Monitoring of thermal waters and fumarolic gases in the active volcanoes in Hokkaido, Japan

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We have continuously performed geochemical monitoring in the active volcanoes in Hokkaido, Japan, to detect changes in their volcanic activity. We have observed thermal waters and fumarolic gases in Meakandake (1986-present), Tokachidake (1986-present) and Tarumai (1998-present) volcanoes, and have observed thermal waters in Komagatake volcano (1991-present). During each monitoring period, a magmatic eruption occurred in Tokachidake volcano (1988-89) and small phreatic eruptions occurred in Meakandake (1988, 1996, 1998, 2006 and 2008) and Komagatake (1996, 1998 and 2000) volcanoes.

Tokachidake volcano erupted in 1988-89, and the eruption enhanced the temperature and chemical compositions of thermal waters discharging at the flank [1]. Before the 1988-89 eruption, the temperatures and total sulfur concentrations of fumarolic gases were high compared with those of the present. Because these changes were affected by the volcanic activity, these monitoring is a useful method to understand the state of the volcano. Recently, the chemical compositions of the thermal waters slightly changed again associated with the increase of the volcanic activity.

In Meakandake volcano, no obvious chemical changes were observed in thermal waters at the flank in spite of repeated phreatic eruptions. In contrast, the HCl component in the fumarolic gases and thermal waters at the summit craters slightly increased before the eruptions [2].

In Komagatake volcano, the thermal and chemical increases were observed at the flank thermal spring during repeated phreatic eruptions [3]. These changes might be related to the volcanic activity.

Tarumai volcano did not cause any eruptions during the observation period. The decrease of the chemical concentrations of thermal waters and fumarolic gases generally continued during this period.

[1] Takahashi *et al*. (2015) *Bull. Volcanol*. 77, doi 10.1007/s00445-014-0887-6. [2] Murayama *et al*. (2010) *Rep. Geol. Surv. Hokkaido* 81, 45-64. [3] Ogino & Okazaki (2002) *Rep. Geol. Surv. Hokkaido* 73, 235-242.