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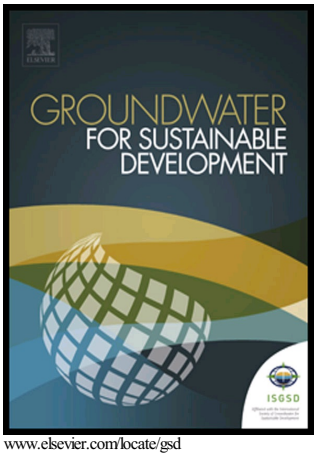

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Evaluation of groundwater quality and its suitability for drinking and agricultural purposes using Self-Organizing Maps

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Abstract

In arid and semi-arid regions, the sustainable use of groundwater for drinking and agricultural activities is threatened by the deterioration of groundwater quality due to natural and anthropogenic processes. Evaluation of geochemical status of groundwater is necessary to adequately plan and manage the groundwater resources. In the present study, self-organizing map (SOM) clustering technique was applied to identify homogeneous clusters of hydrochemical parameters in El Mila plain, Algeria, to assess the quality of groundwater for potable and agricultural purposes. The visualization of SOM-analysis indicated that 35 groundwater samples collected in the study area were classified into three clusters, which showed progressively increase in electrical conductivity from cluster 1 to cluster 3. Samples belong to cluster one mostly located in the recharge zone showing hard fresh water type, however, water type gradually changed to hard-brackish type in discharge zone including clusters 2 and 3. Ionic ratio studies indicated the role of carbonate rock dissolution in increases groundwater hardness, especially in cluster 1. However, evaporation and evapotranspiration are main processes increasing salinity in cluster 2 and 3.

Keywords: Groundwater quality; Self-Organizing Maps; Drinking water; Irrigation water; El Milia; Algeria.

1. Introduction

Water quality below the surface displays the all processes and reactions that affect on the water from the moment it condenses in the atmosphere to the time it is abstracted from the wells (Arumugam and Elangovan, 2009).

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