3.4.14

Concentrations of dissolved sulfate ion and total sulfur in Yugama, a crater lake of the Kusatsu-Shirane volcano, Japan

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Yugama is the largest crater lake of the Kusatsu-Shirane volcano that is one of the active volcanoes in Japan. Its water is strongly acidic because of continuous supply of acidic fluid such as volcanic gases from its bottom. The latest volcanic activity of the Kusatsu-Shirane volcano was observed between 1982 and 1983, as phreatic eruptions at Yugama.

In this study, we re-analyzed preserved Yugama water samples since 1966 for sulfur species by applying two analytical methods. One was ion chromatograph, by which concentrations of the sulfate ion (SO_4^{2-}) were determined. The other one was gravimetric analysis preceded by oxidation of the samples, by which total concentrations of sulfur species (ΣSO_4^{2-}) were determined. If the sulfate ion is the only dissolved sulfur species, these two methods must yield very similar results for a sample.

The concentration of ΣSO_4^{2-} had been larger than that of SO_4^{2-} by more than 6,000 mg/dm^3 in 1966. The gap between the two had been narrowing year by year since then. They had become nearly the same at the time of the phreatic eruptions at Yugama in 1982 – 1983, and have been so ever since. The difference between the concentration of SO_4^{2-} and ΣSO_4^{2-} is supposed to be due to the existence of sulfur species at the intermediate oxidation states such as poly-thionates. Our observation is in good accordance with the studies of poly-thionates in Yugama which concluded that they were decomposed and oxidized to sulfate ions by high volcanic activity [1]. It is thus indicated that the Kusatsu-Shirane volcano is still at high activity state, although the observable eruption has not been reported since 1983. This is supported by other observations for the volcano such as tremors, earthquakes and so forth. To summarize, we make the statement that it is highly probable to understand the change in volcanic activities of the Kusatsu-Shirane volcano by monitoring the concentration difference between SO_4^{2-} and ΣSO_4^{2-} in Yugama.

Reference

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3.4.15

Noble gases from Oldoinyo Lengai volcano, Tanzania

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Fieldwork was conducted in the active North crater of Oldoinyo Lengai volcano in the East African Rift, Tanzania. Oldoinyo Lengai is the only active carbonatite volcano. Gases were collected from two fumaroles discharging close to the currently active vent. Measured fumarole temperatures were <195°C, despite vigorous eruptive activity. Gases were collected in 50ml helium proof glass flasks with high vacuum stop-cocks at either end. Gas was pumped through the flasks using a battery powered pump at a rate similar to the degassing observed at the site. One gas sample was analysed for helium and neon isotopes. The neon isotope data are indistinguishable from air, though it is uncertain whether this is due to air entrainment during sampling or if the fumaroles are influenced by atmospheric gases dissolved in a shallow hydrothermal system. The measured $^3He/^4He$ ratio of this gas sample is 4.3 ± 0.02 R/Ra. However, correcting this value for air contamination using the measured He/Ne ratio ($^4He/^{20}Ne = 0.75 \pm 0.02$) gives a source $^3He/^4He$ value of 6.8 ± 0.5 R/Ra. This is similar to data from silicate lavas and xenoliths of the East African Rift, presumed to represent the local lithospheric mantle [1]. Since partitioning of noble gases between a carbonate and silicate melt is poorly understood, it is unclear if the natrocarbonatite itself comes from this region, or if late stage fractionation or liquid immiscibility from a silicate melt play a role at a higher level (i.e. in the crust itself). Noble gas analyses of fresh natrocarbonatite lavas as well as included phenocrysts are in progress, and will also be presented.

References

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