

伊豆・小笠原・マリアナ（IBM）島弧と伊豆衝突帯（ICZ）の珪質岩ジルコンの酸素と珪素同位体比の特徴

Characteristics of O and Si isotope ratios of zircons of silicic rocks from the Izu-Bonin-Mariana (IBM) arc and the Izu collision zone (ICZ)

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The Izu-Bonin-Mariana (IBM) Arc is an active intra-oceanic arc for ~52 million years, and silicic crusts have been generated by subduction zone magmatism [e.g., 1,2]. The north end of the IBM arc has been colliding with the Honshu Arc at the Izu Collision Zone (ICZ) for ~15 million years and voluminous syn-collision granitic plutons are exposed in ICZ [e.g., 3]. Silicic crust formations by intra-oceanic crustal subduction and the following arc-arc collision are probably significant processes of continental crust formation during the early Earth history.

Elevated $\delta^{18}\text{O}$ values (6.0–7.5‰, VSMOW) in Hadean and Archean zircons are interpreted as evidence for incorporation of low temperature aqueous alteration products to the zircon-forming magmas as early as 4.3 Ga [4,5]. Similarly, low $\delta^{30}\text{Si}$ magmas can be caused by incorporation of severely weathered materials [6,7]. Oxygen and Si isotope ratios of zircons can be useful to investigate incorporation of low-temperature weathered material to their parent magmas. We established zircon standards, a kimberlite xenocryst KC-KLV-Zrc1 from Kaalvallei, South Africa ($\delta^{18}\text{O}_{\text{VSMOW}}=5.43\pm0.14\%$, $\delta^{30}\text{Si}_{\text{NBS-28}}=-0.38\pm0.19\%$, 2SD) and a detrital zircon megacryst KC-MGK-Zrc2 from Mogok, Myanmar ($\delta^{18}\text{O}_{\text{VSMOW}}=19.14\pm0.14\%$, $\delta^{30}\text{Si}_{\text{NBS-28}}=-0.18\pm0.09\%$, 2SD), for in situ O and Si isotope measurements by SIMS. And we performed O and Si isotope analyses of zircons from IBM Arc (6 granitic rocks and 1 gabbro, ~52 to 0.15 Ma) and ICZ (6 granitic rocks, 15.7 to 4.3 Ma) by SIMS. Typical spot-to-spot reproducibility (2SD) of SIMS measurements was $\pm0.25\%$ for $\delta^{18}\text{O}$ and $\pm0.3\%$ for $\delta^{30}\text{Si}$, respectively. Part of isotope data have already reported in JpGU 2016 [8].

The zircon $\delta^{18}\text{O}$ values of most IBM granitic rocks (4.9 to 5.2‰) are within the range of the mantle-like zircon value ($5.3\pm0.6\%$, [4,9]) with one exception of the Omachi Seamount sample (7.0‰). Zircons from IBM fore-arc gabbro have slightly low values (4.6‰). In contrast, zircons from ICZ tend to have elevated $\delta^{18}\text{O}$ values (up to 6.4‰), indicating incorporation of accreted sediments in the Honshu Arc. The $\delta^{30}\text{Si}$ values of all measured zircons ($-0.4\pm0.3\%$) are consistent with the kimberlite zircon within analytical uncertainty ($\sim\pm0.3\%$). The present results suggest that incorporation of sediments to produce elevated $\delta^{18}\text{O}$ magmas effectively occurs by the arc-arc collision process but production of low $\delta^{30}\text{Si}$ magma require further accumulation and incorporation of matured sediments.

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