

Geothermal exploration of the Iwaki Volcano using the Br/Cl ratio in river, spring, and hot spring water

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Promising geothermal resource exploration areas in the vicinity of the Iwaki Volcano include the area around Lake and Hyakuzawa. Since 2011, three geothermal resource exploration drillings have been conducted around the Lake area. However, no promising geothermal power site has been found. Therefore, this study attempts to identify signs of such a site from the Br/Cl ratio of river, spring, and hot spring water samples collected from various locations around the entire area of the Iwaki Volcano.

We used 10 spring water, 18 stream water, and 27 hot spring water (Onsen) samples. We analyzed sample for Li^+ , Na^+ , NH_4^+ , K^+ , Mg^{2+} , Ca^{2+} , F^- , Cl^- , Br^- , NO_3^- , SO_4^{2-} , Fe, Mn, Sr, Ba, B, Si, alkalinity, $\delta^{18}\text{O}$, and δD .

The analysis of Br/Cl in the hot spring water samples using the Cl vs. Br concentration diagram from Angcoy and Arnórsson (2015) revealed that they were relatively clearly divided into having seawater or magmatic (geothermal signature) origins. From the Br/Cl ratio of the hot spring water samples, it was determined that any geothermal signature in the river and spring waters would be detected by the Br/Cl ratio of those samples.

The results of the analysis of the Br/Cl ratio of these river and spring water samples indicated that they were not magmatic in origin with the exception of two rivers flowing around the Lake and Hyakuzawa areas. However, hot spring water flows into these. Thus, no promising geothermal resource exploration areas were found outside the Lake and Hyakuzawa areas.

Keywords: Iwaki Volcano, Br/Cl ratio, Geothermal exploration