

Age and geochemical characteristics of the igneous rocks recovered from the surveys for delineating Japanese continental shelves

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Characterization of igneous basement and reconstruction of the volcanotectonic history of the survey area are the major targets of the surveys for delineating Japanese continental shelves operated by METI. Sampling using R/V Hakurei-maru No.2 equipped with Deep-sea Boring Machine System (BMS) and arm dredges covers wide area of the Philippine Sea, Izu-Bonin arc, and seamounts on the subducting Pacific plate. Here we will present summary of results of $^{40}\text{Ar}/^{39}\text{Ar}$ dating and chemical and isotopic analyses on whole rock samples from these areas and discuss their significance.

1) Kyusyu-Palau Ridge (KPR): KPR is regarded as a remnant arc separated from the Izu-Bonin-Mariana arc by the spreading of the Shikoku and Parece Vela back-arc basins. Samples were collected on the KPR and also from the ridges extending in west direction into the Daito Basin. Preliminary dating results indicate that the collected samples are mainly Oligocene in age. Chemical characteristics of the basaltic to andesitic lavas and breccias from KPR show enrichment in large-ion-lithophile elements (LILE) and depletion in high-field-strength elements such as Nb and Ta, confirming island arc origin of this ridge. This enrichment in LILE and depletion in HFSE are less significant in the samples from the ridges extending to the west from the KPR. They show lower $^{206}\text{Pb}/^{204}\text{Pb}$, but higher $\delta^{7/4}$ relative to those on the KPR, i.e., have more Philippine Sea MORB-like characteristics. This across-arc geochemical variation seems to be similar to the trend observed in the Izu-Bonin arc. As is observed in the Izu-Bonin arc, along-arc variation appears to be present also in the KPR. Pb isotopic composition becomes most radiogenic around the Okinotorishima island (20oN). On Pb-Pb isotopic plots, KPR shows different slope from that of the Izu-Bonin arc and points to the space with higher $^{206}\text{Pb}/^{204}\text{Pb}$ and nearly zero or negative $\delta^{7/4}$ and $\delta^{8/4}$. This implies that one of the endmember component (possibly slab-derived component) for arc magma source of KPR was different from that of the Izu-Bonin arc.

2) Southern Izu-Bonin arc and West Mariana Ridge: Basaltic lavas from the West Mariana ridge gave $^{40}\text{Ar}/^{39}\text{Ar}$ ages between 4 and 6 Ma. These ages predate the initiation of rifting of Mariana Trough in this area, implying arc volcanism on this ridge ceased at or before the rifting separated this ridge from the currently-active Mariana frontal arc. The basalts from the West Mariana Ridge have slightly lower $^{206}\text{Pb}/^{204}\text{Pb}$, but comparable or higher $\delta^{7/4}$ and $\delta^{8/4}$. This might indicate the temporal variation of the magma source in the northern Mariana arc associated with the onset of rifting.

From the Minamiio spur extending from south of the Minamiiojima in SW direction into the Parece Vela Basin basaltic lavas were recovered. These lavas show lower concentrations in LILE relative to the West Mariana Ridge lavas, but still have clear enrichment in LILE and depletion in HFSE, implying occurrence of arc volcanism on this spur in Miocene.

3) Kinan seamount chain (Taichi Seamount): Dredge sampling recovered blocks of pillow lavas. These lavas are enriched in most of the incompatible elements relative to MORB-like lavas from the Shikoku Basin floor. The isotopic characteristics of these lavas are only slightly enriched relative to the Shikoku Basin floor lavas. The Pb isotopic compositions are similar to the post-spreading lavas in the Parece Vela Basin, but with much less radiogenic Sr and Nd isotopic compositions.

4) Seamounts around the Amami Plateau: Samples from the seamounts around the Amami Plateau can be divided into two groups. One is hornblende andesite with clear arc-like signature in trace element composition. They are nearly identical in Pb isotopic composition. The other type of samples is olivine basalt with significantly different (depleted) in Pb isotopic compositions from the previous group and lack in depletion in Nb and Ta.