Paper Number: 196

Groundwater exploration using electromagnetic frequency domain and electroseismic sounding methods in Kalahari sands and Karoo Sequence in Zimbabwe.

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Abstract

Exploration for groundwater resources for community water supply was carried out in the Kalahari sands underlain by sandstone, mudstone and basalt of the Karoo Succession. Occurrence of groundwater in the geological formations is controlled by primary porosity of the sands as well as fracturing and weathering of the basalt. The geological formations form important aquifers exploited for water supply by means of drilled boreholes. A complementary use of geophysical methods in conjunction with geology, approach was used in site investigations. Electroseismic survey method was used to complement the electromagnetic frequency domain method. Electromagnetic profiles were carried out on the target areas. Anomalies identified were further investigated using electroseismic sounding and the results were used to identify potential sites for drilling boreholes. The results of the sounding were presented in the form of a sounding curve. The sounding curves were interpreted using forward modelling assuming that waves generated during the survey had typical seismic velocity values when passing through geological formations in the areas under investigation leading to a hydrogeological model for the area. A geological model for an area under investigation was determined from literature and field observations. A comparison of driller's logs for areas where boreholes were drilled, with models generated from geophysical survey results from groundwater exploration was also done.

Key words: electroseismic sounding, electromagnetic profiling, forward modelling, seismic velocity, geological model, hydrogeological model.

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