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The geochemical analysis about formation of groundwater in Aso caldera, Japan

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Aso caldera is known as rich in groundwaters. Among them, it is notable wide distribution of Fe-rich groundwater (called as Akamizu) in the western part of Aso-dani (north floor of the Aso caldera) . In order to reveal relationship between the Fe-rich groundwater (Akamizu) and hot spring waters which are pumped up from aquifers in deeper depth, we studied their chemical composition.

Hot spring waters were collected from 8 sites (depth: 150 m, 400 m˜1500 m) in October 2012. Temperature, pH, electric conductivity (EC) and oxidation-reduction potential (ORP) were measured *in situ*. Cations (Na^+, K^+, Mg^{2+}, Ca^{2+}, total Fe) were analyzed with ICP-AES and Rb^+, Cs^+, La^{2+} were analyzed with ICP-MS. Si was analyze by colorimetry. Anions (F^-, Cl^-, $SO_4{}^{2-}$) were analyzed by Ion Chromatography. Alkalinity was determined by acid titration. Sulfur isotopic composition of dissolved $SO_4{}^{2-}$ was measured by IR-MS.

Concentrations of major cation showed positive correlation with Cl^- concentration, although total Fe did not show clear relationship. Trace elements, Rb^+ showed positive correlation with Cl^- concentration, but concentrations of Cs^+ and La^{2+} are lower than detection limit. Delta-^{34}S values showed a range of from +13.4 per-mill to +16.0 per-mill, which showed local difference tend to increasing from the east to the west.

Relationship among concentrations of dissolved ions and delta-^{34}S values in the hot spring waters are well explained by mixing between two or three end-members, one of which could be considered as a geothermal fluid. Moreover, chemical composition of Fe-rich groundwater (Akamizu) is explained by the same end-members, which suggests contribution from the geothermal fluid.

Keywords: Aso, hot spring, groundwater, isotope