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Full Length Research Paper

Geostatistical calculation for clay reserve in Azraq Basin in Jordan

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Industrial minerals in the Hashemite Kingdom of Jordan are vital to both economical and industrial development and this is true as far as the estimation of the reserves is carried out appropriately. The aim of this study was to geostatistically investigate the clay spatial behavior and geological reserve in Qa' Al-Azraq area in north east Jordan through known seventy four random drilled boreholes. Quantification of spatial arrangement or dependence was investigated through defining the best variogram model using optimal unbiased geostatistical tools of ArcGIS-Geostatistical Analyst, and MINEX. Clay thickness kriged map indicates a central concentration distribution of clay. Variations in kriged map tones comply with the major local fault systems allocated at the center of the study area forming pond structure bounded by the four faults. Two east-west cross sections were implemented using MINEX software. They provide visual maps for clay thickness distribution along the impurities of diatomite and interburden layers of silt, sand and gypsum. Clay reserves estimated using Inverse Distance Method (IDM) and Ordinary Kriging Method (OKM) were 6.1 and 5.94 Billion Cubic Meter respectively. The results of this study indicate that the area is a promising future target for economic investment in the local raw materials.

Key words: Ore reserve, ordinary kriging, arcmap, MINEX.

INTRODUCTION

Industrial minerals in The Hashemite Kingdom of Jordan are vital to economical and industrial development in view of quality and adequate quantity. Thus, reserves estimation should be carried out appropriately. Among these industrial minerals are the clay deposits that are located in Qa' Al-Azraq area northeast Jordan.

Estimation of industrial minerals reserves requires a statistical tool that is optimal and unbiased. However in nature, minerals are not purely random on a landscape but have some spatial arrangement that depends on inherent and altered characteristics and therefore, classical statistical methods of analysis are not appropriate (Al-Qinna, 2003). Quantification of spatial arrangement or dependence is determined using geostatistical methods. According to the first law of geostatistics, variables that are close to each other have similar magnitudes (that is, closely-spaced variables may be spatially correlated), whereas samples taken farther apart have values differing by a greater order of magnitude. Therefore, spatial data correlation between neighbors should be estimated and used for prediction of the overall area (Issaks and Srivastava, 1989).

Within the last 25 years, geostatistical methods have been introduced and applied to provide a best linear unbiased estimate (BLUE) of parameter values at unsampled locations. The major difference between geostatistic and classical statistics is that the former allows direct modeling of the inherent spatial data correlation (Sutherland et al., 1991; Triantafilis et al., 2001).

Geostatistical analyses imply the use of correlograms, variograms, and kriging. The correlogram is an ordered set of correlation coefficients for a common variable, where each pair of measurements is separated by distance (h). Autocorrelation is a measure of the dependency between neighboring samples.

The autocorrelation coefficient [ρ(h)] of a regionalized

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