

Seismological evidence of in-situ supra-subduction zone ophiolite observed along the fore-arc in the Izu-Bonin arc

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Toward understanding formation, deformation and alternation processes of arc crust in the Izu-Bonin intra-oceanic subduction zone, JAMSTEC has been conducting intensive active-source seismic surveys to cover the entire Izu-Bonin arc. Our previous studies revealed several new seismological constraints on formation processes of arc crust. For examples, along the current volcanic front which is believed to preserve an entire crustal formation process since a steady-state plate subduction has been occurred in the Oligocene age, crust of continental composition having V_p of 6 - 6.8 km/s has been predominantly generated beneath basaltic volcanic center. In the rear-arc region which is proposed to be formed by rifting of the arc crust, we discovered a seismological evidence indicating a paleo-arc structure. A variation pattern of the volume of continental component of crust along the rear arc is similar to that we found in the present-day volcanic front. We found, from new data, that the structure of the fore-arc region represents significantly different characters from those obtained at the volcanic front as well as the rear-arc. Petrological studies in the forearc region proposed a formation of oceanic crust associate with boninitic volcanism (i.e., supra-subduction zone ophiolite) during a stage of subduction initiation. The newly obtained seismic structures in the forearc strongly support this idea; i.e., layers having crustal seismic velocity is remarkably thin (less than 10 km) even under the Bonin ridge where boninitic volcanism is observed, and velocity-depth profiles in the fore arc is almost identical to that of typical oceanic crust as well as seismic velocities measured from ophiolite samples. This seismic structure is also well corresponds to the gravity data showing a north-south trend of a high gravity anomaly along the entire Izu-Boninnforearc region. This suggests that similar 'supra-subduction ophiolite' structure may extend along the entire Izu-Bonin forearc.