

Geochemical Characteristics of Geothermal and Non-geothermal Water at Wahawa Field in Sri Lanka

M.M. Sajath^{*1}, D.T. Udagedara¹, S.A. Samaranayaka¹

¹*Department of Science and Technology, Uva Wellassa University of Sri Lanka, Badulla, Sri Lanka.*

Hydrogeochemistry of the geothermal and non-geothermal water is highly related to geology in Wahawa geothermal field. The objective of this study is to accumulate all existing geochemical and isotopic data into the water in the Wahawa area, in high grade metamorphic terrain of Sri Lanka. In this study, the $\text{Cl-SO}_4^{2-}\text{-HCO}_3^-$, and Na-K-Mg ternary diagrams, stable isotopes were used to characterize the water and estimate the subsurface temperature using AqQA computer code. Twenty two water samples were analyzed. Geochemistry of geothermal water is separate from that of non-geothermal water. Higher contents of Na, K, Cl, F, Br, NO_2^- , NO_3^- , PO_4^{3-} , SO_4^{2-} , and Total Dissolved Solids in geothermal water are most likely due to the dissolution of feldspar, mica, and sulfide minerals in the granitic and dolerite rocks. Similarly, lower values of Mg, Fe, Cu and Zn suggest less ferromagnesian minerals in the basement. The classification based on major ions reveals a Na-K- SO_4 type of geothermal water for Wahawa. Non-geothermal water is dominated by the Na-Ca- SO_4 . The water was classified, mixing processes studied and the origin and movement towards the water determined. From the ternary plots, the waters can be classified as groundwater, geothermal water and a combination of the two, with the geochemical diagram which plots close to mature water. The plots also suggest that all the water originates from old systems. In overall, the chemical compositions of geothermal water in this area are determined by the interface between the groundwater (meteoric waters of current hydrological cycle) and the rock environment. The procedure may depend on pH, mineralization, the rate of other ions and temperature. Most of the geothermal water seems to have equilibrated with respect to specific minerals. Geothermal waters in Wahawa are formed by mixing.

Keywords: Hydrogeochemistry, Geothermal water, Ferromagnesian, Mineralization, High grade metamorphic terrain.