



Geothermal energy from the Main Karoo Basin (South Africa): An outcrop analogue study of Permian sandstone reservoir formations

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The geothermal potential of the South African Main Karoo Basin has not been addressed in the past, although thick siliciclastic successions in geothermal prone depths are promising target reservoir formations. A first assessment of the geothermal potential of the Karoo Basin is based on petro- and thermophysical data gained from an outcrop analogue study of Permian sandstones in the Eastern Cape Province, and evaluation of groundwater temperature and heat flow values from literature. A volumetric approach of the sandstones' reservoir potential leads to a first estimation of 2240 TWh (8.0 EJ) of power generation within the central and southern part of the basin. Comparison with data from other sedimentary basins where deep geothermal reservoirs are identified shows the high potential of the Karoo for future geothermal resource exploration, development and production. The mainly low permeability lithotypes may be operated as stimulated systems, depending on the fracture porosity in the deeper subsurface. In some areas auto-convective thermal water circulation might be expected and direct heat use becomes reasonable. The data presented here serve to identify exploration areas and are valuable attributes for reservoir modeling, contributing to (1) a reliable reservoir prognosis, (2) the decision of potential reservoir stimulation, and (3) the planning of long-term efficient reservoir utilization.