

Reconstruction of proto-arc basalt lava emplacement at the Amami Sankaku Basin

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How forearc oceanic crust was developed is a key to investigate evolution of the subduction system. However, few proto-arc oceanic crust is exposed below the modern oceanic arc and it is a problem for study how the arc was grown up. IODP Exp. 351 successfully recovered a proto-arc oceanic crust at the Amami Sankaku Basin which have similar geochemical feature to forearc basalts (FABs) of the Izu-Bonin-Mariana Arc which lacks geochemical evidence of subduction-recycled components (Arculus et al., 2015, Nature Geoscience).

Exp. 351 cored a 1611-m-long cores composed of 1461 m thick sediments (Unit I-IV) and 150 m thick basement rocks (Unit 1) at Site U1438, just west of Kyushu-Palau Ridge. Based on the biostratigraphy and paleomagnetism of sediments, the age of the basement is estimated to Eocene (e.g. Brandl et al., 2017, EPSL). The Unit 1 is built up with mostly sheet flows with sparsely vesicular tholeiitic basalts. The lower half of Unit 1 is composed of thin sheet flow of sparsely olivine (Ol)-plagioclase (Pl)-clinopyroxene (Cpx) phyric basalt, while the upper Unit 1 consists of thick sheet flows containing Ol and Pl phenocrysts up to 3 mm in maximum. The top 12 m of Unit 1 consist of moderately vesicular, Ol-Cpx phyric basalt sheet flows. Top surface crust of Unit 1 is conformably covered with umber-like dark mudstone of Unit IV. Limestone and tuff layers in the lower part indicate that the intermittent volcanism or the site U1438 was located at a basin in the early phase. Homogenized geochemistry of the lower half suggests that they were emplaced in an axial summit trough and on the spreading ridge. Upper half of the Unit 1 may be emplaced off ridge by flood of voluminous lava flows. Top basalt flows may be derived from a relatively high-Mg magma at ~3 km off ridge.

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