家地区基本没有矿，反而树林退化严重。现代时期植被和清代矿业不存在直接的因果关系。

以上对东川地区基本介绍背景上，进一步介绍三个具体矿山的情况。滇东北有两个大银矿，及鲁甸县乐马厂和会泽县者海镇矿山厂。乐马厂有嘉庆到道光年间的记载，反应规模异常大，为内地第一大厂。矿山矿的情不同，根据文献规模不大，但1950年代以来有冶炼厂，几十年靠古炉渣运行。2011和2014年的照片反应目前还在开采，因近期开采古代矿洞冶炼痕迹已经比较难找。

一下简单介绍四个案例，即矿山、金牛厂、棉花地厂、和大银厂。

滇东北银矿
清代文献记载与工业资料的出入

厂名	文献记载	现代开采情况
金沙厂	1742年开，铜银矿，1774之前报税达5000两，道光年间税额在1199两	无资料
乐马厂	1767年开，铜银矿，报税高达42,532两，1829年报4,674 ，1800年前称内地第一大银厂	鲁甸矿业公司50年代以来在开采，古炉渣回收量不大
矿山厂、角麟厂倭铅厂	1800年前后开，未定税额 18世纪中叶以来有锌产额，供东川钱局，约300吨	矿山冶炼厂50年代以来到1989年靠古炉渣回收，总量达1,33万吨！
棉花地厂	1794年开，税额达5106两，1800年前缺额	无资料
金牛厂	1798年开，税额为298两（1844年还报税）	无资料
铜厂坡厂	1794年开，税额达1000两	无资料
老彝良厂	道光年间的锌矿	

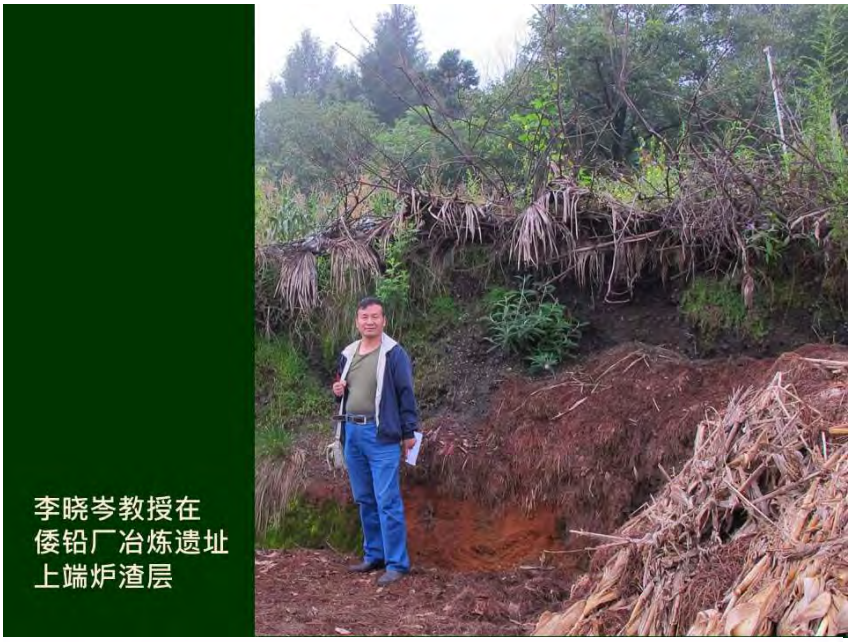
矿山厂概况：据文献记载有两个银厂，鈀矿厂和角麟厂，开厂在1800年前后，没有定税额。没有税额的银矿一般规模很小。除了银矿以外，者海地区有倭铅厂，应该是锌矿。阿那多黑铅厂可能也在这个地区。倭铅厂的锌供应东川钱局，根据铸钱量估算，每年的供应量大约为300顿，反应开采规模不小。

矿山银矿根据文献资料应该是小厂，可是建国后在者海建立冶炼厂，从1950年代到1989年为止收回炼古炉渣，据《云南会泽铅锌矿志》的总回收量高达133万吨。工业数据无疑反应一个巨大的铅银矿。

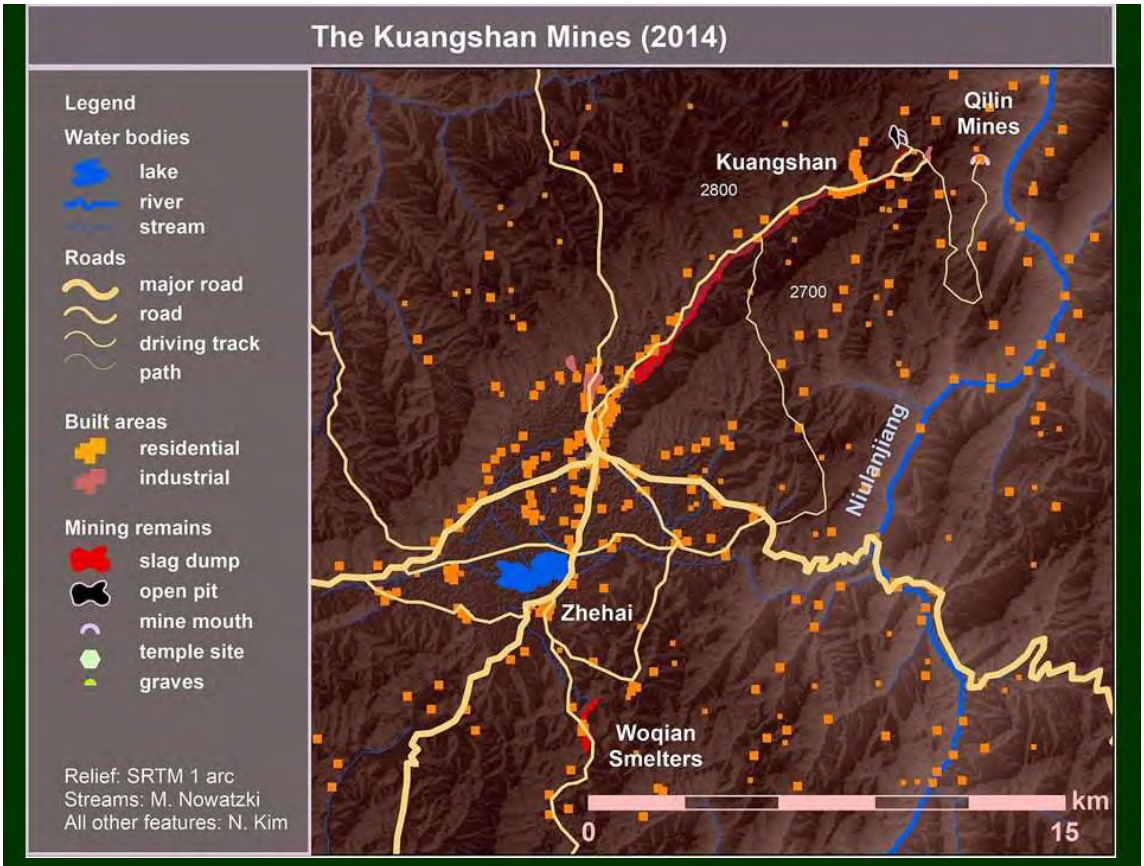
经过2014年李晓岑、杨煜达和本人进行的田野考查了解的情况：开采区很集中，因1990年代当地土法开采痕迹不多，冶炼厂分为两个地点，炼铅炉渣在矿山、炼锌炉渣在倭铅厂。炉渣规模非常大，矿区进行分布分析也反映规模之大，无疑是大矿。

