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Extremely high crustal production rate of the Izu-Ogasawara-Mariana intra-oceanic arc

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The crustal structures across the Izu-Ogasawara-Mariana arc, obtained by Japan Agency for Earth-Marine Science and Technology (JAMSTEC), provides an estimate of the average crustal production rate since 50 Ma. It has been well established that continental crusts have been created as the middle crust of the Izu-Ogasawara-Mariana arc with P-wave velocity of 6.0-6.5 km/s (Suyehiro et al., 1996; Takahashi et al., 2007); however, the production rate of this 'continent' has been still unknown yet. The crustal volume can be calculated by crustal structures obtained by seismic surveys, however, a part of the crustal materials are transformed into mantle through differentiation of crustal materials (Takahashi et al., 2007). Based on a model of Tatsumi et al. (2008), we estimated volumes of transformed crustal materials and calculated the total volumes of arc materials. As shown by distribution of high velocity lower crust beneath the eastern half of the Shikoku Basin, the arc volcanisms also occurred on oceanic crusts produced by backarc opening in the past and the crust has been overprinted by the arc activities after stop of the backarc opening. We, therefore, identified the eastern end of the original oceanic crust using magnetic lineation pattern (Okino et al., 1994) and removed volumes of the oceanic crust from total ones of arc crustal materials. It is then suggested that the total volume of crustal materials across the Izu-Ogasawara-Mariana arc is over 16,000 cubic kilometers per one kilometer. The total volume is higher in the northern Izu-Ogasawara arc and smaller in the southern part. We assumed the volumes of the Kyusyu Paleo Ridge as the remnant arc, and found that the crustal production rate of the oceanic arc is unexpected high value. In this presentation, we introduce crustal image across the arc and the detailed scenario derived the result.

Keywords: oceanic crust, crustal structure, arc growth, OBS, seismic survey