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Geothermal surveys in the oceanic volcanic island of Mauritius

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Oceanic island chains are generally characterised by young volcanic systems that are predominately composed of basaltic lavas and related magmatic products. Although hot springs are occasionally present, the pervasive, massive, recent outpourings of basaltic lavas are the primary manifestation of the existence of geothermal resources. These islands may have, in principle, significant potential for the exploitation of geothermal energy. In this paper, we present results of recent investigations aimed at the evaluation of geothermal resources of the island of Mauritius, that is the emerging portion of a huge submarine, aseismic, volcanic plateau extending in the SW part of the Indian Ocean. The plateau is related to a long-lived hotspot track, whose present-day expression is the active volcano of La Réunion Island, located about 200 km SW of Mauritius. The island does not show at present any volcanic activity, but magmatism is quite recent as it dates from 7.8 to 0.03 Myr. Geochemical data from water samples collected from boreholes do not indicate the presence of mature water, i.e. circulating in high-temperature geothermal reservoirs, and argue for short-term water-rock interaction in shallow hydrogeological circuits. However, this cannot rule out that a deep magmatic heat source, hydraulically insulated from shallow aquifers, may occur. To evaluate the geothermal gradient, a 270-m-deep hole was thus drilled in the island central portion, in which the most recent volcanic activity (0.03 Myr) took place. Temperature-depth profiles, recorded after complete thermal equilibration, revealed a thermal gradient of 40 mK/m. Attempts of extracting additional thermal information were also made by measuring the temperature in a 170-m-deep deep water hole, no longer used. The results were consistent with the gradient hole, i.e. pointing to a weak or null deep-seated thermal anomaly beneath Mauritius and low geothermal potential. The deep thermal process (mantle plume) invoked to occur in the hotspot area thus seems to yield no particular thermal signature.