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Singularity analysis and robust neighborhood statistics

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Neighborhood statistics involving data within small neighborhoods have the advantages of revealing more detailed local structures and spatial variations of spatial patterns, and provide less biased information compared with global statistics. However, the resulting neighborhood statistics are influenced by the size of neighborhood. Singularity analysis can be regarded as a type of robust neighborhood statistics. It measures the gradient of relative change within small neighborhoods. The value of singularity index at a location of z rarely relies on the element concentration at that location, but depends on the changes around z. From the multifractal theory viewpoint, the singularity index is independent of the size of neighborhood. Singularity analysis is a powerful tool to identify geochemical and geophysical anomalies in mineral exploration. Recent studies demonstrated singularity analysis can well detect the weak geochemical anomalies related to mineralization due to decaying and masking effects of covers.