# A spatial variation study of groundwater quality parameters in the Gonabad Plain using deterministic and geostatistical models

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## ABSTRACT

Groundwater is one of the major sources of water supply in arid and semi-arid regions. Thus, in order to protect groundwater quality, data on spatial and temporal distribution of groundwater are important. One way to protect groundwater quality is through the investigation of spatial distribution data. Geostatistical methods are one of the most advanced techniques for the interpolation of groundwater quality. Therefore, in this study by geographic information system ArcGIS and GS+, deterministic interpolation methods such as Inverse Distance Weighting (IDW), Global Polynomial Interpolation (GPI), and Local Polynomial Interpolation (LPI), with power ranging from 1 to 5, as well as geostatistical interpolation methods such as OK, SK, and UK, with exponential and rational Quadratic models, were used for studying the spatial distribution of quality parameters such as Cl, EC, TDS, and anion. The data were related to 44 exploitation wells in the Gonabad Plain in the Razavi Khorasan Province in the year 2013–14; after normalization, the best model parameters of the fitness semivariogram were selected based on the nugget effect to Sill. Then, based on cross-validation criteria such as MRE, RMSE, and R, the best interpolation method was selected. The results showed that the IDW method, with the powers of 3 and 4, had the lowest error and the most correlation compared to the GPI, LPI, OK, SK, and UK methods. Finally, the zoning maps and spatial distribution for the studied parameters were prepared based on the best interpolation method.

*Keywords:* Interpolation; Geostatistics; Groundwater quality; Cross-validation; GIS

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