

西南三江及扬子西缘区 构造岩矿综论集

主 笔 王铠元
副主笔 孙克祥

Chief editor Wang Kaiyuan
Vice editor Sun Kexiang

The Selectcomprehensive Review on the
geotectonics pretrology and ore deposits
in Southwestern Sanjiang and the
westmargin of Yangtze Platform

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论文选集出版

马杏垣

一九九〇年

序

西南三江及扬子西缘区位居我国西南区的西南侧，北端延入青海南部，又属于西北大区。本区通常称为横断山脉区，它临近也接联青藏高原；不但是中国最著名的高原区，而且是极著名的“世界屋脊”西藏高原的东南一隅接壤区。由于自然气候、地理、地貌、交通都极特殊和困难，再加上多民族聚居、文化教育落后；故而，多年以来一直是我国的经济落后区，工农业都处于落后状态，工作条件很差，应该说是西部大开发中的最需要、最应当给予大力重视的地区。

西南三江区即是怒江、澜沧江及金沙江、红河流域的简称，而这“三大江”（四江）因受地质—地貌的控制，都呈西北—东南方向延伸通流。概要算来，此区面积达到 35 万平方公里左右；流域范围虽然不那么大，然而它在地质—地貌上的极大特殊性，却是中国自开始进行地矿调查研究工作以来，为人们所倍加注意和重视的地区。自早期一直到目前，所给予的横断山脉的美称，是十分引人入胜并常被人们所引用的，如：“横断山块断带”、“横断山区镁铁—超镁铁岩”、“横断山脉地质”等等。人们所以这样注目和重视横断山脉这一美名，其最根本的则是因为此区不单单有与全中国不同的江河、山脉走向和数条控制江河山系的大规模深断裂带，即巨型板块俯冲碰撞缝合线带，以及相应伴随的构造—岩浆—变质—成矿带；而且还是冈瓦纳与欧亚两个超级古大陆拼接—分界带的一个重要段落，而亚洲的两个巨大构造结之一的东结——“希隆横断山构造结”即出现在本区。从地质—构造—地球物理各个方面而言，本区都是应该和必然引起特别重视的地区。

作者王铠元自 1951 年起，就在此区的龙门山西南段彭县—灌县地区和周围，进行以白水河为主要铜矿区的普查—勘探工作；50 年代中期又转入以西康会理地区铜矿为主的铜、铅—锌、铁等矿产普勘。50 年代中期至六七十年代初期，在该区长期从事矿产普勘、1/100 万区调；并重点进行了滇西“八大变质带”和维西、中甸、德钦地区的火山岩及斑岩铜、钼矿床研究。所积累的资料是丰富的，所撰写的文章、论文也是有根有据、有一定理论水平的。这对目前和今后进行有关的工作和研究都有重要引用和参考价值。

80 年代初（1981 年）起，作者参加了与地科院地质所协作进行的“六五”、“七五”两轮十年重点研究的“西南三江地区大地构造与成矿关系研究”课题，在深入研究三江四条重要构造带—深断裂带—板块俯冲碰撞缝合带的同时，更伴随着进行了全区性的卫星遥感影像研究、解译和重要的变质带、岩浆带的同位素地质年代学研究。因而，创

新性的甚至是独有性的资料和见解颇多。独有性的资料和创新性的见解可概括有如下几点：

1. 首次提出和深入探讨了冈瓦纳和欧亚两超级巨大陆的“双分界带”观点：两者的接界拼合以前都认为是“单界线”，而王铠元经过研究后认为应是“双界线”，西东两界线之间为“构造转换带”或“构造过渡带”。

2. 首先提出并深入研究论述了“北澜沧江—昌宁—双江—深大断裂带—板块缝合带”，并全面探讨了其应具有“双变质带”、“蛇绿岩带”、“岩浆—火山弧带”、“俯冲—碰撞构造模式”、“同位素年龄值双值带”，以及其他特有的标志等等。

