Japan Geoscience Union Meeting 2010
(May 23-28 2010 at Makuhari, Chiba, Japan)

SCG086-29 Room: Function Room B Time: May 26 11:45-12:00

Magma dynamics of acidic volcanism in the intra-arc rift zone in the southern Izu arc

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In the Izu-Ogasawara (Bonin) arc, volcanic front from Aogashima to Torishima Island is characterized by Acidic volcanism and caldera. The intra-arc rifting, characterized by back-arc depressions, is active in this region. Drilling survey by R/V JOIDES RESOLUTION, Leg 126, was operated, and diving survey by ROV ALVIN was operated before Leg 126, preliminary survey of ODP operation. The bimodal volcanism, basaltic and rhyolitic volcanism, and hydrothermal activity were found by diving survey. In 1995, samplings of volcanics by dredge in volcanic front to echelon seamount chains were operated during research cruise by R/V MOANA WAVE (MW95 07). Geochemical variation of volcanic rocks and magma genesis was studied by Hochstaedter et al. (2000, 2001) etc., tectonic setting of volcanism was considered by Morita (1998), and dating of volcanism was studied by Ishizuka et al. (1998). These studies were researched mainly basaltic volcanism, that is, magma and mantle dynamics in the wedge mantle. Acidic volcanic rocks were dredged during MW9507 cruise. However, studies of acidic volcanic rocks in the rift zone were rare. Herein, we present petrographic and chemical analyses of the acidic rock samples both to interpret their petrogenesis on experimental results, and to reconstruct the magma genesis of acidic volcanism.

Dredge sites by MW9507 are 120, and about 50 sites are in rift zone. Baiyonneise Caldera include these dredge sites. Many recovered rocks are basalt, and rhyolites were recovered at some sites. Andesite is rare in the rift zone, and recovered volcanics shows bimodal characteristics. Geographical characteristics are separated by depressions in rift zone, and dredge sites and volcanics are divided into three parts, knolls near the volcanic front (Front), knolls in the back-arc depression (Depression) and knolls in the back-arc side of the depression (Knoll) in this study. Rhyolite shows depleted composition in Front to enriched composition in Knoll from east to west. On the other hand, Y and Zr show different characteristics, Depression shows depleted and both Front and Knoll show enriched composition. Zr/Y ratio is low in Front to high in Knoll, and some Depression samples show extremely low ratio.

Acidic volcanism in the Izu-Ogasawara arc is considered to partial melting of arc middle to lower crust (Tamura and Tatsumi, 2003) because rhyolite shows similar composition to experimental results of basaltic or andesitic parental material under anhydrous, low pressure and low temperature (Beard and Lofgren, 1991 etc.). Rhyolite in rift zone shows similar phenocryst and groundmass mineral composition to anhydrous, low-P and T experiments, felsic pl composition and hornblende- and biotite-free mineral assemblage. Therefore, we consider that parent of acidic volcanics in rift zone is basaltic lower crust.

Hochstaedter et al. (2000) described that variation of incompatible elements from volcanic front to echelon seamount chains were caused by compositional variation of parent materials. That is, enriched mantle moved from back-arc side, and partial melting occurred at western echelon seamount. Residual mantle moved toward the volcanic front due to mantle wedge convection and then melt again. Based on this model, we conclude acidic volcanism model to interpret variation of incompatible element composition of acidic volcanics. During basaltic volcanism, basaltic lower crust evolved with volcanism. Composition of basaltic lower crust show enriched in back-arc side

and depleted in front. During rifting activity, rhyolitic magma was produced by melting of basaltic lower crust by heating from magma and release of pressure. This rhyolite show enriched composition in back-arc side to depleted composition in front site reflected by difference of lower crust composition.

Keywords: intra-arc rift zone, rhyolite, lower crust, partial melting, incompatible elements