Understanding of Deep Geological Structures and Metallogenic Prediction in the Fanchang Basin Based on Gravity, Magnetism and Electricity Joint Invision

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The Middle-Lower Yangtze River Metallogenic Belt (MYMB) is an important iron-copper polymetallic mineral deposits base in eastern China. With deeper prospecting in recent years in this area, there are fewer and fewer mines that are easy to identify, and prospecting turning to deeper levels is also becoming harder. In recent years, cases of large deposits discovered in deep areas of Luzong, Tongling and Ningwu indicate that there is good prospection potential in the Middle-Lower Yangtze River Metallogenic Belt.

The Fanchang Basin is located in the middle of the MYMB. It is situated adjacent to the Tongling to the south, the Ningwu basin to the east, and the Luzong basin to the north. The Mesozoic tectonics are complex and the magmatic activity was intense, forming a northeast-trending fold structure in the north and a volcanic cover in the south. Judging from the quantity and scale of the deposits discovered in the past, many large iron-copper polymetallic deposits were discovered in Tongling, Ningwu and Luzong, whereas the prospecting work in the Fanchang Basin did not made a big breakthrough, only some small mineralization was discovered. The Fanchang Basin has similar stratigraphic, tectonic movements and magmatic activities as adjacent areas. Theoretically, there is a greater potential for prospecting in this area. This work aims at understanding the deep structure, the distribution of rock mass and the spatial distribution of the stratums of the Fanchang Basin (volcanic rock basin) based on the method of combined magnetic, gravity and electric inversion under the constraints of the prior information of drillholes and base rock geology. We interpret the deep geology of the Fanchang Basin and obtained the following results:

(1) We used the 2.5D gravity-magnetic joint inversion method to obtain the deep three-dimensional geological structure of the Fanchang Basin by referring to the electrical parameters of the AMT inversion under the constraints of prior geological conditions. We improved the understanding of the tectonic evolution of this study area and provide a foundation for future work.

(2) We basically determined the main folds morphology and the deep structure of the area of coverage in the volcanic basin: the shape of the Binjiang synclinorium was destroyed due to the emplacement of granite; The Zhaishan anticline is closed, its axis is inclined to the northwest, and the Silurian sequence is thin. The Honghuajian is a complex overturned anticline and extends to the Daijiadian in an east-north direction; The Silurian strata thicken because of inversion; simultaneously, the shape and location of secondary folds in the volcanic rock cover were determined.

(3) The characteristics of the main faults in the volcanic basin were confirmed.

(4) The distribution range, depth and deep morphology of the main magmatic and subvolcanic rocks in this area were confirmed. The Binjiang granite extends to the Zhaishan anticline and in inclined to the south; the Banshiling rock mass extends in a southwest direction along the exposed position, and there are differences between the center and marginal phases. The subvolcanic rocks mainly occur near the Paifangzhang, some are produced in the form of rock strains and veins at the Honghuajian anticline, and the lithology is dominated by diorite.

(5) According to the results of 2.5D profile inversion, a 3D geological model of the Fanchang Basin was developed, which clearly shows the spatial characteristics of ore-controlling geological bodies and possible ore-forming rock masses. Finally the regional metallogenic models were combined to carry out a

two-dimensional and three-dimensional metallogenic prediction, which may support future prospecting work.

(6) We have delineated multiple prospecting target areas: For the problem existing in the inversion process of the sections, to sum up the experience and the spatial relationship between the favorable stratum and the fault and rock mass of the 3D geological model. Finally, the Keshan, Dabailing-Fangcun, Baozishan-Nanshan, Wolongdun-Sanliangshan, Baimashan, etc. have been delineated as prospecting targets. The location, depth of possible mineralization is given according to the three-dimensional model, which may support future prospecting work.