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论文

基于地统计学插值方法的局部奇异性指数计算比较研究

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摘要: 以铜陵矿集区土壤Pb元素为例,研究稀疏采样条件下地统计学克里格方法,序贯高斯模拟方法对奇异性指数计算的影响。研究结果表明,序贯高斯模拟方法强调了短距离范围内的空间不确定性,弥补了克里格方法平滑效应的不足,对于精细重建土壤元素的空间分布特征具有更好的效果。对于稀疏采样的数据集,较之原始数据和克里格方法,基于序贯高斯模拟方法获取的奇异性指数能够更精细的刻画局部空间结构,更好的应用于土壤地球化学异常的提取和识别。

关键词: 序贯高斯模拟 克里格 奇异性指数 地统计学

Comparison of Geostatistical Interpolation Methods for Local Singularity Exponent Calculation

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Abstract: Using data of Pb concentrations within soil samples from the Tongling Mining District area as an example,Kriging and Sequential Gaussian Simulation were used to determine the local singularity exponent within a dataset with low spatial density sampling.Within this highly variable dataset,when Sequential Gaussian Simulation was used,the calculated maximum concentration of Pb and the standard deviation and coefficient of variation were similar to those of the raw dataset,whereas when the method of Kriging was applied the same statistics were significantly lower than those within the raw dataset.This means that the Sequential Gaussian Simulation method can be used to interpolate soil geochemical data without significant smoothing of the dataset,enabling the highlighting of spatial variations over even short distances and potentially being a better method of interpolation prior to interpretation than Kriging,which may leading to a loss of resolution.Furthermore,the method of Kriging can also compress the range of the singularity exponent calculated by this method,whereas when the Sequential Gaussian Simulation method was applied to the data,the range and contrast between individual data points were significantly increased,improving the user's ability to identify anomalies within the dataset.Semi-variograms constructed from data interpolated using the Sequential Gaussian Simulation method are more homogenous and correspond well with the semi-variograms constructed from the raw data,especially between shorter distances,when compared to those constructed from Kriged data.For datasets with low spatial density,for example those generated by regional governmental or reconnaissance soil sampling,when compared with the raw and Kriged data,the Singularity Exponent calculated using Sequential Gaussian Simulation is significantly better at locating spatial structures and highlighting significant anomalies.Within the Tongling mining district this is demonstrated by the good correlation between areas highlighted during Sequential Gaussian Simulation and areas with known Pb-Zn mineralisation;this is not necessarily the case when using the raw soil Pb concentrations and when using data that has been Kriged.This indicates that,for the datasets with low spatial density sampling,calculation of a singularity exponent based on Sequential Gaussian Simulation could produce significantly improved results,and therefore improved interpretation,than using the data of raw or Kriged during the identification of anomalies within soil geochemical data.

Keywords: Sequential Gaussian simulation Kriging singularity exponent geostatistics

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