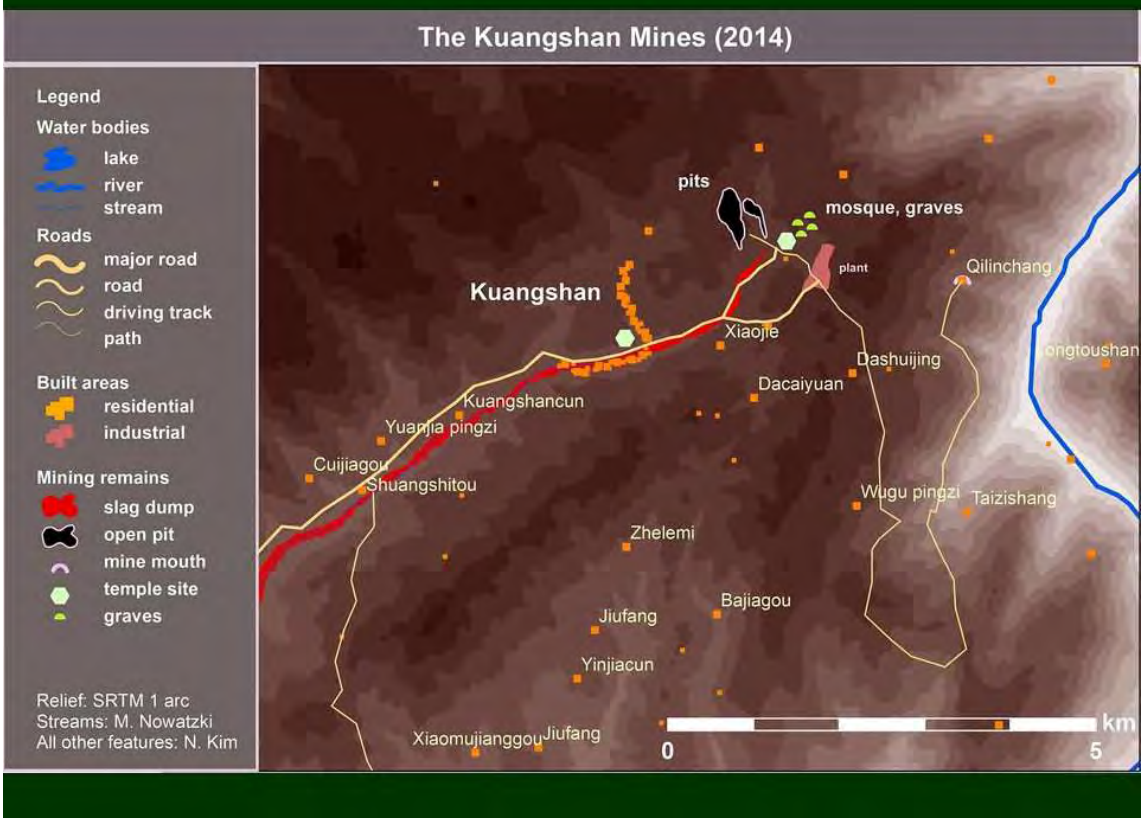

会泽县者海镇矿山厂
The Kuangshan Mines
Wangjiacun
Image © 2016 CNES / Astrium
Google Earth
Reiseführer
1984
Bildaufnahmedatum: 10/31/2014
26°38'36.20" N 103°42'55.77" O Höhe 2468 m
sichthöhe 4.61 km




李晓岑教授在
倭铅厂冶炼遗址
上端炉渣层




The Kuangshan Mines (2014)
Legend
Water bodies
lake
river
stream
Roads
major road
road
driving track
path
Built areas
residential
industrial
Mining remains
slag dump
open pit
mine mouth
temple site
graves
Relief: SRTM 1 arc
Streams: M. Nowatzki
All other features: N. Kim
Qilin Mines
Kuangshan
2800
2700
Niulanjiang
Zhehai
Woqian Smelters
km
0
15


The Kuangshan Mines (2014)
Legend
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Mining remains
slag dump
open pit
mine mouth
temple site
graves
Relief: SRTM 1 arc
Streams: M. Nowatzki
All other features: N. Kim
pits
mosque, graves
plant
Qilinchang
Kuangshan
Xiaojie
Dashuijing
Dacaiyuan
Kuangshancun
Yuanjia pingzi
Cuijiagou
Shuangshitou
Wugu pingzi
Taizishang
Zhelemi
Bajiagou
Jiufang
Yinjiacun
Xiaomujianggou
Jiufang
km
0
5

金牛厂概况：此矿文献相对多，除了正式方志以外有黄梦菊的《云南事实》，其中1840年代任会泽知县编著文件的摘录涉及到矿山和金牛的资料。根据税收记载（《道光云南通志》和《滇南矿产图略》）金牛厂开厂于1798年，税额为298两，一直到1840年代报税基本满额。税收反应一个中等银矿。可是黄梦菊的记载反应的情况决然不同，1780年代以来开采，到1790年代后期一时旺盛，年产量可能高达100顿，1799年进水，立即萎缩，之后几十年只维持小规模开采。

