Abstract

groundwater resources have great importance in arid and semi arid areas as a major source of water supplier. Population growth, industrial development and lack of proper environmental control have led to quality decline and contamination of groundwater resources. One of the main problems in the qualitative assessment of these resources is that it is impossible to sample all points. By considering the spatial correlation of environmental variables, Geo-statistical methods extend result of the observation points to other parts and save sampling time and cost. In this study, geo-statistical methods were engaged to prepare spatial and probability maps of heavy metal contamination of arsenic, lead and cadmium concentration as well as spatial variation of qualitative parameters of electrical conductivity, TDS and total hardness in the groundwater of Qom watershed, and results of interpolation were evaluated using cross-validation method by means of MBE, RMSE and RMSSE index. The results show the superiority of the exponential model (with least RSS and maximum r^2) for semi-variogram for arsenic and spherical model for lead and cadmium to be used in ordinary kriging to produce spatial maps of these elements. Semi-variogram exponential model for arsenic and the spherical model for cadmium and lead showed higher estimation accuracy to provide the probability map for heavy metal pollution in indicator kriging. Due to proper correlation (r=0.994) between electrical conductivity and TDS, use of each variable as covariate to aid in the estimation of the other, increases the accuracy of estimated Co-kriging in compare to ordinary kriging method. Validation results indicate the superiority of the spherical model to estimate the total hardness in the ordinary kriging. Finally, maps produced with the GS^+ software environment were transferred to GIS and were presented as spatial maps by adding the watershed borders.

Keywords:
Geostatistics, kriging, probability map, heavy metal contamination,
groundwater quality, Qom watershed

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Spatial variability of groundwater quality parameters and risk assessment of heavy metal contamination in Qom watershed

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