



Assessment of Spatio-temporal Oscillations and Physico-chemical Properties of Azna-Aligudarz Basin

Fatemeh Gholami¹, Arash Malekian*²

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Extended Abstract

Introduction: The increase in population and need for food has resulted in the development of agricultural lands and pressure on aquifers, which has led to a sharp decline in the quantity and quality of groundwater resources. In many countries, especially in arid and semi-arid regions, in which the average annual precipitation is not adequate to support water requirements, groundwater is commonly used for agriculture, drinking and industry causing water crisis as a major dilemma. Groundwater quality is one of the most important factors in maintaining stability of aquifers and sustainability of groundwater resources means their exploitation and use in such a way that they do not seek quantitative and qualitative vulnerabilities and surrounding ecosystems. The qualitative and quantitative analysis of water resources is one of the most important evaluation approaches needed in this case.

Materials and Methods: Azna- Aligudarz basin with an area of 2116.8 square kilometers is located in the western part of Iran and in the east of Lorestan province .The purpose of this research is to assess the quantitative and qualitative characteristics of groundwater in this area. First, the spatial and temporal fluctuations in groundwater level during the study period were assessed. Then for the seasons of recharge and discharge of aquifer during the study period (2004-2014), changes in physicochemical characteristics, the most important aquifer parameters for agricultural use based on Wilcox and California classification, the governing mechanism of water quality, type and hydrochemical facies of groundwater was analyzed.

Results: The findings showed that the water table of aquifer reduction was 10.45 cm. Average annual loss in the recharge season is equivalent to 83.7 cm during the statistical period, and 12.27 cm the annual drop in the discharge season or 98.16 cm during the study period. In general, groundwater level decreased by 1.33 meters over water years (2004-2014), affecting most of the south-west side of the basin. According to the results of physicochemical properties of water, concentration of most parameters changes has been incremental. Even, the parameter changes for TDS, CO₃, Ca and Mg was more evident. The results of the California classification also showed that more than 55% of the area in terms of EC, TDS and SAR is in the unchanged range. According to the Wilcox diagram, the water quality is mostly in the S1C2 class (low salinity and alkalinity). Based on hydrochemical diagrams, it was determined that the main type and hydrochemical facies of water are Bicarbonate type and Calcic facies. The Gibbs graph also expresses the interactions between rock and water and weathering of minerals as the main determinant of water quality mechanism in the region.

1. Master of Science (MSc), Department of Natural Resources, University of Tehran

2. Associate Professor, Department of Natural Resources, Tehran University, Corresponding Author: malekian@ut.ac.ir
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Discussion and conclusion: The results indicate that uncontrolled water withdrawal over the last ten years has led to the greatest decline in the quantity and quality of groundwater in the south-western part of the basin and is moving forward to the surrounding lands. Also, one of the factors reducing the water level during the study period is the excessive withdrawal of water during the discharge season. The highest increase in water quality levels has also occurred in the south-western part of the basin, which is more evident in the discharge season than in the aquifer recharge period. The results indicate that HCO_3 , Ca and Mg have the highest frequency in groundwater than other factors. Moreover, the main type of groundwater is bicarbonate with Calcic facies which is considered as heavy water and creates an almost corrosive state in industry.

Keywords: Water level changes, Bicarbonate type, Gibbs chart, Hydrochemical diagram, Mineral weathering.