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Magma chamber of Ofunato Stage, Miyakejima volcano based on high-pressure experiments

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Miyakejima is an active volcanic island located about 200km south of Tokyo in Izu-Mariana arc. Tsukui et al. (2001) divided the volcanic activity of the last 10000 years into four stages: 10000-7000 (Ofunato Stage), 4000-2500 (Tsubota Stage), 2500 y.B.P to AD1154 (Oyama Stage) since AD1469 (Shinmio Stage). We performed melting experiments of OFS scoria, which is one of the least fractionated Miyakejima basalt, in Ofunato stage. Experiments were performed in the temperature ranges of 1050-1200C at 1.0, 1.5, 2.0, 2.5kbar using IHPV at the Magma Factory, Tokyo Tech. Based on the experimental results and petrology of OFS, magma chamber in Ofunato Stage was reconstructed. The magma chamber was located at 5˜6km depth (˜1.5kbar) and water-rich (˜3 wt.%) basalt magma crystallized olivine and calcic plagioclase (which is the typical phenocryst assemblage throughout Ofunato Stage) at ˜1100C under NNO-buffer. Condition of the magma chamber was maintained almost constant for 3000 years. A series of crystallization trends were calculated using MELTS program (Ghiorso and Sack, 1995), and it is found that andesites erupted in Tsubota Stage can be formed by fractional crystallization of OFS basalt at 1.5kbar under NNO. Postulated water content in magma (˜0.6 wt.%), however, is much lower than in Ofunato Stage (˜3 wt.%). Accordingly it is suggested that magma chamber has been significantly degassed (0.6 wt.% H2O in magma) during the dormant period (4000˜7000 y.B.P)

Keywords: Miyakejima, Magma chamber, High-pressure experiment, Ofunato Stage