

## Helium isotope variations in subduction-type volcanic hydrothermal systems

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Large variations of  $^3\text{He}/^4\text{He}$  ratios of gas and fluid samples were observed in subduction-type modern hydrothermal systems ( $0.3R_a - 8R_a$  where  $R_a$  is the atmospheric ratio of  $1.38 \times 10^{-6}$ ) compared with those of mid-ocean ridge basalt (MORB) glasses ( $7.5R_a - 9.5R_a$ ). These variations are principally attributable to binary mixing of two components: mantle He ( $8R_a$ ) and crustal helium ( $0.1R_a$ ). Major source of the latter component could be due to radiogenic helium in the subsurface crustal material. Thus, shallow assimilation would result in helium isotope variations around an isolated volcano. Early case study on the Ontake volcanic hydrothermal system showed that high- $R_a$  was located in hot spring close to the central cone and decreased with distance from the volcano. Subsequent studies around Mt Nevado del Ruiz and Mt Kusatsu-Shirane confirmed the negative correlation between the  $^3\text{He}/^4\text{He}$  ratio and the distance. There may be three necessary conditions to produce such a tendency. First, the volcano is independent strato-type and there is no other volcano close to the subject. Second, the magma chamber is located just beneath the volcano so that the conduit is not inclined significantly. Third, the hydrothermal system is well developed and the emission of mantle helium is stable for a long time. In order to apply these hypothetical conditions to a caldera volcano, we have carried out helium isotope survey around Aso volcano in Southwest Japan. Mt Aso is the largest active volcano in Japan with a caldera 25 km north-south and 18 km east-west. Post caldera activity is currently observed in central cone at Mt Nakadake. We have collected hot spring gas and fluid samples within the Aso caldera together with the outside and measured  $^3\text{He}/^4\text{He}$  and  $^4\text{He}/^{20}\text{Ne}$  ratios by a noble gas mass spectrometer. The helium isotopes, after correction of air contribution, decrease with the distance from the central cone in the region. The tendency is consistent with those of strato-volcanoes reported in literatures.

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