

Seismological evidences showing along arc variation of crust and mantle evolution in the Izu-Bonin arc

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JAMSTEC has been conducting integrated active-passive source seismic studies to cover the entire Izu-Bonin arc. New seismological constraints on formation and evolution processes of the arc crust are revealed from active source data. For examples, a large volume of felsic-to-intermediate component crust having V_p of 6.0 - 6.8 km/s is predominantly observed beneath basaltic volcanic centers along the Quaternary volcanic front. We 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 after Oligocene. 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. The passive-source seismic data provide additional constraint to mantle evolution process in the mantle wedge. Seismic tomography shows that low-velocity anomaly in the mantle wedge extending down to the subducting slab beneath the volcanic front coincide with thicker parts of the arc crust north of Aogashima and south of Sumisu-jima. Image of random velocity inhomogeneities obtained by S-wave peak delay times also shows remarkable along arc variations; i.e., at 30-70 km depth, strongly inhomogeneous regions were imaged beneath the Quaternary volcanoes and weak inhomogeneities were imaged on the forearc side. Those observations demonstrate that mantle up-welling to control the crustal growth may not be uniformly distributed along the volcanic front but centered at several areas, as suggested by a petrological study.

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