3. 首先建立了构造—变质作用同位素地质年代表和构造—岩浆活动同位素地质年代表。

4. 首先提出利用美国 4 号卫星中比例尺 1/100 万 ~ 1/50 万彩片拼接、解译彩片图和构造图。它们为进一步深入认识三江地区大地构造提供了重要佐证。

5. 首先全面研究并撰写滇西 8 个主要变质岩的系统资料、基底岩群年龄和时代划分、归属新论点。除此之外，还有一些不再多说。

总起来看，这本综合性论文集是由在本区工作研究多年的几位专家所撰写，其资料丰富，创见颇多、依据可靠、探讨深入，填补了地矿科技研究方面的不少空白。它既具有很强的实践性、实用性、参引性，又具有较高的理论性，在当前尚无相同类的专著供人们参考使用。因而，正式出版本书供同行们，特别是供西南地区的同行们参阅，应该是有不少裨益的。我们为此书的出版感到欣慰。

现在党中央已明确提出“西部大开发”的伟大战略，而这本论文集所包括的地域范围恰好是中国西部最主要枢纽地带之一，此书的出版将对“西部大开发”起到特殊作用。是以志之。

王铠元

2000 年 7 月 5 日

PREFACE

Under the energetic support and help of many comrades, this 《Elected Works of Comprehensive Themes》 is formally published finally and presented it before the geologists of the same occupation. If it has some experience to be drawn by them (of the same occupation), especially who working in southwest China into their working, research and ponderation, we would console ourselves. It is also just a bit of contribution in another respect in our life. This Work has been selected from some treatises written by myself and my partners since 1950 s, esp. 1970 s, with progression of the sixth, seventh and eighth “Five-Year Plans”. According to the contents, it is divided into three parts. Part one collected 20 pieces of themes that mainly expounded the new views regarding the tectonics in the Regions of the Three Rivers and the Yangtze western margin in southwest China; and probed into the major characters and structural evolution on the deep-reaching fault zone – Plate Subduction Zone of the two Regions all proceeded from a point of view of the Plate Tectonics. Part two collected 11 pieces of articles that paid main attention to researches into the metamorphic rocks, partial magmatic rocks in Three Rivers Region and their chronology in isotope geology; and established the chronologic scales in isotope geology of the tectono-metamorphism and tectono-magmatic activity in Three Rivers Region. Part three-the mineral deposit and remote sensing geology of satellite collected 11 pieces of themes that largely approached and established the mineral deposit, genetic features and models for some Cu, Hg, Fe, Tin ore deposits in the two Regions; and studied, processed the remote sensing images from satellite covered the whole Three Rivers Region, Yunnan Province and some important sections, and comprehensively discussed or approached corresponding structure features on this basis. This comprehensive research of good effect had been conducted by using the high-tech means in combination with practical observations in key spots. But we regretted being unable to attach the color mosaic images of 1:1 000 000 scale covered the whole Region.

Since the 3rd Plenum of 11th Central Committee of the Communist Party of China, esp. since execution of the reform and opening up policies by the country, the vigorously developing scientific researches in various fields, frequently holding symposiums for academic exchanges have greatly promoted the rapid development for geoscience and provided a favorable environment for us to write relevant themes. Some of us had the honor to take part in researches into different projects and subjects during the period of the three “Five-Year Plans”. Without such favorable conditions and excellent situations created by our Party, this Selected Works is impossible to be written and published. We owe further developments and improvements in China’s science and technology to the

Central Committee of CPC.

The Regions of the Three Rivers and Yangtse west margin in southwest China are adjacent to the unique Ridge of the Qingzang Plateau, and of the famous Hengduan Mountains Ranges and several Rivers in our country, esp. the intercontinental Plate Suture Zone which has been concerned about by geologists at home and abroad of which there were the matching zone and "transitional transform zone" in important fragments between the Two Supercontinents of Gondwana land in East Tethys and Eurasia. Besides, accompanied with these characteristic structures, diversified, changeable and very complicated tectonic characters and geomorphological landscape appear, e. g. the Hutiaoxia of Jinsha River (with a relief of 3 800m) and Meilixueshan (difficult to climb up even for mountaineering expedition), etc. The most important "Tectonic Zone of Demarcation" in South China consisting of the Lommeshan orogenic belt and Jinhe-Erhai zone, and their extensions southeastward-Honghe Suture Zone has been one of the concerning about focuses by multitudinous tectono-geologic scholars for several decades. Many categories of large, medium and giant scale of ore deposits (e. g. Cu, Mo, Zn, Pb, Pt, Hg, Au, etc.) occur in the two Regions. They are new achievements achieved from reconnaissance survey, exploration and researches in recent years, and will be concerned about and exploited in several years to come. For this reason, to summarize, expound, compile and print these results obtained from work and researches done into a volume are of significance.

