Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

SCG67-P12 Room:Poster Time:May 2 16:15-17:30

Across-arc geochemical variation of Quaternary Basalts dredged from central part of Izu-arc

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The Izu-Bonin arc located western margin of the Philippine sea plate extend to ca. 1200 km south from central Honshu of Japan with ca. 400 km width. The Izu-Bonin arc is a match for NE Honshu arc (Nishimura and Yuasa, 1991). Although volcano lying on the volcanic front (VF) of northern part of this arc expose above the sea level (e.g. Izu Oshima, Miyakejima), almost this arc sink down to sea surface. Active rifts (AR) exist just behind VF with 20-30 km width. These are parallel to the VF and Izu-Bonin Trench and enclosed with escarpment. Ishizuka et al. (2003b) reported Ar-Ar age of igneous rocks dredged from central part of Izu-Bonin arc. According to these age data, recent volcanism (<1Ma) occurred only VF and AR. In this study, we report geochemical data of basalt dredged from Myojin volcano, Myojin rift and Aogashima rift. Basalts exhibit evident across-arc variations. Ba/La ratio, Sr, Nd and Hf isotopic ratios decrease correspondingly distance from Izu-Bonin trench toward rear-arc. Whereas (La/Sm)N increase correspondingly distance from Izu-Bonin trench. Based on ratios of trace elements and each isotopic feature, we conclude that VF basalts generated from flux melting of mantle due to adding aqueous fluid to wedge mantle from subducting slab. On the other hand, genesis of AR basalt is to supply supercritical melt (e.g. Kessel et al. 2005) of slab to wedge mantle. Chromian spinel composition, Cr# of inferred chromian spine equilibrated with mantle is 0.75, held in olivine of VF basalt suggest that residual mantle equilibrated with VF primary magma is dunite. Degree of partial melt of AR basalt decrease correspondingly distance from Izu-Bonin trench toward rear-arc. Tollstrup et al. (2010) interpreted magma genesis of basalt after cessation of Shikoku back-arc basin. They proposed that basalts of western seamount chain (WS) and back-arc knolls (BAK) derived from partial melting of mantle due to adding supercritical melt to mantle wedge from subducting slab, whereas aqueous fluid contributed to partial melting of mantle beneath AR and VF. In their discussion, activity age and activity region are not considered. According to their conclusions, supercritical melt related to genesis of basalts from WS and BAK is not contribute to partial melting of mantle wedge recent volcanism (<1Ma). Bryant et al. (2003) revealed that VF basalt volcanism has continued since 15Ma. Moreover, Ishizuka et al. (2003b) reported volcanism has traveled eastward with time in the central Izu-Bonin arc. It means Izu-Bonin arc volcanism has become narrow range with time. Distinct slab flux between VF and AR in this study suggest that occurrence of supercritical melt is traveling with time toward VF side due to change subducting angle of slab into more steep angle since 15Ma to 3Ma (Honda et al., 2007). Therefore supercritical melt related to genesis of basalt from WS and BAK at predate volcanism contribute to AR recent volcanism.

Keywords: basalt, Izu-Bonin arc, geochemical across-arc variation, Myojin seamount, Aogasima rift, Myojin rift