



Analysis of Geochemical Element Behaviors in Soils by Multifractal Methods

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Soils are not only one of crucial environmental media but also one of the most important objects for environmental geochemistry. Usually, soils are developed from various kinds of rocks. During the weathering of rocks, the issues, such as the evolution of geochemical elements and the different behaviors of geochemical elements in soils, have been gaining great concern. This paper will explore the geochemical distribution patterns by fractal and multifractal methods, and then use the soils with different periods in the Hainan Island, China, as the case study to analyze the behaviors of geochemical elements. The soils in the Hainan Island are strongly aluminized, and anthropological activities have little impacts on the zonal soils. Thus the dynamic evolutions of the geochemical elements in soils are relatively of their original characteristics.

The TAS analysis based on the diagram of $\text{SiO}_2\text{-Na}_2\text{O+K}_2\text{O}$ is implemented and has shown that most of the soils are evolved from granodiorite rocks, and some from basalts. This analytical result is quite consistent to the regional rock sampling investigation. Spider diagrams of trace elements also present that the soils are mainly developed from basalts and granites. In terms of the multifractal parameters characterizing the distribution patterns of the geochemical elements in the soils evolved from seven geological systems, it is shown that in the surroundings the multifractal behaviors of the geochemical elements are strongly associated with their inner geochemical behaviors on one hand, and on the other hand, anthropological activities and weathering behaviors of the soils also have specific effects on the multifractal parameters. In the study, the right parts of the multifractal spectrum curves of the geochemical elements in soils evolved from the Changchengian system change significantly, which implies that there are much lower geochemical data for elements. But for the soils evolved from granites and basalts, the left parts of the multifractal spectrum curves are different from others. In this aspect, the multifractal behaviors of the geochemical elements in soils are significantly correlated with both the evolving history of soils and the inner geochemical behaviors of the elements.