This Selected Work's major features lies in its distinct regionalism-just located in the matching (or adjacent) zone of the two Intercontinental Huge Continents (Gondwana and Eurasia) and three geotectonic units in China. Under the guidance of the theory of plate tectonics, using two advanced means of the chronology in isotope geology and satellite remote sensing, the Works expounded the basic problems on tectonics, petrology and metallogeny, etc. put forward some new cognition and original ideas which were mostly confirmed by practice. In the "tectonics" part, the author first advanced that the two supercontinents of Gondwana and Eurasia should be the "matching zone of double boundaries" not be the "junction zone of a single boundary", with a "transition or transform zone" lying between the "west boundary" and "east boundary"; and up to now without any basement rock group which definitely belonged to the two supercontinents being discovered; this understanding is more approach to the practice of the tectonic evolution. The author also expounded the established marks and relevant situation specifically, in depth and in detail for the four intercontinental huge plate suture zones. In part of the "petrology and isotope geology", in addition to expounding the metamorphic rocks in western Yunnan earlier on, the author first put forward the "chronologic scales in isotope geology of tectono-metamorphism and tectono-magmatic activities in Three Rivers Region", making it smoothly connect with that in the whole country, and providing correlation bases and filled in the gaps. In mineral deposit part, in addition to expounded and explored the copper deposits of Pengxian of Sichuan, Huili of Xikang, and mercury deposit in Baoshan, Dahongshan iron-copper deposits of Xinping, Yunnan Province worked done in early phase, the author first advanced the structure control and division on metallogenic epoch regarding

the metallogeny from the metallic element assemblages in the whole Three Rivers Region; consequently combined the metallogeny closely with the plate tectonics specifically and unitedly. The author made detailed interpretations in remote sensing geology for the correspondence situations of structures between images and practice covered the whole Three Rivers Region and Yunnan Province; and explained the basic situations on the 《Geological Maps of Yunnan Province in first Generation of 1:3 000 000 Scale》 in passing. We regretted being unable to attach this set of color map and the united stratigraphic scales.

On this occasion of publishing the 《Selected Works》, I'm particularly grateful to the senior geologists: Professor Huang Jiqing for his guidance and help in many times respectively in 1950 s and 1980 s; Prof. Li Chunyu for holding the consultant of the Three Rivers Tectonic Subject in the sixth "Five-Year Plan" by himself, and making specific guidance and help to those work and researches; Prof. Cheng Yuqi and Ma Xingyuan for the written "inner title of the book" and "dedication" separately; Prof. Dong Shenbao for his new ideas and specific guidance to the "Researches into Metamorphic Rocks in Western Yunnan"; Prof. Liu Dongsheng for giving his concerns and support to the publication of the 《Works》.

Many articles in this 《Elected Works of Comprehensive Themes》 have referred to and quoted the materials of data from many geologists of a trade, the attached maps were all drawn by Engineer Guo Shaowu, and comrades Liu Yunyu, Cheng Jing and Wu Jijian, etc. I here by express my heartfelt thanks together.

By Wang Kaiyuan
May 1998 in Kunming

前言

经过不少同志的大力帮助和支持，这本书终于正式出版与地矿同行们见面了；如若能对同行们尤其是西南区同行们的工作、研究和思考有一些裨益的话，我们也就感到欣慰了。这也算是我们几个人工作一生在又一个方面的点滴奉献吧。此集文章选自我们及合作者从 50 年代开始，特别是自 70 年代以来，随着“六五”、“七五”及“八五”计划的工作进展而撰写的一些论著编辑而成。根据文章内容划分了三个部分：一、大地构造，收入 17 篇，主要包括有关西南三江及扬子西缘区的大地构造新见解的论述，都是以板块构造观点探讨两区的深断裂带—板块俯冲带的主要特征及构造演化。二、岩石及同位素地质，共收入 8 篇，主要为滇西和三江区变质岩、部分岩浆岩和它们的同位素地质年代学研究，并据以建立了三江区构造—变质作用同位素地质年代表和三江区构造—岩浆活动同位素地质年代表。三、矿床及卫星遥感地质，收入 6 篇，主要包括两区某些铜、汞、铁、锡矿矿床地质和成因特征及模式的探讨和建立，以及三江全区、云南省和重要地段的卫星遥感影像研究和处理成果，并据以综论或探讨相关的构造特征，这是一项使用高科技手段结合重点实际观察而进行的综合研究，效果颇好。但可惜不能将全区 1/100 万彩色镶嵌片附上，应算是个遗憾。

