D-56: Schlumberger resistivity soundings at the Mahapelessa thermal spring

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Mahapelessa thermal spring is located in southern Sri Lanka, latitude 7° 15'N and longitude 81° 00' at Mahapelessa (Sooriyawewa) in the Hambantota district. It borders the Highland-Vijayan boundary that divides two geologically distinct regions. The spring is from within a NE-SW trending valley of approximately 0.75km x 3.0 km where the outer regions are of undulating terrain. A narrow bridge of harder ground ~50m wide trending NS passes through the main spring. The regional geology is considered to be Precambrian consisting of biotite and biotite hornblende gneisses. Quartzite is noted SE of the valley. Air photos show NE, NW and northward lineaments with no major evidenced faults near by. The surface temperature of the hot thermal spring is 44°C and that of the "cold" thermal spring NE of the hot spring is 35°C. Both springs contain highly saline waters of conductivity 7100 mSm^{-1} and emit gas bubbles, with hydrogen concentrations of over 1000 times that of air.

Pulsed D.C Schlumberger resistivity vertical electrical soundings were conducted along a NE-SW profile 20m north west of the spring. Six locations, one near the spring, two to SW and three to NE were separated by 100m. For a greater depth of investigation a maximum current electrode separation of 1.8km was used that was limited only by logistical constraints.

The interpretation of the VES curves indicate in general a four layer resistivity model to a depth about 60-70m. The top layer of thickness ~5-10m has a low resistivity of 2-8 Ω m. The underlying second layer is of thickness ~10m and of medium resistivity 600-1200 Ω m, but extending to a thickness of ~35m and resistivity of 8 kΩm between the hot and "cold" springs. The third layer is of low to medium resistivity (10-45 Ωm) and the thickness gradually thins out from ~20m in SW to fade out 150m. NE of the spring and could well be infiltrated with thermal waters. The last detected layer shows widely varying resistivity (~20-90 kΩm from SW to NE. However modeling VES data for the three soundings NE of the spring is best accomodated by considering layer of resistivity ~1-2 kΩm below 60m. The resistivity variation indicates thickening trend of the weathered rock from NE to SW over the highest resistive layer dipping ~7° SW. Thermal waters are most likely to flow from SW along the third resistivity contrast or vertically upward between the hot and cold springs. Any preliminary test bore holes can be sited 100m to the SW and NE of the hot spring.

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