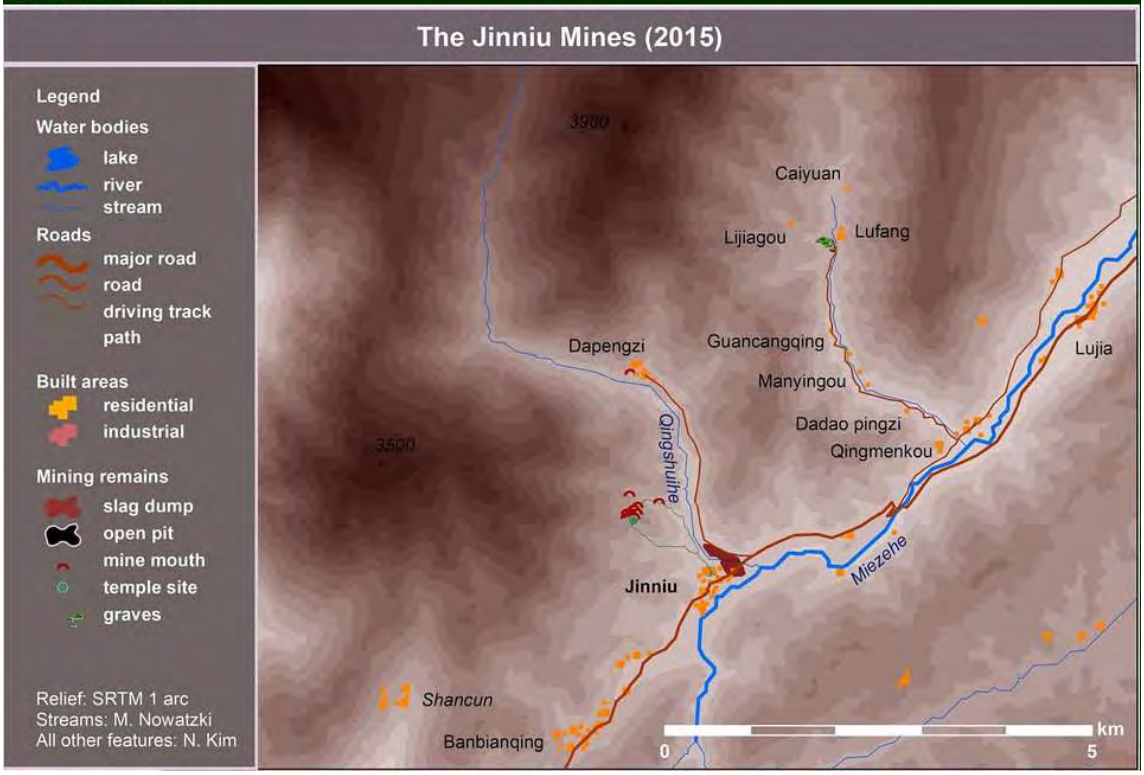
2015年的田野考查证明金牛厂村冶炼遗址和山坡上开采规模都不大，附近试采遗迹找到，规模非常小，证明黄氏记载准确，矿山已停顿几十年，税额未变。

会泽金牛厂



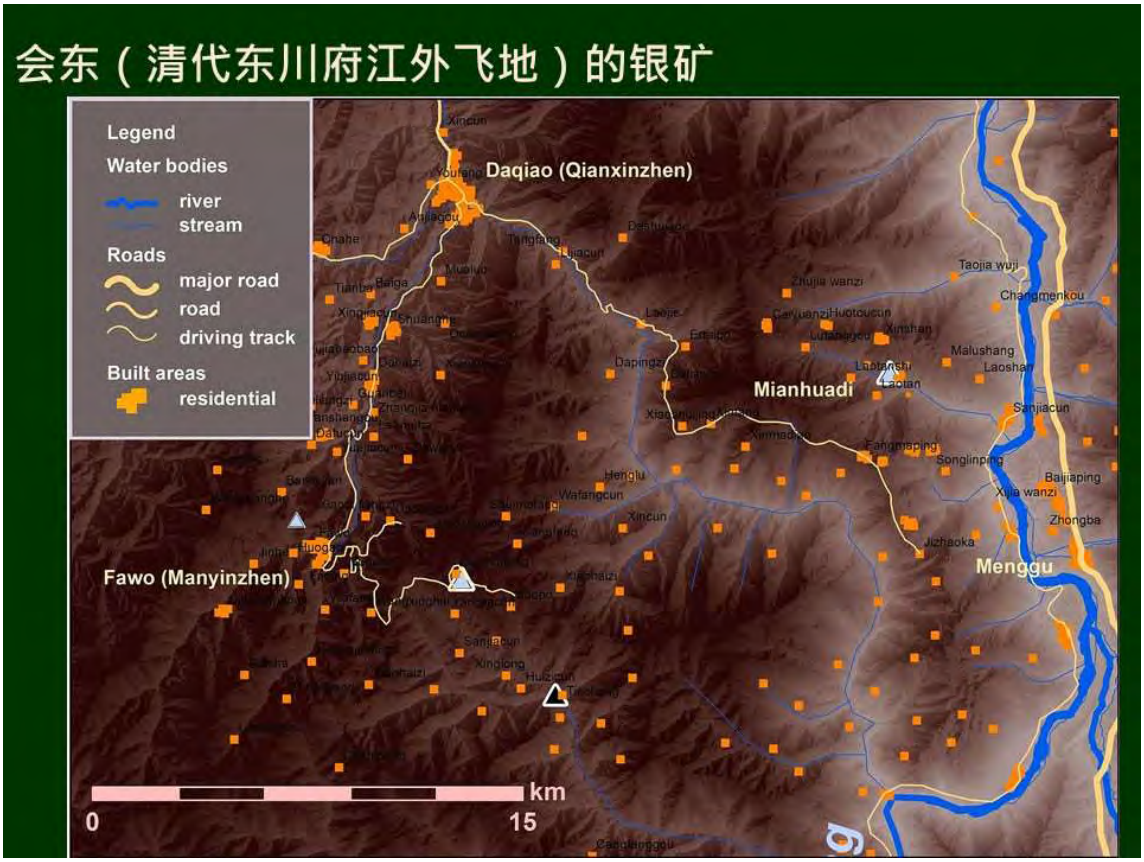
View onto Jinniu from the old road near the saddle (temple area)





