康滇地区前震旦纪地质与成矿

冯本智 等著

地质出版社

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内 容 提 要

本书主要是根据作者对本区实际研究成果（1982—1985），并参阅了前人所积累的丰富地质资料撰写而成的。

书中运用了近代变质地质学的观点，系统地总结了康滇地区（地质构造位置上是指扬子准地台西缘）晚太古宙—元古宙各时代变质岩系的层序、岩石组合、原岩建造、变质相和相系、变质作用的期次和时代、花岗质岩石的类型、特征及其成因；讨论了变质作用的类型、物化条件、时空变化规律以及其所反映的大地构造环境和本区的地壳演化。提出扬子准地台前震旦纪基底具有双重构造及在太古代基底解体分裂后，演化为元古代裂谷构造的观点。本书最后阐明了前震旦纪一些重要的铜、钒-钛-铁、锡矿床的成矿规律与形成机制。

本书可供岩石学和矿床学等方面的科研、教学和生产工作人员参考。

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前　言

中国扬子准地台西南边缘属黄汲清所划分的"康滇地轴"。在地理位置上位于云南中部和四川西部，即为康滇地区。该区分布有三套前震旦纪变质岩系，其一包括会理群、昆阳群、板溪群等浅变质岩系；其二为河口群、大红山群浅中级变质岩系；其三为康定群、苴林群等中高级变质岩系。其中大红山群、河口群、昆阳群、会理群内分布有铁、铁-铜、铜、镍、锡石等矿床，大部分矿产在国民经济中占有重要地位。近年来，通过各种比例尺的地质测量及专题研究，在地层的划分对比、成矿规律等方面都取得较明显的成绩。认为上述会理群、昆阳群的时代属元古宙，主要为晋宁期构造旋回的产物。它们基本上可与扬子准地台北部、东部的前震旦系，诸如：火地垭群、神农架群、梵净山群、冷家溪群、四堡群、张八岭群、九岭群一修水群、双溪坞群等相对比。

至于前人所称的"康定杂岩"虽然研究已久，由于问题复杂，自然地理条件不佳，加之测试技术满足不了要求等原因，长期以来对"杂岩"的认识始终没有统一。"康定杂岩"北起四川的康定、泸定，向南过石棉、冕宁、西昌、米易、渡口，然后进入云南东部延伸至元谋一带。从本世纪的30—40年代开始，我国老一辈地质学家谭锡畴、李春昱、张兆瑾、黄汲清、程裕淇等都到该区工作过，大家一致认为该"杂岩"属前寒武系，有的人将其划入太古界。他们的发现与研究为以后的工作打下了良好的基础。50年代，秦正将渡口铁矿区的地层划为前震旦系，自上而下分为冷水箐层与花岗片麻岩。60—70年代，在本区开展了系统的1:20万区域地质调查工作，四川省第二区测队提出"康定杂岩"是由变质岩和某些岩浆岩经混合岩化作用而形成的，混合岩化作用的时期为澄江期；同期云南第三地质队在元谋地区将前震旦系自下而上分为阿拉益组、普登组、路枯模组、凤凰山组和海资哨组，以后，曹仁关将普登组—海资哨组称为苴林群。吴懋德将元谋、新平等地的变质岩系总称为龙川群，并进一步划分为上部大田亚群、下部大红山亚群。80年代以来，贺节明、骆耀南、刘俨然等对由康定到渡口、元谋的前震旦纪变质岩与花岗质岩石做了不同程度的研究，取得了不少新的认识，特别是骆耀南提出："康定杂岩代表高级变质地体，元谋普登组和花岗岩类岩石组成绿岩-花岗岩区，它们都属于太古宙"*。总之，这些研究对"康定杂岩"、元谋片麻岩的认识有不少的提高，但从变质地质学的观点来看，研究还不够深入、全面。

