Evolution process of volcano-bounded basin revealed by mapping of seismic reflectors associated with geological boundary from drilling results in Izu rear arc

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International Ocean Discovery Program (IODP) has successfully conducted the first rear-arc drilling in the Izu-Ogasawara (Bonin) intra-oceanic arc at Site U1437 in 2014. The drilling purpose of Site U1437 is to reveal the formation of oceanic arc crust and its evolution into continental crust about the history of “the missing half” of the subduction factory. Site U1437 is located at the volcano-bounded basin between the Manji and Enpo backarc seamount chains in the Izu rear arc and ~90 km west of the arc-front volcanoes Myojinsho and Myojin Knoll, at 2117 m below sea level. Site U1437 had excellent core recovery in Holes U1437B and U1437D, and we succeeded in hanging the longest casing ever in the history of R/V *JOIDES Resolution* scientific drilling (1085.6 m) in Hole U1437E and cored to 1806.5 mbsf.
In order to evaluate the crustal structure of this proposed site before the IODP drilling, Japan Agency for Marine-Earth Science and Technology carried out many seismic reflection and refraction surveys using R/V Kaiyo and Kairei in the Izu rear arc during 2006 to 2008. Five clear seismic reflection profiles consisting of three kinds of survey environments and one seismic velocity image by seismic refraction survey are obtained across the drilling site U1437. Five sedimentary units consisting of volcaniclastics are identified from our interpretations around the drilling site in the seismic reflection profiles over the 5 km/s and 6 km/s iso-contours of P-wave velocity obtained by the velocity image of seismic refraction survey in order to evaluate structure of the drilling location before drilling. However, some unit boundary is not recognized from the drilling core. It means the difficulties for identification the geological target from only seismic images in volcanic regions. According to the drilling results, the acquired geological core is consisted of seven lithological units (I, II, III, IV, V, VI and VII). Units I to V was produced at age of 0-9 Ma. The Unit VI and VII, 1320-1806.5 mbsl, have the ages ranging from 9 to ~14 Ma. P-wave velocity calculated from obtained core samples increases downhole from ~1500 to ~4500 m/s which agree with the range of our velocity analysis. Tops of unit II, V and VII correspond to the strong reflector of seismic profiles. We interpreted and mapped using grid survey data around the drilling site. The top of unit II which corresponds to the volcaniclastics has south dipping trend. The top of unit V which corresponds to the mudstone with volcaniclastics layer has south dipping trend. The top of unit VII which corresponds to volcaniclastics estimated by near-vent deposit has southeast dipping trend. Each reflector is interrupted by igneous basement near seamount chains. We also calculate the thickness from unit VII to V and unit II to seafloor from mapped reflectors. These features suggest the different activity of various directions in the Izu rear arc. We will discuss about the evolution process in Izu rear arc deduced from our mapping results.

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