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Identification of ore-forming element association anomalies by Bi-dimension Empirical Mode Decomposition (BEMD) combined with Principal Component Analysis (PCA) in Tengchong Block, Southwestern China

Chen Y Q¹, Zhang L N¹, and Zhao B B²

1 School of the Earth Sciences & Resources, China University of Geosciences, Beijing, China

2 Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, China

Correspondence author: Yingqing Chen (yqchen@cugb.edu.cn)

The Tengchong block, an important Sn polymetallic ore concentration area of Southeastern Asia tin ore-forming belt, located at the southeastern segment of the East Tethyan tectonic domain [1]. In this paper we try to create a combinatorial method which combines linear with non-linear model for extracting element association anomaly which can be used for effectively identifying ore-finding targets. In this paper, PCA [2] was applied to establish rock-forming element groups: $[\text{SiO}_2\text{-K}_2\text{O}]$ - $[\text{Fe}_2\text{O}_3\text{-V-Co-Ti-Cr-Ni-Cu-Mn-MgO}]$, which may characterize granites and faults associated with mineralization. And ore-forming element group: (a) $[\text{Pb-Cd-Ag-Zn}]$, which may indicate lead-zinc mineralization associated with Early Cretaceous metaluminous granites; (b) $[\text{Sn-W-Bi-F}]$, which may indicate the greisen type of tin and the tin-tungsten polymetallic mineralization associated with Late Cretaceous and Cenozoic peraluminous granites. Then the ore-forming association components characterizing different types of mineralization are extracted from the ore-forming element groups mentioned before by Bi-dimension Empirical Mode Decomposition (BEMD) [3]. Finally ore-finding targets are delineated based on the ore-forming association components obtained by BEMD from the ore-forming element groups. The ore-forming association components can be effectively used for mapping ore-finding targets of both the greisen tin deposits and the skarn lead-zinc polymetallic deposits in the study area based on geochemical data from stream sediment survey at scale of 1:200,000 from the National Geochemical Mapping Project of China. It has been illustrated by our studies that BEMD combined with PCA can be effectively applied in extracting the geochemical association components characterizing different types of mineralization and the geological factors associated with mineralization.

References

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