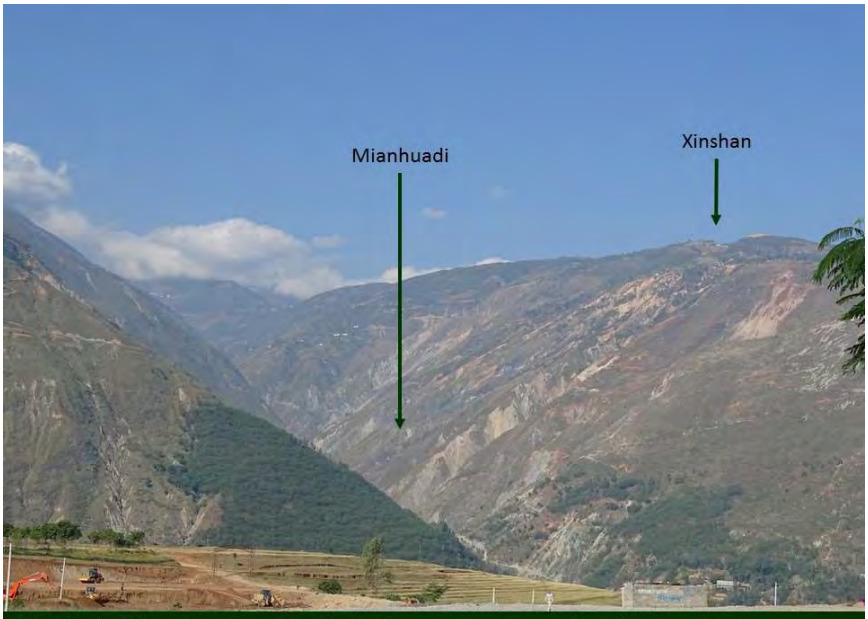
今四川会东县靠近金沙江地带2016年杨煜达和本人针对性考察棉花地银矿，发现大

桥镇古代十分重要，决定对《东川府志》提到“大银厂”这个地名进行考查，2017年刘培峰和本人进行。



棉花地厂：据文献乾隆后期一时重要，没有工业开采，现在村落很小。经过考查发现庙宇规模异常大，其他痕迹如炉渣矿洞不多。应该重要几十年到半个世纪。

大银厂：据文献只不过是地名，乾隆中期以来就有，未开采。1950年代以来附近有铁矿，规模颇大，在开采。考查反应古矿区有两个，发窝街为“老山”，大银厂非村为“新山梁子”，发窝清代属会理州，大银矿属东川，相距大约7公里。古代炉渣堆以前在发窝街村下，当地人已无有关传说，大银厂因露天铁矿村子已搬迁，有炉渣。大银厂是规模颇大，开采历史长的钴矿，疑是明代后期会川密勒山，清代可能已不开采，因而口述历史已失传。



