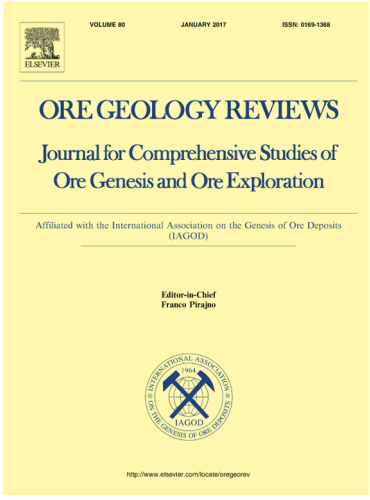

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Abstract

The spatial distribution of cobalt-rich crust thicknesses on seamounts is partly controlled by water depth and slope gradients. Conventional distance–direction-based variogram have not effectively expressed the spatial self-correlation or anisotropy of the thicknesses of cobalt-rich crusts. To estimate resources in cobalt-rich crusts on seamounts using geostatistics, we constructed a new variogram model to adapt to the spatial distribution of the thicknesses of the cobalt-rich crusts. In this model, we defined the data related to cobalt-rich crusts on seamounts as three-dimensional surface random variables, presented an experimental variogram process based on the distance–gradient or distance–"relative water depth," and provided a theoretical variogram model that follows this process. This method was demonstrated by the spatial estimation of the thicknesses of cobalt-rich crusts on a seamount, and the results indicated that the new variogram model reflects the spatial self-correlation of the thicknesses of cobalt-rich crusts well. Substituted into the Kriging equation, the new variogram model successfully estimated the spatial thickness distribution of these cobalt-rich crusts.

Keywords