

Result of active-source seismic imaging in Izu-Bonin intra-oceanic arc and its implications for arc evolution

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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. I revealed, from those surveys, several new seismological constraints on formation processes of an arc crust. For examples, a large volume of felsic-to-intermediate component crust having V_p of 6 - 6.8 km/s has been predominantly observed beneath basaltic volcanic centers along the current volcanic front, which is believed to preserve an entire crustal formation process since a steady-state plate subduction has been occurred. I also discovered a similar along arc variation of the felsic-to-intermediate component crust in the rear-arc, which is proposed to be separated from the volcanic front. These findings suggest that the main part of the arc crust consisting of the felsic-to-intermediate component was created before the rear-arc has been separated from the volcanic front probably in Oligocene age. From recently obtained seismic data in the fore-arc, on the other hand, I found that the structure of the fore-arc region represents significantly different characters from that of the volcanic front. Petrological studies in the fore-arc region proposed a formation of oceanic crust associate with boninitic volcanism (i.e., supra-subduction zone ophiolite) during an initial stage of subduction. The newly obtained seismic structures in the fore-arc strongly support this idea; i.e., layers having crustal seismic velocity is remarkably thin (less than 10 km) under the Bonin ridge, and velocity-depth profiles in the fore-arc is almost identical to that of typical oceanic crust as well as an ophiolite section. Compiling the above seismic structures in the fore-arc, the rear-arc and the volcanic front well demonstrates the crustal evolution process from the fore-arc oceanic crust formed in the initial stage of the subduction to the mature arc crust in the current volcanic front.