Spatio-temporal Distribution of Surface Water Quality in the Kebir Rhumel Basin, Algeria

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Abstract : This research aims to present a surface water quality assessment of hydrochemical parameters in the Kebir Rhumel Basin, Algeria. The water quality index (WQI), Mann–Kendall (MK) test, and hierarchical cluster analysis (HCA) were used in oder to understand the spatio-temporal distribution of the surface water quality in the study area. Eleven hydrochemical parameters were measured monthly at eight stations from January 2016 to December 2020. The dominant cation in the surface water was found to be calcium, followed by sodium, and the dominant anion was sulfate, followed by chloride. In terms of WQI, a significant percentage of surface water samples at stations Ain Smara (AS), Beni Haroune (BH), Grarem (GR), and Sidi Khlifa (SK) exhibited poor water quality, with approximately 89.5%, 90.6%, 78.2%, and 62.7%, respectively, falling into this category. Mann–Kendall trend analysis revealed a significantly increasing trend in WQI values at stations Oued Boumerzoug (ON) and SK, indicating that the temporal variation of WQI in these stations is significant. Hierarchical clustering analysis classified the data into three clusters. The first cluster contained approximately 22% of the total number of months, the second cluster included about 30%, and the third cluster had the highest representation, approximately 48% of the total number of months. Within these clusters, certain stations exhibited higher WQI values. In the first cluster, stations GR and ON had the highest WQI values. In the second cluster, stations Oued Boumerzoug (OB) and SK showed the highest WQI values, while in the last cluster, stations AS, BH, El Milia (EM), and Hammam Grouz (HG) had the highest mean WQI values. Also, approximately 38%, 41%, and 38% of the total water samples in the first, second, and third clusters, respectively, were classified as having poor water quality. The findings of this study can serve as a scientific basis for decision-makers to formulate strategies for surface water quality restoration and management in the region.

Keywords : surface water, water quality index (WQI), Mann Kendall (MK) test, hierarchical cluster analysis (HCA), spatial-temporal distribution, Kebir Rhumel Basin
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