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Geoelectrical characterisation of basement aquifers: the case of Iberekodo, southwestern Nigeria

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Abstract

Basement aquifers, which occur within the weathered and fractured zones of crystalline bedrocks, are important groundwater resources in tropical and subtropical regions. The development of basement aquifers is complex owing to their high spatial variability. Geophysical techniques are used to obtain information about the hydrologic characteristics of the weathered and fractured zones of the crystalline basement rocks, which relates to the occurrence of groundwater in the zones. The spatial distributions of these hydrologic characteristics are then used to map the spatial variability of the basement aquifers. Thus, knowledge of the spatial variability of basement aquifers is useful in siting wells and boreholes for optimal and perennial yield. Geoelectrical resistivity is one of the most widely used geophysical methods for assessing the spatial variability of the weathered and fractured zones in groundwater exploration efforts in basement complex terrains. The presented study focuses on combining vertical electrical sounding with two-dimensional (2D) geoelectrical resistivity imaging to characterise the weathered and fractured zones in a crystalline basement complex terrain in southwestern Nigeria. The basement aquifer was delineated, and the nature, extent and spatial variability of the delineated basement aquifer were assessed based on the spatial variability of the weathered and fractured zones. The study shows that a multiple-gradient array for 2D resistivity imaging is sensitive to vertical and near-surface stratigraphic features, which have hydrological implications. The integration of resistivity sounding with 2D geoelectrical resistivity imaging is efficient and enhances near-surface characterisation in basement complex terrain.

Keywords

Groundwater exploration Crystalline rocks Near-surface investigation Basement aquifers Nigeria

Notes

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