# Power-law models for prediction of undiscovered mineral deposits and for assessment of mineral resources

Q. Cheng (1,2)

(1) State Key Lab of Geological Processes and Mineral Resources, China University of Geosciences, Wuhan, Beijing, China (Qiuming@cug.edu.cn), (2) Department of Earth and Space Science and Engineering, York University, Toronto, Canada (qiuming@yorku.ca)

This paper introduces a suite of related power-law models for prediction of mineral deposits and for mineral resources assessment. These models include: (1) a power-law model for quantifying local singularities and the strengths of geoanomalies related to mineralization and mineral deposits; (2) a power-law model for modeling the spatial and frequency distributions of singularities and undiscovered mineral deposits; and (3) a power-law model for probabilistic estimation of total mineral resources in a mineral district. A case study of prediction of Sn/Cu mineral resources potential in the Gejiu mineral district Yunnan, China was used for model validation and application demonstration. Datasets used in the example include discovered Sn/Cu mineral deposits, geochemical concentration values of trace and major elements in stream sediments, geophysical aeromagnetic data and gravity data. Local singularities were calculated on the basis of geochemical data using a windows-based singularity analysis method, and the optimum spatial correlation determined between the strength of singularity and the location of discovered mineral deposits was applied to separate mineralization-related geochemical anomalies from the geochemical background values. Multiple geological evidential layers of maps including the distance from intrusive bodies and the distance from intersections of faults in the area were further integrated to map the posterior probability of mineral deposits in the area.