The Discussion on Division of Mesozoic Intrusive Rocks around the Songliao Block and Ore-forming Series

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Abstract: The peripheral zone of Songliao block has been affected by the activities of North China Plate, Siberia Plate and Pacific Plate for a long time, and has formed multiple periods of magmatic rock intrusion events. Especially after getting into Mesozoic era, frequent intrusion activities have formed a large number of deposits related to intrusive rock. Therefore, Mesozoic era is also known as “Metallogenic era”. According to the characteristics of Mesozoic intrusive rock periphery of Songliao block and the relationship with ore-forming. Divide it into two intrusive rock provinces, three intrusive rock zones and seven ore-forming series.

Taking the Nenjiang fault as the boundary, divd the Songliao fault into two intrusive rock provinces, Great Khingan Mountain and Hejialiao. The Heigliao intrusive rock province is divided into the Lesser Khingan Mountain intrusive rock zone in the north, the Changbai Mountain intrusive rock zone in the east, and the Qilaotushan intrusive rock zone in the south, basing on Taxi-Linkou Fault, Shenyang-Xunke Fault (the north of Tanlu Fault) and Chifeng-Kaiyuan Fault.

(1) Triassic-Jurassic polymetallic ore-forming series related to intermediate-acid-alkaline magmatic intrusion. Indosinian movement, early Yanshan movement and the continued subduction of the North American plate to the Eurasian plate provide a favorable environment for magma intrusion in the region, thus forming many intrusive rock polymetallic deposits or poly metallic deposits after the late reformation by intrusive rock in the period. Typical deposits include silver, lead and zinc polymetallic deposits such as Qingehezii in Dandong and Bayendaba in Kirchtenstein. (2) Late Triassic-Early Jurassic porphyry type, fine network vein type and skarn type polymetallic ore-forming series. Influenced by the intrusion of magmatic rocks in the early and mid-Yanshan, the lithosphere transitioned from full compression to extension. The transformation causes the deep molten material to rise and form a large-scale medium-acid magma intrusion. The medium-acid magma intrusion has contact metasomatic mineralization with Paleozoic, forming skarn type polymetallic deposits such as Huanggangliang and Cuihongshan. On the other hand, with the increase of magmatic hydrothermal fluid, decomposition and atmospheric precipitation, the content of volatiles such as CO₂ in the hydrothermal fluid increases, often causing the boiling of fluids. It forms fine vein-like molybdenum mineralization with the medium-deep granitic rocks forms earlier, and forms fine vein-disseminated porphyry molybdenum mineralization in the shallow porphyry. (3) Middle-Late Triassic, magmatic Cu-Ni sulfide deposits ore-forming series. It mainly exists in the type I and type A granites. The ore is formed by three methods: deep magma melting, intermediate magma separation and crystallization, and late hydrothermal enrichment. (4) Early Jurassic-early Cretaceous porphyry, hydrothermal vein, epithermal and skarn deposit ore-forming series related to intermediate-acid volcanic intrusive activities. The North American Plate continued to subduct toward the Eurasia plate, and the subduction of the Paleo-Pacific plate to the Eurasian continent was also gradually increasing. Under the influence of the tectonic movement, intermediate-acid volcanic and magmatic rock were widely developed, and they formed a series of typical deposits such as medium-high temperature hydrothermal vein type molybdenum deposit of granite mountain type, low sulfide epithermal type gold deposit of Sandaowanzi type, etc. (5) Early Cretaceous Sn-Fe-Cu-Mo-W-Ag-Pb-Zn-Rare Earth ore-forming series related to magmatic activity. This was the main period of the intrusive rock activity of the Mesozoic. It not only formed a large number of deposits, but also had a strong superposition and transformation effect on the early metallogenic events. It was a relatively complicated installment mineralization event and formed obvious zoning characteristics of ore deposits which rich silver-lead-zinc in the west slope, rich Sn-Fe-Cu-Mo-W-Ag-Pb-Zn in the main ridge and rich Cu-Mo-Ag-Pb-Zn in the east slope. (6) Early Cretaceous porphyry-epithermal ore-forming series. The lithosphere mantle was delamination and thinned, resulting in asthenosphere upwelling, causing partial melting of upper lithosphere materials. At the same time, it was accompanied by large-scale fluid and metagenesis, forming Au(Cu) ore mainly of porphyry - epithermal deposit. (7) Jurassic-Cretaceous high and medium temperature magmatic-hydrothermal type gold deposit ore-forming series. During this period, a large number of NNE structure was formed, providing favorable ore-conducting and ore-hosting structures for magmatic hydrothermal intrusion and mineralization, and formed Baizhangzi gold deposits, etc.

The Daxinganling intrusive rock province is the main area for the remote action of the North American plate in the area around Songliao block. Distributing (1), (4), (5) and (6) ore-forming series; The Changbai Mountain intrusive rock zone continues to be subjected to the remote action of the North American plate the subduction of the Paleo-Pacific plate in the later period. There are a large number of intrusive rocks in the area, so there are many ore-forming series. Distributing (1), (2), (3) and (6) ore-forming series, Lesser Khingan Mountain and Qilaotu Mountain intrusive rock zone are located in the marginal zone of the plate subduction, which is relatively less affected, intrusive rock is...
relatively less exposed, Lesser K'ingan Mountain intrusive rock zone mainly based on (1) ore-forming series, Qilaotu Mountain intrusive rock zone distributed (1) and (7) two ore-forming series.

**Key words:** ore-forming series, division of intrusive rock, Mesozoic, ore-forming series, Songliao Block

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