自中国共产党十一届三中全会以来，特别是自我国实行改革开放以来，各学科学术研究事业蓬勃发展日甚活跃；各种学术性交流研讨会时常举行，大大促进了地质科学的快速发展，为我们撰写有关论文提供了有利环境。我们几人都曾有幸参加不同项目、不同课题的三个五年计划，从而为合作撰写此论文集所选编的文章提供了条件，如无这种大和小的有利环境条件，此论文集也是不可能出版面世的。改革开放的政策为我国科学技术进一步发展，为我国科学技术进一步提高创造了大好形势。

西南三江和扬子西缘区，既邻接地球上独有的“世界屋脊”——青藏高原，又有我国著名的横断山带和多条著名江河，尤其还有国内外同行所关注的具有洲际性板块构造缝合带，其中就有位居东特提斯的冈瓦纳与欧亚两超级大陆重要段落的拼合（接）带及“过渡转换带”。另外还有与这些特征构造相伴随出现的多种多样、变化多端和极其复杂的大地构造特征和地貌景观，如金沙江虎跳峡（水面与峰顶高差约 3 800 米）及梅里雪山（专业登山都很难攀登）等等。龙门山造山带与金河洱海带向东南延联接红河缝合带，是中国南方最重要的“构造分界带”，也是数十年来，诸多地质构造学家所关注的焦点之一。两区还有丰富的多种大、中型以及超大型矿床，如 Cu、Mo、Zn、Pb、Pt、Hg、Au 等，都是近些年来以及今后若干年内普勘研究新成果而被关注和开发利用。因

而，把已经工作过和研究过的成果予以总结论述、汇编成集，是很有意义的。

此综论集主要和重要的特点在于它有鲜明的地区性，位于具有洲际性的两个巨大大陆（冈瓦纳、欧亚）和中国三大构造单元的拼接或临接带。应用板块学说为指导对构造、岩石、成矿等基础问题，运用同位素地质年代学和卫星遥感等两大先进手段加以论述，提出了一些新认识和新创见，大都得到了实践验证。第一部分“大地构造”的文章中，（首先）提出冈瓦纳与欧亚两巨大陆应是“双界线拼接带”而不是“单界线接合带”，在“西界线”和“东界线”之间为一“过渡带或转换带”；迄至目前转换带中尚未发现有确属两巨大陆的基底岩群，这样理解更接近于构造史的实际。在此部分中还较具体、深入而详细地论述了四条具洲际性巨大板块缝合带的标志和相关情况。在第二部分“岩石与同位素地质”中，除较早论述滇西变质岩外，首次提出“三江构造变质作用和构造岩浆活动同位素地质年表”，这就为三江与全国的变质作用和岩浆活动同位素地质年代表顺利联接，既提供了基础也填补了空白。第三部分矿床地质文章中，除论述探讨了早期工作过的四川彭铜、会理铜矿和保山汞矿以及新平大红山铁铜矿床外，还首次提出三江全区金属元素组合成矿的构造控制和成矿期划分；从而具体和统一地把成矿与板块构造紧密联系起来。第三部分的遥感地质方面，详细判译三江全区和云南构造与实践结合情况；也顺带说明《1/300万第一代云南省地质图》基本的和主要的情况，但也可惜不能附上这幅彩色图和统一地层表。

在本书正式出版之际，要特别感谢多位前辈地质学家：黄汲清教授分别在 50 年代和 80 年代都曾给予多次指导和帮助；李春昱教授亲自担任了“六五”三江大地构造课题顾问，具体指导和帮助三江大地构造的工作和研究；程裕淇和马杏垣两位教授分别给本书题写“内页书名”和“题词”；董申保教授为“滇西变质岩研究”提出了有益见解和具体指导；刘东生教授为本书出版给予了很大的关心和支持。

书中的不少文章参引诸多同行们的资料或数据；文章中的附图均由郭绍武工程师和刘云玉、陈景、吴继艰等同志代为绘制。特在此一并致以深切的谢意。

王铨元 孙克祥

2000 年 5 月于昆明

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