

Multivariate Statistical Techniques for the Evaluation of Spatial and Temporal Variations in Groundwater Quality of Astaneh-Kouchesfan Plain, Sefid-Rūd Basin, North of Iran

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Abstract

Astaneh-Kouchesfahan Plain is one of the most important water resource systems in Sefid-Rūd Basin, north of Iran. In the study, Spatio-temporal distributions of groundwater quality were evaluated for 23 different stations in the plain using multivariate statistical techniques. After descriptive analysis, Multivariate Analysis of Variance technique (MANOVA) and Cluster analysis (CA) were performed to measure significant effects of spatial, seasonal and annual differences on mean concentration of key hydrochemical parameters of groundwater. The MANOVA results explain that the interaction of location on seasonal variables is significant to increase the hydrochemical variations. In addition, the results of cluster analysis show a 3- cluster dendrogram which reflects variations in natural and human activities.

Keywords: Cluster Analysis, Groundwater quality, Hydrogeochemistry, Sefid-Rūd Basin, Iran, Statistical analysis.

Introduction

Sefid-Rūd River is the second largest river system in the Iran and the largest river in Gilan Province. This river with approximately 670 kilometres (416 mi) long, originates from northwestern Iran and flows generally northeast to meet the Caspian Sea (Afshin, 1992). In Gilan Province at northern part of Caspian Sea Basin, groundwater is one of the major supplies of water resource, which supports human health, socio-economic development and ecological diversity.

Astaneh-Kouchesfahan Plain is an important water resource system in Gilan. It is one of the largest plain in north of Iran and by area; it comprises about 15% of Gilan. In the Astaneh-Kouchesfahan Plain, the quality of groundwater is just as important as its quantity. Hence, the assessment of groundwater quality can play an important role in sustainable development and it can provide the necessary information for groundwater management. In this study, an attempt was made to assess quality of groundwater resources in Astaneh-Kouchesfahan Plain