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High precision gravity assisted with differential global positioning system (DGPS) and geomagnetic surveys for mapping ground water reservoir potential in volcanic terranes of south Ethiopia.

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ABSTRACT

Well designed, high precision and detailed gravity aided by differential global positioning system (DGPS) and total geomagnetic field surveys have been carried out at the semi-arid area of Borena zone, Gelchet locality, Southern Ethiopia. The surveys have been aimed at investigating shallow groundwater aquifers and groundwater conducts within the Cenozoic volcanic rocks that lie above the Precambrian gneiss basement rock. It has been aimed at addressing the problem of dire domestic and agricultural water scarcity in the area.
In total 115 gravity data points were measured using both gravity and DGPS methods The total magnetic field was measured at 300 data points mainly along eight lines and additional infill points. The data obtained from gravimetric and magnetic surveys were processed and interpreted with the help of a priori information from surface geology. The magnetic survey was effective in mapping faults, which act as groundwater conduit whereas the gravity survey was effective in mapping the undulation of the basement structure to target shallow groundwater reservoir potential localities. Low residual gravity anomalies and very high gravity gradient are interpreted as localities where the Precambrian basement is deep and structures such as faults are respectively mapped. These areas are especially mapped as good shallow groundwater aquifers. Finally, better drilling sites for groundwater taping are recommended.

Keywords: Gravity. Geomagnetic. Deferential global positioning system. Groundwater reservoir. Groundwater conduit. Cenozoic Volcanic. Ethiopia