View into Mianhuadi valley from the east bank of the Jinshajiang





Remains of the tunnel gate 槽门 near the top end of Mianhuadi village



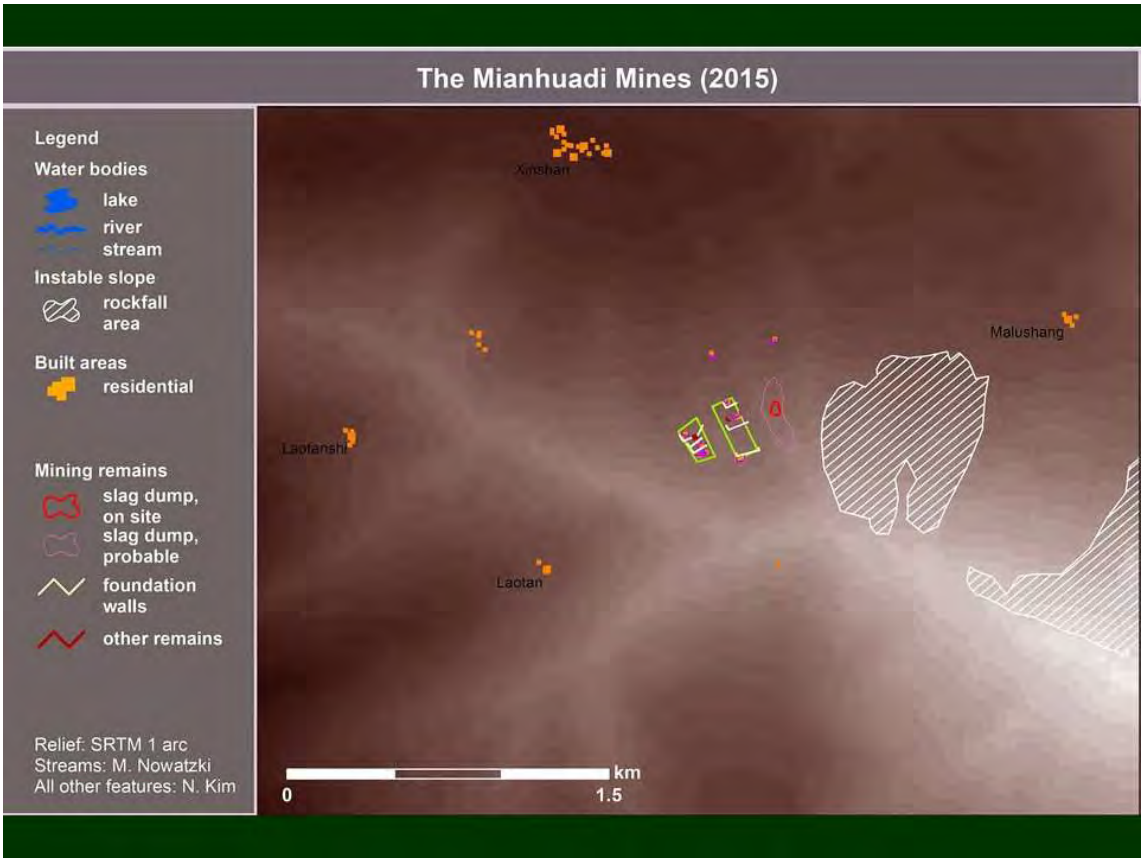
Mr. Xin pointing out remains





Old bricks and stone slabs





大银厂废村的露天矿



Satellite image (2015) showing the large-scale open pit mining at Dayinchang

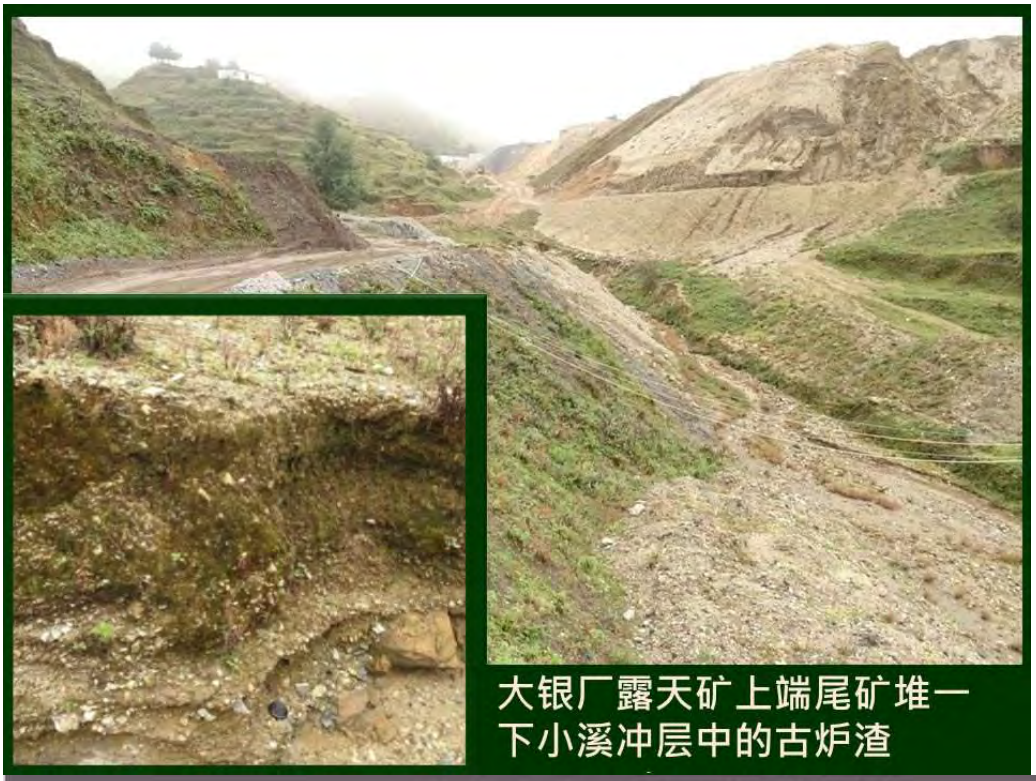


Teacher Geng and the primary school

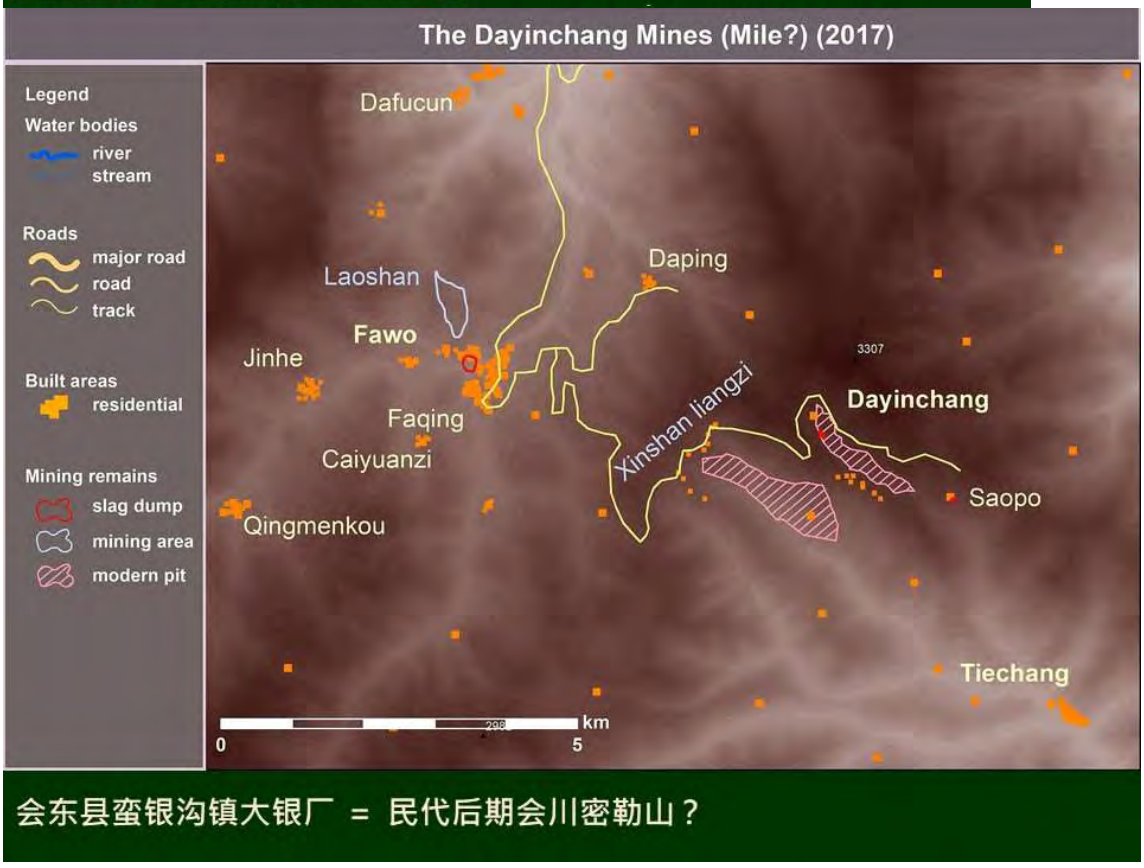
发窝街小学的耿武昌老师



发窝街后山坡上的古矿区，地名称"老山"



大银厂露天矿上端尾矿堆一下小溪冲层中的古炉渣



会东县蛮银沟镇大银厂 = 民代后期会川密勒山？

四个案例表明，明清时期矿山的具体情况不进行考查就无法判断，经过考察和分布分析才有一定的认识。能了解到的情况有限，但相对具体。

Silver mining in late imperial China: Confucian obfuscation and remains on site

Nanny Kim
Heidelberg

WEHC Boston, 2018

The problem

Silver was not a minted currency,
yet by 1450 had become the money for larger transactions

=> Demand clearly high

Yet Silver mining is represented as negligible in the official records

=> No development despite demand?

=> Effective restriction?

=> Systematic obfuscation?

Why we know so little



Scarcity of specific sources

Ming period (1368–1644)

All snippets in all records: **ca. 1 printed page**

- names (mostly in late Ming private writings): 6
- mines in Yunnan (according to an 18th century author): 23

Qing period (1644–1911)

All texts in records: **ca. 10 pages**

- Names in tax records: 43
- Known major mines: ca 50
- **But:** Names of historic mines in Yunnan recorded 1949: 147

Silver outputs reconstructed from occasional tax reports



Quan Hansheng 1976:
Reconstruction of annual outputs empirewide based on tax records
Ming: 14 t/a (total ca. 3800 t)
Qing: 17 t/a (total ca. 4500 t)

Top recorded tax revenues for specific mines
Gejiu 1707: 36,614 *liang* = 1.4 tonnes
Lema ca. 1750: 42,532 *liang* = 1.6 tonnes
Annual outputs at the official tax rate of 18%: 7 to 9 tonnes

Estimated total domestic outputs in the literature: **2,600 t**

An approach that taps new sources

Joint project with Yang Yuda (Fudan University, Shanghai)

