



Multifractality and resource potential prediction and environment assessment

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Spatio-temporal structures of geochemical fields are believed to be the essence of various geological phenomena resulting from a series of dynamic self-organization processes. Diverse fractal and multifractal models have been used to study the spatial and temporal structures of indexes in different kinds of geochemical fields. In our study, according to large data sets from different media, including ore-forming elements from stream sediments and bedrocks, oil/gas indexes in surface soils, and cations and anions from eco-environmental systems, it is found that fractal and multifractal to a great degree is one kind of ubiquitous properties for geochemical fields. Computer simulation results and case studies have shown that: (1) fractal and multifractal properties of geochemical indexes in different kinds of geochemical fields are not always the same. Generally, major ore-forming elements and trace elements in metallic geochemical fields follow some kind of strong multifractality, whereas the multifractality of major elements may be weaker; and there also exist difference between the fractality and multifractality of metallic elements and those of petroleum indexes; (2) fractal dimension, local singularity and other multifractal parameters to characterize multifractal properties could be used to evaluate the ore-forming potential, predict petroleum target area and assess the quality of geochemical environment. To some extent, spatial variability of geochemical indexes at various scales is associated with geochemical anomaly zones and this kind of variability could be characterized by singularity exponents and usually the anomaly could be reflected well by multifractal exponents.