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Multivariate Statistical And Geospatial Techniques for the Assessment of Groundwater Suitability for Drinking and Irrigation Purpose in Sokoto-Rima Catchment Area, NW Nigeria

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This study aims to provide adequate primary information on physico-chemical parameters, water quality indices, probable source of ions responsible for groundwater chemistry and their spatial variability in Sokoto-Rima Catchment. A combination of hydro geochemistry, multivariate statistics, and geographical information system (GIS) approaches was employed to evaluate the groundwater quality and its sustainability for both drinking and agriculture in the Hydrological Area (HA). The results showed that the groundwater samples are mainly Ca–Na–HCO3 type. The Hierarchical Cluster analysis showed total of Four (4) clusters, which correspond with spatial 50 groundwater distribution. The component analysis showed that PC1 and PC2 represents the major geochemical processes taking place, due to the presence and dissolution of some carbonate silicate and evaporate minerals in the aquifer. Correlation analysis indicates that rock weathering and leaching are the main natural drivers of GW hydrochemistry in this area. the results of PCA are validated using the cluster analysis and correlation matrix analysis. Based on the groundwater quality index (GWQI), it is found that all the groundwater samples belong to excellent to good water quality domains for human consumption. The results of irrigation water quality index including sodium adsorption ratio (SAR), permeability index (PI) and sodium percentage (Na %) suggested that most of the groundwater samples are good quality water for agricultural uses except in few locations were the KR indicated Marginal to unsuitability status. The IDW interpolation technique was used to generate the spatial distribution maps of each parameter of groundwater dataset for this study.

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