Spatial Uncertainty Modeling for Geochemical Elements Under Cover, Based on a Geostatistical Simulation Method

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Areas that are under cover, such as grassland, forest, desert, and ice, can have great ore potential. The effects of covered layers will weaken the geo-information, which may cause significant spatial uncertainty in geochemical and geophysical exploration in area, especially where samples are sparse. The modeling of uncertainty can help to improve the efficiency of mineral prospecting. The development of geostatistical simulation provides a possible way to assess the spatial uncertainty of geological variables. Sequential indicator simulation (SISIM) is one of the most common methods for geostatistical simulation, and it can be applied in spatial uncertainty modeling for single and multilocation spatial variables. To illustrate this, the stream sediment data in the grassland covered area in the northeast of the DongUjimqin Banner district of Inner Mongolia were collected. We used SISIM to simulate the main ore-forming elements at unsampled locations. The uncertainty is visualized with the use of GIS software, which generates many simulation distribution maps of Ag. Based on these SISIM results, researchers concluded that the local uncertainty of Ag concentration in this covered area is much higher than Ag concentration in an outcrop area. In addition, the probability maps of the multilocation uncertainty showed the joint probability statistics were stricter than that of single-point uncertainty. So it is more acceptable and reliable to join the two approaches of uncertainty assessment to delineate the distribution of Ag concentration, which were used to assess the reliability of the spatial distribution for facilitating the decision-making process in determining which areas are optimum for exploration. The information in distribution maps for Ag concentration reveals more concealed anomalies in the area, and this is helpful for decision-making in mineral exploration.