近几年来，结合四川变质图的编制，我们与攀西大队区调三队变质岩组共同在本区开展了变质地质学的研究，工作范围北自康定、泸定、沿大渡河至石棉，过拖乌、冕宁，沿安宁河，南至金沙江附近的渡口、会理，然后进入云南的元谋、东川、易门以及哀牢山、苍山等地，调查了这一带的变质岩系及有关的重要金属矿床。通过工作所取得的成果包括：建立了晚太古宙的康定群及其层序，在区内与有关的地层进行了对比；确定了康定群的变质作用类型、变质相系及有关的递增变质带；恢复了康定群的原岩建造及其变化；研究了康定群内分布广泛的花岗质岩石，确定它们是属于与混合岩化有关的片麻状奥长花岗岩-

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* 骆耀南：康滇构造带的古板块历史演化（攀西地质，1982，1期）

片麻状英云闪长岩类；对河口群、会理群重点研究了其沉积岩相、火山岩相、岩相组合及其成因，在此基础上恢复了两群的古地理环境；重点研究了前震旦纪有代表性的铜矿床、钒-钛-铁矿床和锡矿床的特点及其成因。

根据以上研究，确定扬子准地台的基底具双层结构，总结了两套前震旦纪地层的差异和相互关系，从而进一步阐述了我国西南地壳的早期演化规律及前震旦纪的成矿作用。

本书就是根据这些研究成果撰写的。除前言外，全书共分九章，其中前言由冯本智撰写，第一、四章由卢民杰、冯本智撰写，第二、三章由卢民杰撰写，第五章由冯本智、文琼英撰写，第六章由冯本智、卢民杰撰写，第七章由张治中撰写，第八章由杨天奇、姜修道撰写，第九章由彭齐鸣撰写，最后由冯本智统一修改定稿。

在完成本项科研工作中，四川省地矿局张云湘、郝子文总工程师、攀西地质大队胡炎基、谢贻谋、邢抚京、周信国等工程师给予了大力支持与帮助，使野外工作能顺利进行。在撰写过程中，长春地质学院领导、地质系领导曾给予了热情的关心与指导，在此致以衷心的感谢。

此外，作者还参阅了四川、云南、贵州地矿局所属有关地质队、区调队及四川、云南冶金地质勘探公司所属有关地质勘探队的许多已刊或未刊的文献，因限于篇幅不能全部列出，特此致歉。

著　者

1987年12月于长春

PREFACE

The southwest margin of Yangtze Paraplatform was previously named "Kangdian axis"by Huang Jiqing, which extends geographically from central Yunnan to west Sichuan, known as Kangdian area. Three types of pre-Sinian rock formations occur in this area. The first one is the low-grade metamorphic rock series including Huili, Kunyang and Banxi Groups; the second is the low- to medium-grade metamorphic rock series such as Hekou and Dahongshan Groups; and the third includes Kangding and Julin Groups which are medium- to high-grade metamorphic rock series. Fe, Fe-Cu, Cu, Ni and Sn deposits have been found in Dahongshan, Hekou, Kunyang and Huili Groups, most of which are economically important. In recent years, significant progress in stratigraphic classification and correlation and metallogenic study has been achieved through geological survey and investigation. The Proterozoic Huili and Kunyang Groups were the products of Jinning orogeny, which might be comparable with the pre-Sinian rock formations in the east and north parts of Yangtze Paraplatform, including Huodiya, Shennongjia, Fanjingshan, Lengjiaxi, Sipu, Zhangbaling, Jiuling—Xiushui and Shuangxiwu Groups.

"Kangding complex" has a long history of investigation, but no agreement has been reached due to its complexity, unfavorable geographic environment and inadequate analysis techniques.

