Paper Number: 2188

Regional exploration technique of groundwater resource in the Precambrian areas of Mozambique through an integration of Topographic and Geophysical data

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Securing water supply for the growing communities in the Precambrian basements is a worldwide challenge. Lack of sound and scientifically-based research activities hinder efficient groundwater management and sustainable development of the fractured aquifers. This study aims at extracting high potential zones of groundwater resource by integration of processing techniques of remote sensing and geophysical data.

Potential areas for groundwater exploration can be detected by analysing the lineament length density and distribution pattern because they are generally associated with weak zones by fracturing which tend to form high permeable zones. Conversely, surface and aero-geophysical data can guide the exploration of groundwater in complex basements. Therefore, the proposed technique must contribute to accessing zones with highly fractured and deeply weathered overburdens for future groundwater explorations.

Adaptive-Tilt Multi-Directional Shading (ATMDS) was applied to the Digital Elevation Model (DEM), gravity, and magnetic grid data to enhance the linear features. Lineaments are then extracted using the automated Segment Tracing Algorithm (STA) for Tete province in Mozambique. The lineaments derived from the 90 meter DEM data indicated that the right half of the study area is dominated by high density of lineaments with predominant four trends along N-S, NE-SW, ENE-WSW and W-E. These trends have been formed by the different tectonic cycles in the study area. Deeper structures were evident where lineaments from various sources were congruent, when lineaments differed in location and orientation clarified varying tectonic forces at varying depths and composition. By integration of lineaments from different sources and analysis of physical properties can help extracting potential groundwater zones.

KEYWORDS: Adaptive-Tilt Multi-Directional Shading, STA, groundwater, Mozambique.