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Singularity analysis of geochemical concentration data in soil over altered rocks

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The local singularity analysis (LSA) method is applied to several vertical soil sections with a few centimeters thickness over altered rocks in mineral district to study how geochemical concentration in soils changes with distance from the surface of altered rocks. pXRF equipment was applied as an in-situ technique to systemically measure the concentration of trace elements in soil section over altered rock in a mineral district in Inner Mongolia, China. Soil sites in a regular grid were analyzed using in-situ pXRF. The data measured at various levels over the altered rock surfaces were modeled by the LSA and then integrated by principal component analysis (PCA). The results show that wind transported soil and sand layer significantly depress the element concentration value on surface. However, the singularity estimated from the element concentration data remains relatively unchanged with increase of distance away from the rock surface. The results also show that the association of elements identified by PCA from the row data changes as increase of distance from the rock surface. However, the association of elements obtained by PCA applied to the singularity of element concentration is relatively independent of the thickness of the soil. This implies that the LSA can reduce the influence of the thickness of soil on the geochemical anomaly identification. This is important to how the LSA can be applied to process geochemical data in surface media in areas with soil or other covers.