CHARACTERIZATION OF THERMAL SPRINGS IN SRI LANKA; A COMBINED GEOLOGICAL, GEOPHYSICAL AND GEOCHEMICAL APPROACH

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The thermal belt of Sri Lanka encompasses nine identified hot springs which are located close to the boundary between the lithotectonic units namely, Highland and Vijayan. This boundary follows irregular trends starting from mid-south to the northeast of the country. Certain aspects of these thermal springs have been studied previously but little knowledge is available about the structures beneath and the relationship between these individual systems. This study has attempted to address these primary problems using geophysics and geochemistry as tools.

In order to understand the structure beneath, the electrical resistivity of the ground was measured. The main geophysical method used here is Magnetotellurics (MT), which is a remote sensing technique with a longer penetration depth. Frequency ranging from 10,000 -0.001 Hz electromagnetic (EM) waves were used in this study. Time domain electromagnetic (TDEM) method was employed as the active geophysical tool to profile the near-surface and to correct the static shift. Only the spring systems of Kapurella, Wahawa and Maha Oya have been discussed here as case studies.

In geochemical analysis, the major cations, Na, K, Ca, and Mg, were studied for their concentrations in the spring water. Chemical geothermometry was employed to estimate the recent water rock interaction temperatures of the thermal waters. Physical parameters measured in the study were surface temperature, pH and electrical conductivity.

Electrical resistivity variations produced in two-dimensional inversion models were used to predict reservoir formations and fracture patterns of individual systems. It was determined from the above models that all the systems are composed of deep reservoir systems where their depth ranges from 8 to 15 km. Further, the reservoirs are connected to the surface by narrow plumes which are identified as fractures in the rock. The source of heat at the geophysically-predicted depth originates from the average geothermal gradient.

The abundant cation in Kanniya and Rangiriulpotha was Ca, whereas it was Na in all other occurrences. These results reveal that there are three *geochemical provinces*, namely, Kanniya - Rangiriulpotha, Maha Oya - Wahawa and Kapurella - Nelumwewa, of which the individual thermal systems are related to each other. Chemical geothermometry provide reservoir temperatures for Kapurella, Wahawa and Maha Oya as 135 °C, 92 °C and 85 °C respectively.