The Prediction of Uranium Occurrence Using GIS Based Geostatistical Algorithms in Erongo Region

Silas T. David
EDS Namibia, Windhoek, Namibia

Mineral resources are pivotal for Namibia's socioeconomic progress and play a crucial role in its energy transition and on a global scale. The Erongo region boasts significant uranium deposits, fostering the establishment of uranium mines, with potential for further discoveries. Consequently, mapping uranium occurrences in this region is imperative for effective mineral resource management. Interpolation techniques provide a means to accurately forecast mineral values at unsampled locations, generating a continuous dataset of spatial distributions. This study employs spatial and geostatistical analytical tools to compare various interpolation methods concerning uranium occurrence patterns in the Erongo region, utilizing ArcGIS 10.6 software. Seventy uranium occurrences were selected to construct prediction models. Deterministic interpolation methods like Radial Basic Function and Inverse Distance Weighting, alongside geostatistical techniques such as kriging, including Empirical Bayesian Kriging, were utilized in both spatial and geostatistical analyses. The interpolation method exhibiting the lowest average standard error, root mean square standardized error, root mean square error, and mean square error was deemed the most suitable for capturing spatial variations in mineral occurrences. Geostatistical approaches, particularly Empirical Bayesian Kriging with a linear semivariogram model, demonstrated superior performance compared to Universal Kriging in spatial analysis. In conclusion, geostatistical interpolation emerges as the preferred method over deterministic interpolation for accurately mapping and predicting potential uranium occurrences in the Erongo region.