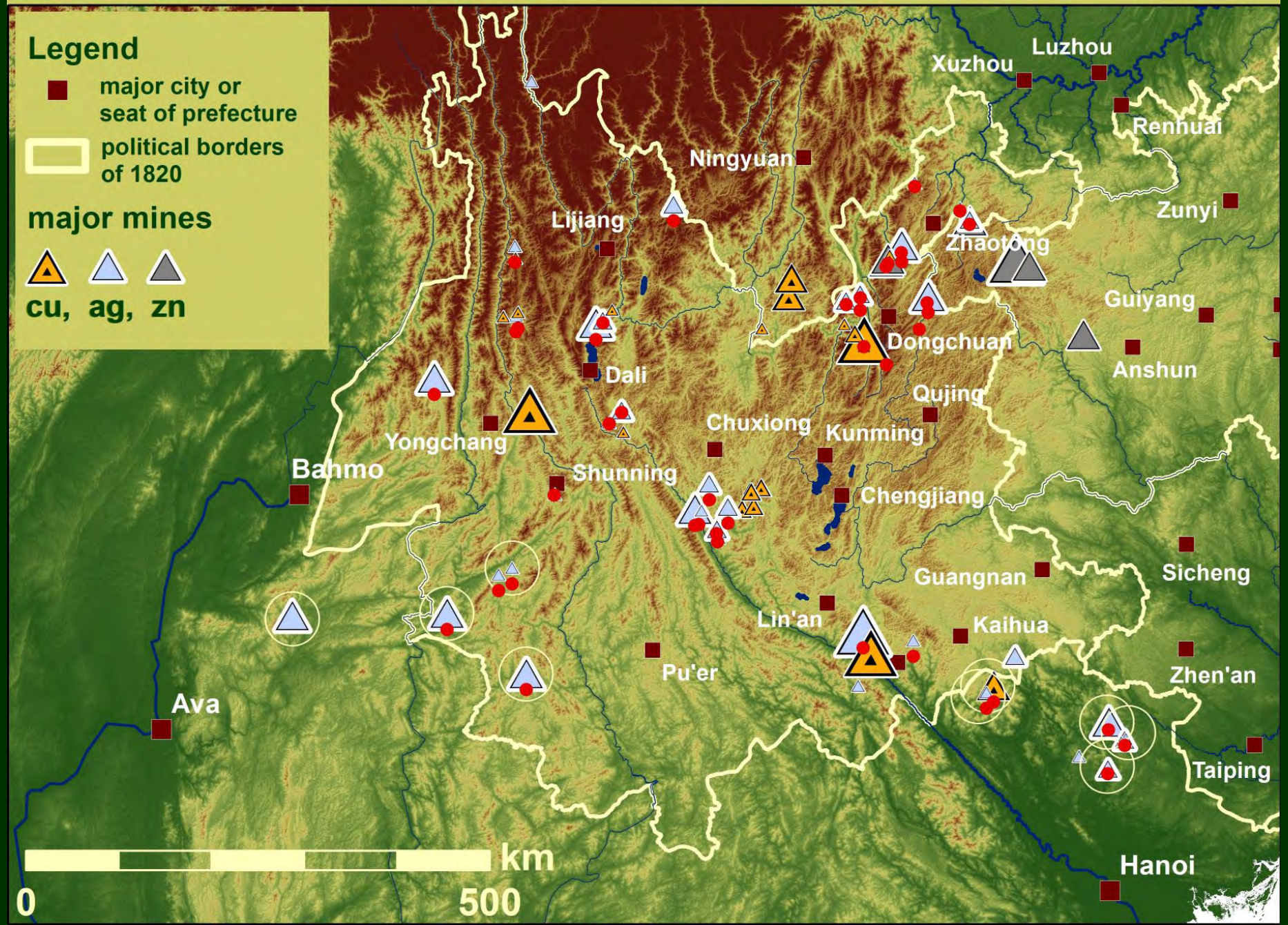
Focus on individual mining sites in the southwest and adjoining borderlands of China, Myanmar and Vietnam

New materials: industrial records on re-exploitation and fieldwork on remains on site

