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The Extraction of Alteration and Geological Information and Prospecting Targets' Prediction of Tibetan Duo-Long Porphyry Copper Ore-concentrated Area Based on ETM⁺ & ASTER Data

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The study area, Tibetan Duo-Long ore-concentrated area, situated in the south of Qiangtang-Sanjiang composite panels and the west of Bangong Lake-Nujiang River metallogenic belt. There are two sets of faults. one is in east-west direction, and the other is north-east direction. Second fractures are well developed in the internal and external contact zone of rock masses and the both sides of faults. The emergence stratum are mainly of Middle Jurassic Series Quse Group Second rock member(J₂q²), Lower Cretaceous Series Meiriquie Formation(K₁m), Neogene System Kangtuo Formation(N₁k) and Quaternary System(Q). The exposed rock masses are granodiorite-porphyry($\gamma\delta\pi\varsigma^3$), diabase-porphyrity($\beta\mu\varsigma^3$) and basaltic-andesite($\alpha\beta\varsigma^3$).

Main research methods and achievements:

1 Mineral collection and spectrum test and analysis

The grids with an interval 300 meters were arranged on Duobuza and Bolong deposits, and 279 rock samples were collected on intersection points of it. ASD-FieldSpec spectrum analyzer was used to scan rock samples. A software called "PIMAView3.1" in PIMA portable short wave infrared analyzer could help to identify the mineral composition, statistical types and relative content of altered minerals, which will be the basis of altered minerals extraction in remote sensing.

2 Geological Interpretation

ETM⁺, the brief of Enhanced Thematic Mapper, carried by U.S. satellite Landsat7 with the band range from 0.45-

0.9 μm , can be better used in geological interpretation.

The technique of geometric correction and image intensification can highlight the boundary of ground objects and the texture of rock masses, as well as the faults. Combined with geological survey data, lithology can be more accurate. The geological interpretation map is demonstrated in figure 1.

3 Altered Minerals Extraction

"De-interfered Anomalous Principal Component Thresholding Technique", developed by Zhang Yujun, has been successfully used in altered minerals extraction. The technique was used in the paper to make the extraction of altered minerals.

The procedures are as follows:

(1) Set up the basis of the extraction of altered minerals

According to spectrum absorption characteristics, altered minerals were divided into A, B groups. The A group includes Anhydrite, Halloysite, Illite, Kaolinite, Montmorillonite, Muscovite, Nontronite, Phengite and Phrophyllite. All of them show a strong absorption in Band 6, weak absorption in Band 1 and moderately reflection in Band 3 and Band 4. The B group includes Aragonite, Calcite, Chlorite, Hornblende and Siderite. Unlike A group, B shows a strong absorption in Band 8. The absorption characteristics in Bands 1,3,4 of B group are same as A group. Through the above analysis, the band combination for Principal Component Analysis of each group can be determined, they are Bands 1, 3, 4, 6 for A and Bands 1, 3, 4, 8 for B.

