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太平洋マントルのオスミウム同位体不均質性について
Osmium isotope heterogeneity in the Pacific mantle: implications for the evolution of convecting upper mantle

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The ^{187}Re-^{187}Os decay system has long been recognised as having great advantage on determining the age of melt depletion of peridotites because ingrowth of radiogenic ^{187}Os in residual peridotites are hampered by extraction of moderately incompatible ^{187}Re associated with partial melting. This is well illustrated by the fact that old and highly depleted cratonic peridotites stored in Archean subcontinental lithospehere tend to show lower ^{187}Os/^{188}Os ratios than those of relatively fertile abyssal peridotites recovered from oceanic lithosphere, regarded as a representative sampling of modern convecting mantle (e.g. Pearson et al., 2007; Rudnick & Walker 2009). Recent accumulation of Os isotope data obtained either from abyssal peridotites (e.g. Harvey et al., 2006; Liu et al., 2008; Lassiter et al., 2014) or from ocean island peridotite xenoliths (e.g. Bizimis et al., 2007; Ishikawa et al., 2011) clearly demonstrated that the modern convecting mantle is substantially heterogeneous in Os-isotope composition. Unlike other radiogenic isotope heterogeneities observed in oceanic basalts, largely controlled by incorporation of recycled crustal materials, it seems likely that the observed range of Os-isotope compositions in oceanic peridotites directly reflect varying degrees of ancient melt extraction in peridotitic mantle. Hence global variations of Os-isotope compositions in oceanic peridotites may provide an important piece of information in unraveling geochemical/geodynamic evolution of the largest part of the Earth's interior, namely convecting mantle.

In this contribution, we focus on the Os-isotope variations in peridotite-serpentinite recovered from Pacific area because the number of data available is as yet scarce when compared with the data from other ocean (Atlantic, Arctic and Indian). Our primary purpose is to test whether mantle domains underlying four major oceans are distinct in terms of Os isotope variations. For this purpose, we examined Os isotope variations in (1) harzburgite-serpentinite recovered from Hess Deep in East Pacific Rise (˜0 Ma), (2) mantle section in Taitao ophiolite, Chile (˜6 Ma; Schulte et al., 2009), (3) harzburgite-serpentinite bodies in Izu-Ogasawara and Tonga forearc (Parkinson et al., 1998), (4) peridotite xenoliths from Pali-Kaau vent in O'ahu island, Hawaii (˜90 Ma; Bizimis et al. 2007), (5) low-temperature type peridotite xenoliths from Malaita, Solomon Islands (122-160 Ma; Ishikawa et al., 2011). The results demonstrated that samples from each area exhibit very similar Os-isotope variations with a pronounced mode in ^{187}Os/^{188}Os = 0.125-0.128. Moreover, relatively larger dataset obtained from Hess Deep, Taitao and Malaita indicate the presence of secondary peak in 187Os/^{188}Os=0.117-0.119, similar to the global population mainly comprised of data from other ocean. These observations suggest that the ancient refractory domains are distributed homogeneously within the whole part of convecting upper mantle.

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