

Geochemical characteristics of groundwater in Southern Malawi

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Groundwater is one of the most important resources in Malawi. Despite surface water covering 20% of Malawi's total surface area of 118,000 km², most of the total rural areas rely on groundwater resources for the supply of household water. This paper aims at deducing the quality of groundwater in Malawi. Having a vast mineral resource potential, there is a possibility of a lot of mining activities in the country, in the near future. The study will be helpful in establishing a baseline for groundwater quality to check any contamination likely to be brought about by future mining activities. In the study, the country has been subdivided into 20 km by 20 km grids. From each grid one groundwater sample from hand-pumped boreholes was collected. The samples were measured for pH, electrical conductivity, Eh, water temperature and dissolved oxygen in the field before being filtered and kept in three 100 ml and two 50 ml pre-washed and pre-weighed PP bottles which were carefully sealed. GPS coordinates and elevation for each sampling point were also recorded.

Results of field survey show that pH values range between 5.29 and 8.07, although previous study reported pH of groundwater in Malawi varies 6.3 to 7.1 (Chilton & Shmith-Carington, 1984; MacFarlane & Bowden, 1992; Palamuleni, 2002). Electrical conductivity ranges from 3 to 1037 mS/m.

We analyzed major elements by Ion Chromatography (Thermo Fisher Scientific Dionex ICS-2100 and ICS-3000) at Akita Prefecture Industrial Center and 52 trace elements by Q-ICP-MS (Agilent 7700) at Akita University. Most of trace elements are lower than detection limits. Potassium-Li and As-U of groundwater show the positive correlation. The groundwater sample which was taken from the Cretaceous sediments shows high value of total dissolved solids (TDS). The results of groundwater samples from Quaternary sediment have relatively high concentration of trace elements. Ground water with high Cl content (>1000 ppm) also have high concentration of trace elements. These are geographically located at the tip of the East African rift system..