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Preliminary isotope results from the deeper part of Hole U1437, IODP Exp. 350: rear-arc or volcanic-front sources?

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The Izu-Bonin-Mariana arc (IBM) is an intra-oceanic arc that formed ~50 million years ago (Ma). Understanding the magmatic evolution of this arc is fundamental in understanding the initiation and evolution of other intra-oceanic arcs and the genesis of continental crust. Previous drilling and dredging at the volcanic front and dredging in the rear-arc of the IBM has provided a record of the magmatic evolution of the volcanic front since the arc's formation, and revealed a geochemical asymmetry between the volcanic front and rear-arc. Determining the causes of this geochemical asymmetry and when it became established is important to understand the magmatic process of the entire IBM arc.

One of the scientific objectives of IODP Exp. 350 is to clarify the geochemical characteristics of the Paleogene basement underlying the Izu rear-arc region, which has not be accessed by dredging (Tamura et al., 2013). Site U1437 is located in the Izu rear-arc, ~330 km west of the axis of the Izu-Bonin Trench and ~90 km of the arc-front volcanoes Myojinsho and Myojin Knoll, at 2117 mbsl. Site U1437 consists of three coherent holes (U1437B, D, and E), reaches 1806.5 mbsf, and is divided into seven lithostratigraphic units (Unit I-VII). Units VI and VII, below 1320 mbsf, are volcaniclastics with coarser material, while Units I to V are tuffaceous mud and mudstone with intercalated volcaniclastic layers. It is worth noting that Unit VI is intruded at ~1390 mbsl by a single rhyolitic intrusion (igneous Unit 1) (Tamura et al., 2015).

Although the available age constraints are 10.97-11.85 Ma, inferred from a nanofossil assemblage at ~1403 mbsf and a preliminary U-Pb zircon concordia intercept age of 13.6 +1.6/-1.7 Ma on the rhyolite at ~1390 mbsl (Tamura et al., 2015), the geochemical characteristics of units VI and VII are expected to approach the geochemical characteristics of the older basement. Moreover, the volcaniclastics of units VI and VII include a greater proportion of coarser material, indicating they are more proximal to their sources.

Therefore, initially we have focused on Hole U1437E (Units V to VII) in order to obtain as much information on the older basement as possible. The shipboard geochemical analyses, using Zr and Y elements that are resistant to alteration, showed that the proximal volcaniclastics of units VI and VII have a wide signature, including arc-front and rear-arc sources, and the geochemical variation in Units I-V generally reflect relative proportions of distal arc-front and proximal rear-arc volcanic sources (Tamura et al., 2015). Our onshore major and trace elements analyses also show arc-front and rear-arc signatures in units VI and VII (Sato et al., 2015).

The rear-arc volcanos in the Izu-Bonin arc are known to have lower $^{87}Sr/^{86}Sr$, $^{143}Nd/^{144}Nd$, and $^{206}Pb/^{204}Pb$ ratios than arc-front volcanos (Tamura et al., 2007). Therefore, in addition to the major and trace element compositions, isotope ratios such as Sr, Nd, Pb, and Hf also provide important constraints to identify the source characteristics of the volcaniclastics. We are now analyzing the Sr, Nd, Pb, and Hf isotope ratios of selected samples from Hole U1437E. Although acid leaching is necessary to eliminate the alteration effect, it is expected that the Nd and Hf isotopes will preserve their original characteristics because of their high resistance to alteration, even though the samples are severely altered. We will present the preliminary isotope results, with constraints, to elucidate the source characteristics of the volcaniclastics and intrusion of site U1437.

Keywords: Sr-Nd-Pb-Hf isotopes, Volcanic front, Rear arc, Izu-Bonin-Mariana (IBM), Exp 350, U1437