

Evaluating Surface Water Quality Using WQI, Trend Analysis, and Cluster Classification in Kebir Rhumel Basin, Algeria

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Abstract : This study evaluates the surface water quality in the Kebir Rhumel Basin by analyzing hydrochemical parameters. To assess spatial and temporal variations in water quality, we applied the Water Quality Index (WQI), Mann-Kendall (MK) trend analysis, and hierarchical cluster analysis (HCA). Monthly measurements of eleven hydrochemical parameters were collected across eight stations from January 2016 to December 2020. Calcium and sulfate emerged as the dominant cation and anion, respectively. WQI analysis indicated a high incidence of poor water quality at stations Ain Smara (AS), Beni Haroune (BH), Grarem (GR), and Sidi Khalifa (SK), where 89.5%, 90.6%, 78.2%, and 62.7% of samples, respectively, fell into this category. The MK trend analysis revealed a significant upward trend in WQI at Oued Boumerzoug (ON) and SK stations, signaling temporal deterioration in these areas. HCA grouped the dataset into three clusters, covering approximately 22%, 30%, and 48% of the months, respectively. Within these clusters, specific stations exhibited elevated WQI values: GR and ON in the first cluster, OB and SK in the second, and AS, BH, El Milia (EM), and Hammam Grouz (HG) in the third. Furthermore, approximately 38%, 41%, and 38% of samples in clusters one, two, and three, respectively, were classified as having poor water quality. These findings provide essential insights for policymakers in formulating strategies to restore and manage surface water quality in the region.

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

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