Beryllium isotopes observed in Hachijo Island

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Three Be isotopes occur in the Earth's surface region. ^{9}Be is a stable isotope and ^{7}Be and ^{10}Be are radioisotopes with half-lives of 53.3d and 1.5Ma, respectively. The radioisotopes, ^{7}Be and ^{10}Be, are produced by cosmic rays in the stratosphere and upper troposphere. Since ^{7}Be and ^{10}Be are attached to aerosols after the production, these isotopes are tracers for aerosols in the upper atmosphere. We have measured ^{7}Be and ^{10}Be concentrations in air and seawater samples around the ocean surface, and estimated mean residence time in the surface layer and the fluxes of these nuclides, which are important to know atmospheric input to surface ocean, using the isotopic ratio ^{10}Be/^{7}Be. We also found the distributions of ^{7}Be and ^{10}Be in the atmosphere over the ocean vary more than 10 times as the function of latitude for the effect of global air circulation. In addition to the spatial distribution, transport of the stratospheric air into the troposphere changes with season, and the maximum transfer occurs in spring in Northern Hemisphere. So continuous observation in a remote island is required to determine the average fluxes of ^{7}Be and ^{10}Be.

We started a continuous observation of air and rain in Hatijo Island (33.1˚N, 139.9˚E), which is located at 290km south of Tokyo in the rim of western North Pacific, from Jan 2002. Similar samplings were made in Tokyo (35.7˚N, 139.6˚E) as the reference. Aerosol samples were collected weekly using high volume air samplers (30 m^{3}/hr), and rain samples were collected for 2-4 weeks using PVC funnels and PE containers. Concentrations of ^{7}Be and ^{10}Be in air and rain samples were determined by γ-ray measurement using HP Ge detectors and accelerator mass spectrometry using 5UD Pelletron at MALT, Univ. Tokyo, respectively.

The seasonal variations of ^{7}Be and ^{10}Be concentrations in the atmosphere and ^{7}Be and ^{10}Be fluxes estimated from rain samples for both stations are similar to each other, especially almost same for atmospheric concentrations. All data show maxima and also the highest ^{10}Be/^{7}Be ratio in spring because of the contribution of stratospheric input. In the other season, ^{10}Be/^{7}Be ratios in Tokyo are 10-30% higher than those in Hachijo Island because of the ^{10}Be enrichment by recycled Be isotopes deposited on crustal materials.

Carbon bearing gases occluded in selected granitic rocks from Japan, Australia and Slovakia

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Carbon in the form of volatiles such as CO_2 and CH_4 is a typical agent to regulate oxygen fugacity in petrogenesis. We analyzed carbon bearing gases (CO_2, CH_4, CO, C_2H_6 and C_3H_8) occluded in more than 400 samples of granitic rocks collected from Japan, Australia and Slovakia. The gas was discharged from these samples by crushing in closed atmosphere and introduced into an FID gas chromatograph equipped with CO_2-CH_4 converter. Major components of the discharged gas were CO_2 (up to 1000 ppm) and CH_4 (up to 300 ppm).

The gas results from Japanese samples show contrastive gas composition by a granite typology, Ilmenite-series and Magnetite-series. The former samples occlude much CH_4 and CO_2, in contrast, the latter ones occlude only minute amount of CO_2. Magnetite is generally formed under the condition of higher oxygen fugacity than that buffered by CO_2 and CH_4. The gas composition from Ilmenite-series samples shows that the CO_2-CH_4 buffer kept the oxygen fugacity of source magma low and prevented magnetite from forming.

The results from Australian samples also show contrastive gas composition by another granite typology, S-type and I-type. S-type and reduced I-type samples occlude much CH_4 rather than CO_2 whereas oxidized I-type ones occlude much CO_2. In general, S-type granites contain much carbon derived from pelitic source rocks and this carbon works as reducing agent in petrogenesis, therefore, the contrastive gas distribution between these types might reflect the redox condition in their source magma.

In contrast, the results from Slovakian samples do not show apparent relationship with these granite typologies. Most Slovakian samples occlude either CH_4 or CO_2. That suggests the CO_2-CH_4 buffer does not work in this region and/or the majority of collisional I/S-type granites were originated from recycled volcanic arc source with minor addition from metapelites. A positive correlation is recognized between magnetic susceptibility and total sulfur content, therefore, sulfur rather than carbon might be the main agent for keeping the oxygen fugacity in magma phase high enough to produce magnetite.