



Groundwater flow systems in the south Pare mountains, Tanzania

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In recent years, water use on the hill slopes of the semi-arid South Pare Mountains in Northeast Tanzania has increased. In order to better understand the hydrogeology of the area, a groundwater flow systems analysis was carried out for two meso-scale catchments (Makanya and Mbaga; both around 300 km²). Extensive geological mapping, 2D geo-electrical resistivity measurements, soil infiltration tests, auger hole tests wells and pumping tests were carried out. Furthermore, some 300 water samples were collected from inside and around the catchment and analysed for all major cations and anions, including dissolved silica. Due to a combination of the dipping and faulting of the geological units, a substantial amount of water was drained out of the Makanya catchment into catchment of Mbaga. In the elevated parts of the catchments, springs contributing to base flow were found in old rockslides, consisting of weathered parent rocks. Water quality in these parts was mainly determined by silicate weathering. In the lower parts of the catchments, springs contained high amounts of sodium, chloride and sulphate and did not compare with water quality found uphill. We concluded that two distinct flow systems exist in the catchment: a local system, defined by the limited thickness of the weathered material and landslides, and a regional flow system that was most likely controlled by regional faulting. This case study demonstrates how hydro-chemical and geophysical methods can be used to analyse groundwater flow systems, which is a pre-requisite for sustainable water resources management in the region.