Multi-fractal analysis on the strength of Au-Cu paragenetic relationships in Duolong mineral district, Tibet, China

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Paragenetic association of elements is a natural and important geological phenomenon reflecting the geochemical behavior of elements during proceedings of various geo-processes. Because of intrinsic characteristics, different elements of paragenetic association may also be differentiated. As a result, the respective material sources could be shifted from the original places, and the strength of paragenetic association of elements could be declined. Therefore, study on paragenetic association of elements can help with locating the material source, characterizing migration form, and indicating precipitation conditions. Resulted from complicated and cascade geo-processes, the strength of paragenetic relationship between elements presents variations in space. To examine influences of the strength of paragenetic association of elements on polymetallic mineralization, the current research proposed a data processing procedure, including non-linear regression and multi-fractal analysis on the regression coefficient. This procedure is currently tested in the Duolong mineral district, Tibet, China, and encouraging results can be derived. In this research, a geographically weighted regression (GWR) is currently used to examine the relationships between the Au and Cu concentration in the study area. The variation of the strength of Au-Cu paragenetic association across the space can be derived. Furthermore, multi-fractal methods are applied to the regression coefficient map in order to delineate the locations highly associated with Au-Cu mineralization. Anomalies respecting the very strong paragenetic association are separated from the background. In addition, noises indicating the locations with strong paragenetic relationships but are not suitable for Au-Cu mineralization is removed; whereas, information indicating locations which possess medium paragenetic relationships but are suitable for Au-Cu mineralization are enhanced. On the other hand, the background map is also informative. Analytical results could be useful with mineral exploration for polymetallic deposits in the future.