Some 50 major mines identified

Fieldwork on 31 sites of major mines, 3 lesser mines

Major located silver, copper and zinc mines, Ming and Qing periods



Fieldwork



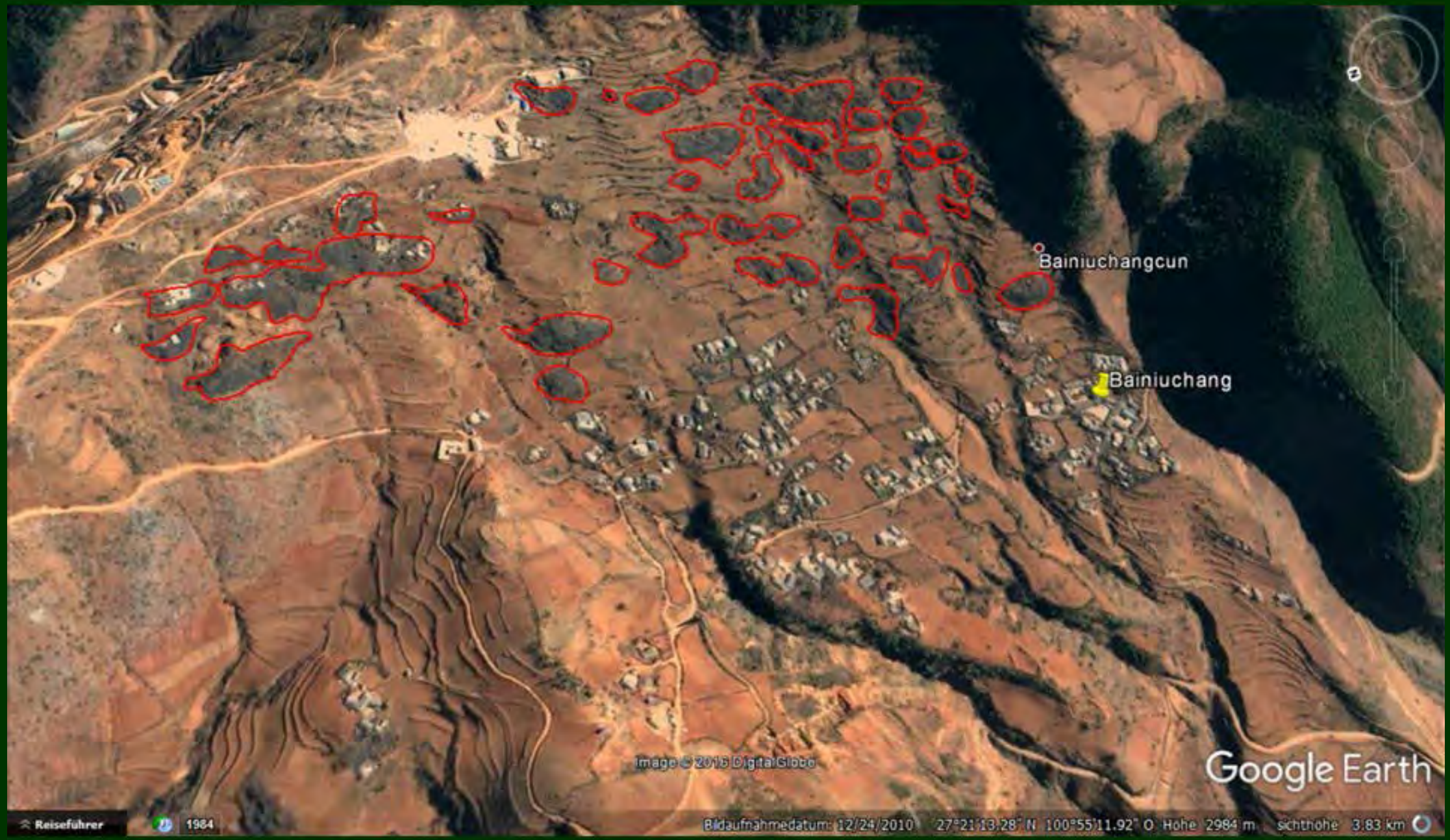
A mining gallery,
Shiyang Mines 石羊厂

The main mining slope of the
Lema Mines 乐马厂:
A ruptured limestone cone

Slag dumps



The Mingguang 明光 Mines in Tengchong



46 slag dumps visible in satellite image of 2010

Oral Histories and local knowledge





Informants at Laochang, Gengma; Fulong, Lanping and Dashuigou, Shuangbai



Remains





Mr. Peng at a grave, Malong Mines 马龙厂



Temple site and cupellation hearth,
Shiyang Mines 石羊厂

Reconstruction of total outputs based on slags

The 5 best documented mines

Reconstruction of outputs on the basis of slags, lead content, and silver yields			
Mine	Period of intensive exploitation	Slag volume (tons)	Estimated output (tons)
Bawdwin/Bolong 波竜	Ca. 1400 – ca. 1860	300,000	**3000-5000**
Munai 募迺	Ca. 1400 – ca. 1800	500,000	**2500**
Kuangshan 礦山	Ca. 1550(?) – ca. 1850	1,300,000	**2000**
Maolong 茂隆	Ca. 1550(?) - ca. 1800	1,176,165 (?)	**1500-2500**
Fulong 富隆	Ca. 1800-1850	130,000	**250-300**

Total silver outputs reconstructed on the basis of material remains and the comparative study of sites



- Ca. 150 mines worked in the late imperial southwest

=> Of these some 50 were similar or larger than the Fulong Mines that produced 250-300 tons of silver

=> Of these 9-12 were on the scale of the 4 very important mines (1000-3000 tons)

Conservative output estimate of 47 visited and/or documented sites:

30,000 tons

The reconstruction based on remains

shows that the demand for silver did lead to a considerable, continuous and expanding exploitation of silver deposits in the southwest of China (and the borderlands beyond)

⇒ **Development corresponding to demand**

=> Effective restriction? Not apparent in the southwest, but probable in the old mining regions of China proper

=> Systematic obfuscation!

The divergence between the scope of mining reflected in the official records and our reconstruction based on remains requires explanation

Output reconstructions of Chinese-operated silver mines during the Qing period, 1644-1850 (tons)			
	Average annual output empirewide	Average annual output of Yunnan province	Average annual output of the southwest & borderlands
Quan Hansheng	**17**	**13**	
Yunnan province, tax records		**13**	
Yang & Kim		**50**	**100**

Not a matter of tax evasion/corruption/illicit activity but a structural phenomenon

Obfuscation involves:

- Systematic under-representation in the official records
- Avoidance in private writings

