

Identification of Ore-Finding Targets Using the Anomaly Components of Ore-Forming Element Associations Extracted by BEMD and PCA in the Jiaodong Gold Clusters, Eastern China

Aoyue Zheng, Yongqing Chen

School of Earth Sciences and Resources, China University of Geosciences, Beijing, China

The Jiaodong gold concentrated luster area, with approximate gold reserve of 5,000 t, located at the southeastern edge of the North China Craton and to the east of the Tan-Lu Fault, is the third largest gold concentrated cluster area in the globe. Multi-stage geological processes (i.e., magma and hydrothermal processes) produce generally regional and local element concentration anomalies of ore-forming elements. Bi-empirical mode decomposition (BEMD) can be applied to establish various types of ore-forming element associations, which can be further divided into two different anomalous components with the help of BEMD. One can be defined as a regional geochemical anomaly generated by geological processes (i.e., magmatism); and the other can be regarded as a local geochemical anomaly created by ore-forming events. Three aspects are illustrated in this paper. (a) Two types of ore-forming element associations are established by PCA: Th-U-Y-Nb-Mo-La and Ag-Cd-Au. The former characterizes molybdenum polymetallic mineralization; the latter does gold polymetallic mineralization. (b) The geochemical anomaly components created by both magmatism and hydrothermal ore-forming processes are respectively identified by BEMD from the ore-forming element associations. (c) The regional and local geochemical anomalies are delineated using the geochemical anomaly components corresponding to different eigenspaces. The PCA and BEMD methods were applied to gold polymetallic ore-prospecting target areas and molybdenum polymetallic ore-prospecting target areas in the Jiaodong gold cluster area, eastern China, by delineating their regional and local geochemical anomalies. The results show that BEMD can extract not only regional anomalies associated with magmatism, but also local anomalies related to the hydrothermal processes from multi-element associations produced by PCA.