"Kangding complex" starts in the north at Kangding and Luding, Sichuan and extends to the south through Shimian, Mianning, Xichang, Miyi, Dukou to Yuanmou, Yunnan. From 1930's to 1940's some Chinese pioneer geologists such as Tan Xichou, Li Chunyu, Zhang Zhaojin, Huang Jiqing and Cheng Yuqi worked there and ascribed "Kangding complex" to Precambrian consistently, someone regarded it as Archean. These laid an important foundation for the further work. In 1950's, the stratigraphy in Dukou iron mine district was declared as pre-Sinian by Qin Zheng, who subdivided it from top to bottom into Lengshuiqing beds and granitic gneisses. During 1960's to 1970's systematic 1/200000 regional geological survey was carried out in this area. The Second Regional Geological Surveying Party of Sichuan declared that"Kangding complex" was formed through migmatization of metamorphic rocks and certain types of magmatic rocks during Chengjiang episode. Meanwhile, the pre-Sinian in Yuanmou area was subdivided from bottom to top into Alayi,

Pudeng, Lukumo, Fenghuangshan and Haizishao formations by the Third Geological Party of Yunnan. Afterwards Pudeng—Haizishao formation was named Julin Group by Cao Renguan. Wu Mao de named the metamorphic rocks in Yuanmou and Xinping as Longchuan Group which might be subdivided into Datian Subgroup above and Dahongshan Subgroupbelow. Since 1980's He Jieming, Luo Yaonan, Liu Yanran and others conducted research on the pre-Sinian metamorphic rocks and granitoids in Kangding—Dukou—Yuanmou area. Significant new recognition has been reached, especially Luo Yaonan's opinion suggesting that" the Kangding complex represents the high-grade metamorphic terrane while the Pudeng Formation and the granitoids of Yuanmou constitute a greenstone—granite belt, all of which are Archean.". It thus can be seen that obvious progress has been achieved in the recognition on "Kangding complex" and Yuanmou gneiss. In the view of metamorphic geology, however, these are far from satisfactory.

In recent years, combined with the compilation of the metamorphics Atlas of Sichuan the authors conducted research on metamorphic geology in cooperation with the Metamorphic Rock Division, the Third Regional Geological Surveing Team of Panxi Geological Party. The work covered Kangding, Luding, along Dadu river to Shimian, Tuowu, Mianning, along Anning river to Dukou, Huili, Yuanmou, Dongchuan, Yimen, Ailao Mountain and Cangshan Mountain. The survey involved the metamorphic rock series and associated ore deposits. Following progresses have been achieved: establishment of the Archean Kangding Group and its sequence and correlation with relevant strata in the region; identification of the facies series type of metamorphism and progressive metamorphic beltin Kangding Group; restoration of the protolith rock formation of Kangding Group and its variation; affirmation that the widespread granitoids in Kangding Group are gneissic trondhjemites—gneissic tonalites related to migmatization; identification of the sedimentary facies, volcanic facies, facies assemlages and genesis of Hekou and Huili Groups and restoration of the paleogeographic environment; recognition on the characteristics and genesis of the significant pre-Sinian Cu, V-Ti-Fe and Sn deposits.

On the basis of the above, mentioned, it could be assured that the basement of Yangtze Paraplatform is characterized by two-layer model. The authors synthesize the differences and relation between these two layers and, further more, illustrate the early evolution history of the crust of southwest China and the pre-Sinian metallogeny.

Aside from the preface, this monograph consists of nine chapters. The preface was written by Feng Benzhi, Chapter1, 4 by Lu Minjie and Feng

Benzhi, Chapter 2,3 by Lu Minjie; Chapter 5 by Feng Benzhi and Wen Qiongying; Chapter 6 by Feng Benzhi and Lu Minjie; Chapter 7 by Zhang Zhizhong; Chapter 8 by Yang Tianqi, Jiang Xiudao and Chapter 9 by Peng Qiming. The manuscripts were checked by Feng Benzhi.

We must express our gratitude to chief engineers of Sichuan Geological Bureau Zhang Yunxiang and Hao Ziwen, engineers of Panxi Geological Party Hu Yanji, Xie Yimou, Xing Fujing and Zhou Xinguo for their help and support during the research, which made the field work successful. we are also in debt to the leaders of our College and Dept. of Geology for their kind care and instruction during writing and editing.

Authors, in Changchun

December, 1987

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