Saline groundwater generation from paleo-termite mounds in the Buffels River valley, South Africa.

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Saline groundwater in semi-arid to arid areas is typically ascribed to evaporative concentration of salts on or near the surface followed by dissolution of salts and downward percolation of brines during episodic rainfall events. This has been previously postulated for large parts of the west coast of South Africa where groundwater electrical conductivity (EC) ranges between 804 µS/cm and 4 820 µS/cm. However, due to the spatial variability of groundwater salt concentrations, it is unlikely that simple evaporation is the only process leading to elevated salinity levels in this region. Palaeo-termite mounds, known as heuweltjies (meaning little hills), are common surface features along the west coast of South Africa, covering up to 25% of the land surface. These structures consist of aerated and nutrient-rich sediments, containing elevated levels of micro- and macro elements, including salts, compared to the surrounding sediments. In the Buffels River valley, exchangeable ions from sediments in the centre of the heuweltjies are up to 20 times higher than in the inter-heuweltjie material. Distinct sulphate rich layers have recently been found within the heuweltjies and may be related to highly variable sulphate concentrations in the groundwater in this area (2 mg/L to 453 mg/L). Groundwater, $^{87}Sr/^{86}Sr$ ratios in the same area are extremely elevated, up to 0.78240, suggesting a direct link to the underlying radiogenic granitic basement gneisses. However, these values decrease towards the west which could suggest mixing between various groundwater sources. $^{36}Cl/Cl$ ratios are also highly variable ranging between 25.94 $x10^{-15}$ and 156.19$x10^{-15}$ suggesting inland recharge and interaction between multiple sources of groundwater. Multiple groundwater sources is also supported by variable ^{14}C activites. $\delta^{34}S$ and $\delta^{18}O$ in sulphates together with Sr and Cl isotopes is used to assess cycling of sulphate between the heuweltjies and groundwater system and shed more light on groundwater salinisation on the west coast of South Africa.