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Preliminary study on contribution of volcanic gas to springs in the Chokai volcano

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The Mt. Chokai is a volcano located on the boundary of Akita and Yamagata prefectures, Japan, and faces the Sea of Japan. There are a lot of springs not only in slope and foot of the mountain but also on the sea floor. Springs mainly distribute in the western slope and foot on the mountain. While, the Detsubo spring is located in the northern slope and shows large flux (from 0.2 to 0.4 m^3/sec; Shimano and Hida, 2001) despite it discharges from higher elevation (about 560 m). Since the Detsubo water shows low pH ($<$ 5) and high SO_4^{2-} concentration ($>$ 50 mg/L), contribution of volcanic gas to the spring water is estimated (Inoue, 1993; Shimano and Hida, 2001; Shimano, 2003; Ogasawara, 2005; Amita, et al., 2007). However, geochemical process to form water quality is still not clear. Ogasawara (2005) suggested the contribution of the volcanic gas to other several springs based on delta^{13}C. This study attempts to reveal the contribution of the volcanic gas to spring waters, especially to the Detsubo spring.

Spring water samples were collected on August 2012, and were analyzed for major dissolved components, delta D, delta^{18}O, delta^{13}C, ^{3}He/^{4}He, noble gas concentrations and groundwater-age indices (CFCs and SF_6). Results of major dissolved components and delta D and delta^{18}O showed almost same values with previous studies. Dissolved components of the most spring water showed Na-Cl/HCO_3 type, while the Detsubo spring showed Na-Cl/SO_4type. Correlation of delta D and delta^{18}O showed that all samples were plotted along the meteoric water line, suggesting that the contribution of magmatic water to groundwater is unlikely or less. delta^{13}C values ranged from -15.3 to -4.3 permil and tended to show higher values than those values obtained by Ogasawara (2005). Only the Detsubo spring and two springs ranged from -5 to -4 permil. Dissolution of marine carbonates is considered to be quite small because spring waters are recharged and flow in volcanic aquifer. This result suggests volcanic gas contributes not only to spring water of Na-Cl/SO_4 type but also to spring water of Na-Cl/HCO_3 type. In the presentation, contribution of volcanic gas to spring water and difference of dissolved components will be discussed based on results described above and He isotopes.