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ENVIRONMENTAL ISOTOPE STUDY IN THE AREAS OF FOUR THERMAL SPRINGS IN SRI LANKA

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Oxygen and hydrogen isotope studies are useful in the genetic classification of thermal spring water. Stable isotopes have also been used extensively as tracers to locate recharge areas to geothermal reservoirs. Geothermal water cools as it rises to the surface and this cooling is a result of conduction, mixing and boiling. Mixing with cold water before and after boiling is very common in geothermal systems and this phenomenon can be detected by studying the change in isotopic composition. Any mixing proportions of two water sources with known $\delta^{18}O$ and $\delta^{2}H$ values will fall along a tie line between the compositions of the end members on $\delta^{18}O$ and $\delta^{2}H$ plot. Thus, each of these processes can be traced isotopically.

Present study was carried out in four thermal spring (Kapuralla, Mahaoya, Marangala-Wahawa and Nelumwewa) areas of Sri Lanka using stable isotope compositions to determine the origin and mixing conditions of thermal spring water. Sixty six water samples were analyzed using Liquid Water Isotope Analyzer based Off-axis Integrated Cavity Output Spectroscopy method for hydrogen and oxygen isotope compositions of thermal and non thermal groundwater. $\delta^{18}O$ and $\delta^{2}H$ values of thermal waters ranged from -5.31 $^{0}/_{00}$ to -5.41 $^{0}/_{00}$ and -32.63 $^{0}/_{00}$ to -33.95 $^{0}/_{00}$ respectively while that of the non thermal waters were in the range from -1.33 $^{0}/_{00}$ to -6.71 $^{0}/_{00}$ and -10.97 $^{0}/_{00}$ to -42.25 $^{0}/_{00}$. All values cluster along the global meteoric water line, conforming that they are of meteoric origin. The thermal spring water samples are relatively enriched both in ^{2}H and ^{18}O than non-thermal deep groundwater and also fall slightly below the meteoric water line. Shallow non-thermal groundwaters too are enriched with ^{2}H and ^{18}O while some samples are indicating the evaporation effect. Slight enrichment of stable isotopes in thermal water compared to average deep groundwater could be a result of mixing with non-thermal shallow groundwater. Isotope composition of studied thermal water indicates that they are of meteoric origin and shows a resemblance to the groundwater of the same area. This is evident from the fact that the thermal water isotopic compositions are intermediate between the compositions of deep non thermal groundwater and shallow groundwater/surface water. This indicates possible mixing of thermal water with shallow groundwater prior to discharging at thermal spring outlets.

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