(2) Extract altered minerals

Altered minerals information was extracted in the

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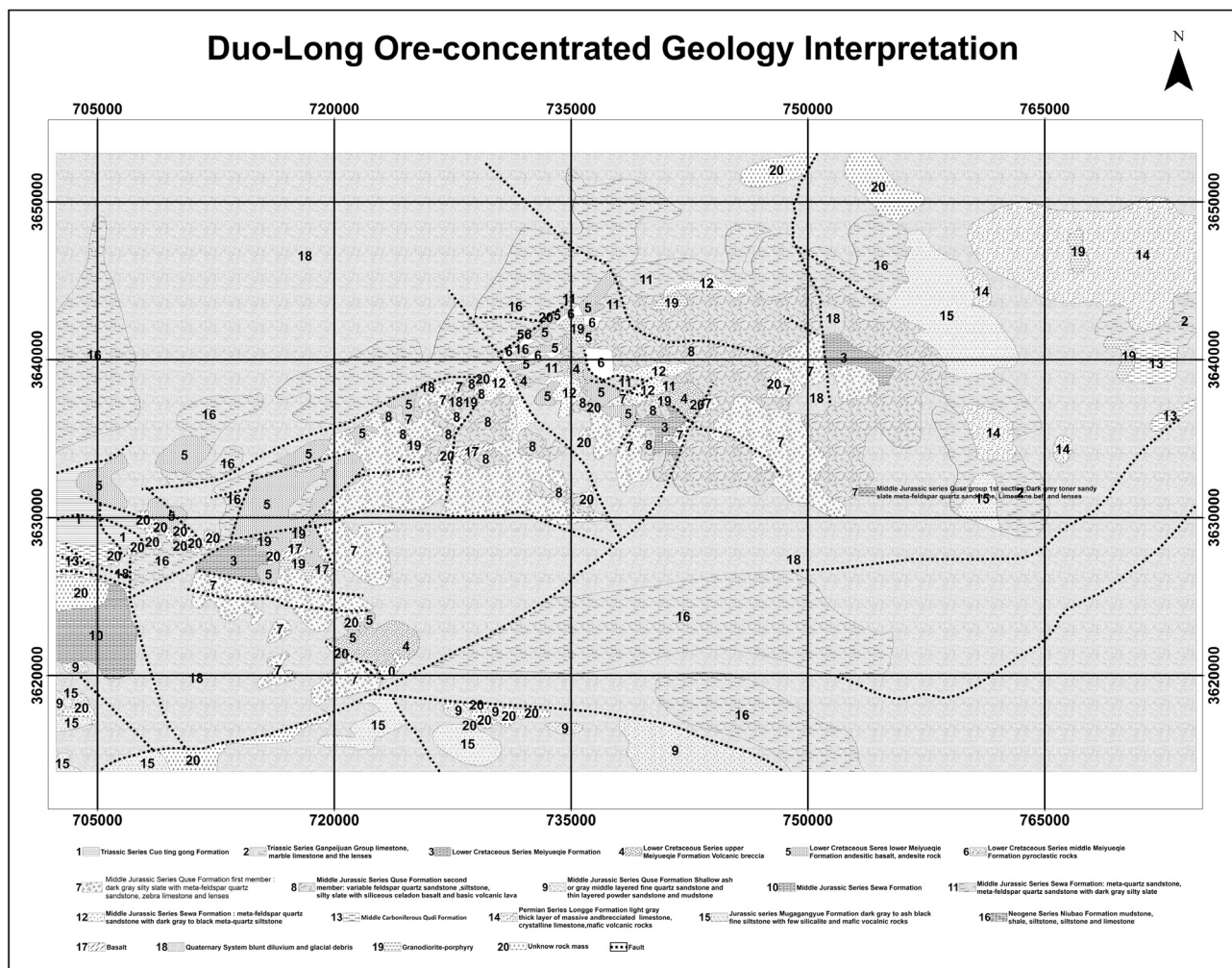


Figure1

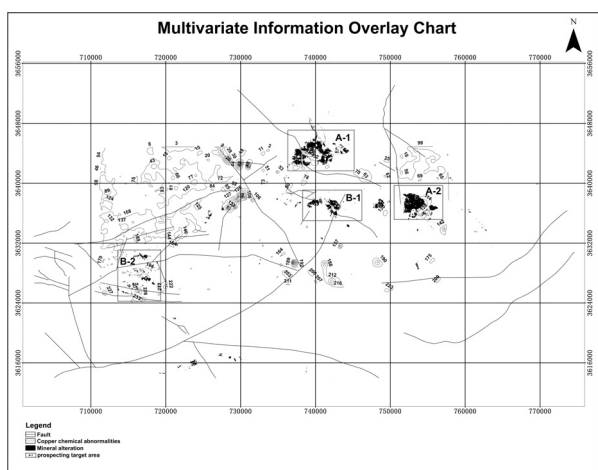


Figure2

method advanced by Zhang Yujun and optimized by Spectral Angle Mapper. The altered minerals distribution is showed in figure 2.

4. Alteration Information Analysis

The combination of alteration anomalies and copper anomalies can make the distribution characteristics more obvious. It can be summed up as follows:

① The extension direction of altered minerals is consistent with the strike of the area's faults structures, extending towards E-W and N-E.

② The distribution of two large alteration areas in the east and north is coincide with copper anomalous high value areas.

③ The characteristic of monoblock alteration area spreading along faults is obvious.

The alteration information distribution is revealed in figure 2.

5. Target Area Prediction Target areas were divided into A and B grades. The mineralization degree in A is higher than B. The specific location of A and B are displayed in figure 2.