The chemical variation of flank volcanic ejecta of Miyake-jima volcano and estimated magma system

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The chemical variation of flank volcanic ejecta of Miyake-jima volcano on historic time consist of five mixing trends(1. 4000-2500yBP, 2. 2500yBP-15C, 3. A.C.1469-1769, 4. A.C.1835-1940, 5. A.C.1962-1983) on SiO2-Al2O3 diagram. Trend1 and 3 are nearly same. These trends can not be explained by crystallization differentiation. The mafic and felsic end menber are basaltic magma with xenocrysts and fractionated andesitic magma, respectively. In 1940, both magmas erupted unhybridizable.

More xenocryst rich basaltic magma mixed with more fractionated andesitic magma. So both magma chambers have close relation of time.

Miyake-jima volcano is on the northern part of Izu-Mariana arc and is the stratovolcano made of low-K tholeiitic basalts. This volcano forms the volcanic front on the Izu arc along with Izu-Oshima volcano, Mikura-jima volcano and Hachijo-jima volcano. Izu-Mariana arc is the typical oceanic arc. So it is good place for studying the magmatic evolution.

Miyake-jima volcano is a conical stratovolcano, and has the Haccho-daira caldera with central cone called Oyama at the top of the volcano and Kuwanoki-daira caldera at the side of the volcano. The flank volcanoes are radially distributed from the center of the volcano. At the seashore, some craters which formed by the phreato-magmatic eruptions are distributed .

The formational history consists of five stages as follows; 1. Main cone stage, 2. Flank volcanoes substage1 (-7ka), 3. Flank volcanoes substage2 (4-2.5ka), 4. Flank volcanoes substage3 (2.5ka-15C), 5. Flank volcanoes substage4 (15C-). And the main cone stage is divided into the older main cone substage which is pre-caldera activity and the younger main cone substage which is post-caldera activity. The edifice of the older main cone consists of many debris avalanche flow deposits and many surge and flow deposits.

The porphyritic plagioclases, olivines and augites are included accidentally into the magmas from wall rocks. The evidences are 1.the amount of these minerals are related to the bulk compositions of peculiar element (EX. plagioclase and Al2O3, olivine and Ni), 2. these elements are not included largely in the groundmass but in the bulk rock, 3. many basalts have positive Eu anomaly.

It is supposed that these accidental porphyritic minerals are from wall rocks consists of allivalite and olivine gabbro. The component minerals of allivalite and olivine gabbro xenoliths have the same chemical composition with minerals included in the host rocks. And every magma has the same assemblage of xenocryst, An-rich plagioclase, olivine and/or Al-rich augite from basalts to dacites.

The incompatible elements trends of magmas among main cone, flank volcano substage2 (4-2.5ka), flank volcano substage3 (2.5ka-15C), flank volcano substage4 (15C-) are different from each other. They show parallel trends in the variation diagrams for the IE and different in the charging level of the incompatible elements. They have the same trend on the K-Rb diagram and have the same 87Sr/86Sr ratios. It suggests that their source materials of the magmas are the same and degree of melting are defferent.

Andesite magma was made by fractional crystallization of basalts. Basaltic andesites erupted from flank volcanoes are made by magma mixing between basalts with xenocrysts and differentiated andesite. Magmas correlative to one eruption stage form one unique mixing trend. And they are parallel each other. This suggests that basaltic and andesiteic magma chambers are connected of time.