Isotope characteristic (δD, $\delta^{18}O$, $\delta^{11}B$, $^{87}Sr/^{86}Sr$, $\delta^{88}Sr$) of geothermal waters from the Tatun Volcanic Group in northern Taiwan

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Chemical and isotopic data for 22 geothermal water samples collected in Taiwan within the Tatun Volcanic Group (TVG) are reported. Major and trace elements including B, Sr and their isotopic compositions as well as water isotopes ($\delta^{11}B$, $^{87}Sr/^{86}Sr$, $\delta^{88}Sr$, δD, $\delta^{18}O$) were determined. Both element contents and isotopic compositions in the geothermal water show large distributions. According to pH, element concentrations and isotopic compositions as well as field occurrences, these geothermal waters can be classified into three categories, namely SO_4^{2-} acidic waters, neutral waters, and Cl- rich acidic waters. Samples of Cl- rich acidic waters show high concentrations in all measured elements, $\delta^{18}O$ (-3.3 – -2.2 ‰) and $^{87}Sr/^{86}Sr$ values (0.70753 – 0.71138) and low pH (1.79 – 2.59), $\delta^{11}B$ (3.0 – 3.4 ‰), and $\delta^{88}Sr$ values (0.17 – 0.39 ‰). Samples of neutral waters show high pH values (2.95 – 7.66), medium $\delta^{88}Sr$ (0.35 – 0.43 ‰) and low $\delta^{18}O$ (-5.8 – -3.0 ‰), $\delta^{11}B$ (0.6 – 9.3 ‰), and $^{87}Sr/^{86}Sr$ values (0.70450 – 0.70474). Samples of SO_4^{2-} acidic waters show medium pH values (2.4 – 4.52), large distributions of $\delta^{18}O$ and $\delta^{11}B$ values (-6.4 – 3.6 ‰, -4.9 – 14.2 ‰, respectively), and extremely high $\delta^{88}Sr$ values (0.36 – 0.70 ‰). $^{87}Sr/^{86}Sr$ values indicate the signal of sedimentary rock contribution in the source region. The deviated values of $\delta^{11}B$ and $\delta^{88}Sr$ from bed rock composition is an indication of the fact that a strong migration effect has occurred on the samples of SO_4^{2-} acidic and neutral waters. Each of these isotope systems reveals important information about a particular aspect of water sources, water/rock interaction, or migration processes. Taking all of these isotope systems into consideration provides a better understanding of the geothermal systems from the TVG in northern Taiwan.