=> Mentalities

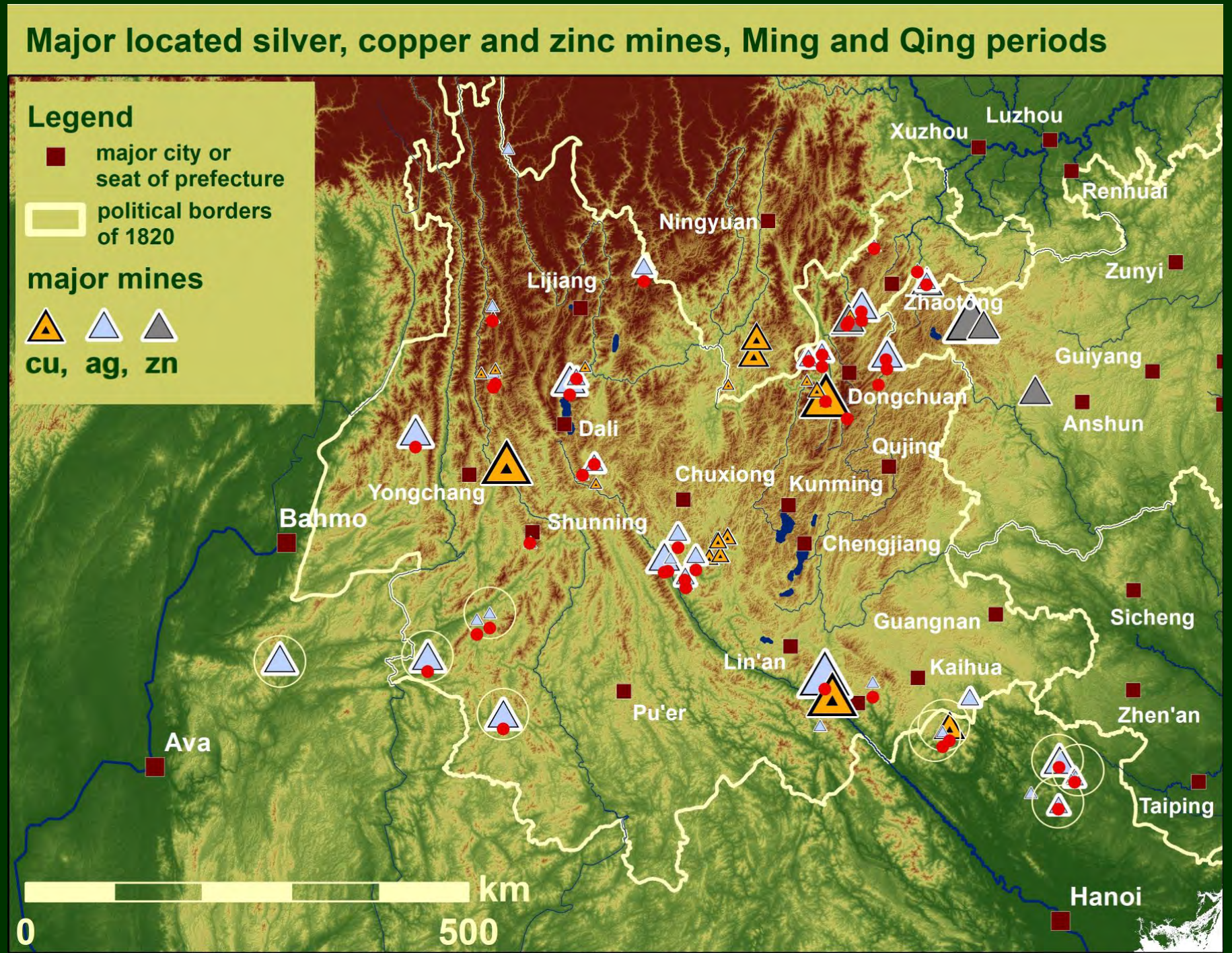
=> Administrative structures



The prefect of Zhaotong 昭通知府 in official winter outfit, photo ca. 1900.

(1) The borderland mines

for obvious reasons rarely appear in the records



(2) The purist Confucian stance: Agrarianism

人睹其利，予睹其害。
夫礦開則人聚，人聚則食廣。
雲南有限之谷，其能飼此不耕之人乎！
(倪蜕 Ni Shui, early 18th cent., quoting an early 16th cent. official)

People see profit; I see calamity.
For when mines are opened, people congregate,
and where people congregate, they consume food far and wide.
Yunnan, with its limited grain cannot feed these people who do not work the land!

(3) Administrative realities

Confucian agrarianism





- Condoning mining as an occupation of the landless poor
- Presenting mines as necessary (esp. iron and copper)
- Presenting mines as small-time exploitations by local villagers

Avoidance in the official records

A keyword search for mining-related terms in the veritable records (實錄), essays on statecraft (經世文), and searchable private writings (筆記) produces:

Under 100 entries for the Ming (1368-1644)
Over 400 entries for the Qing (1644-1911)

Over 80% of the entries are concerned with social problems caused by miners 礦徒 or with measures to control them.



Layered administrative structures

Fully official and centrally regulated structures: Minimal and hyper–stable representation, minimised tax revenue reported and forwarded

Customary regulations and practices on the local level: public and recorded locally but carefully kept out of fully official communications

=>Systematic obfuscation

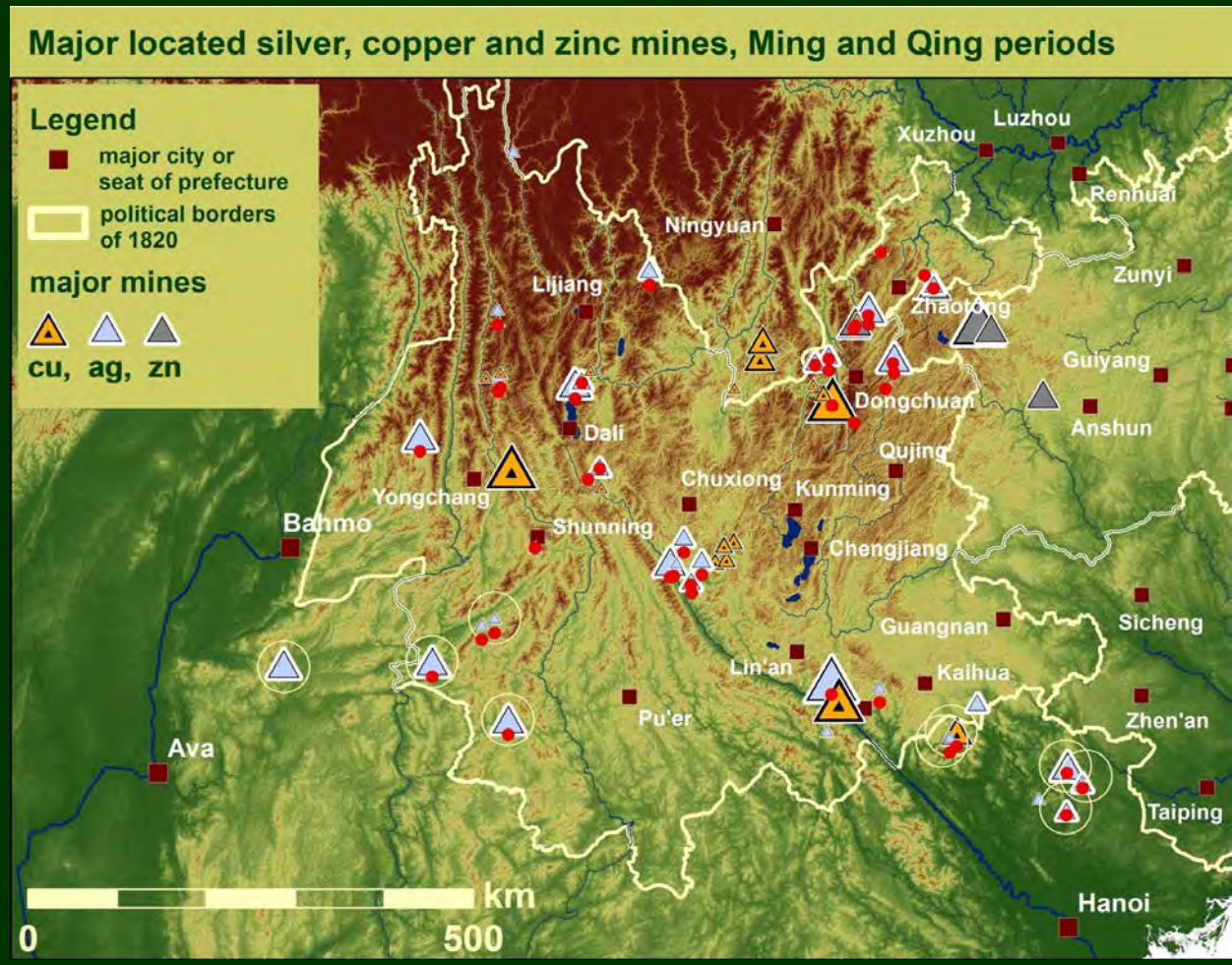


Conclusion

Reconstructed silver flows out of the southwest:
30,000 tons

Most of the silver entered the Chinese monetary market, which is still largely a black box.

Many aspects of administrative and economic realities in late imperial China were kept off the records.



Thank you!

For more on the silver mines in the Chinese Southwest and the borderlands:

http://www.zo.uni-heidelberg.de/sinologie/research/epm/