

Mafic-felsic magma interaction at Satsuma-Iwojima volcano, Japan: evidence from mafic inclusions in rhyolites

Genji Saito[1]

[1] GSJ

Geochemical and petrographic studies of the rhyolites and mafic inclusions from Satsuma-Iwojima volcano were carried out in order to investigate evolution of a silicic, bimodal magma system during the post-caldera stage. Abundant mafic inclusions, which are fine-grained with vesicles in their cores, are present in the Showa-Iwojima rhyolitic lava. Inclusions with similar textures are found in Iwodake volcanic bombs but are less common than in the Showa-Iwojima lava. The major and trace element compositions of the inclusions plot along mixing lines connecting the host rhyolites with spatially and temporally associated basaltic to basaltic andesite magmas. Plagioclase phenocrysts in the inclusions have a large variation in core compositions (An₄₂ to An₉₆), and exhibit various zoning profiles and reaction textures, indicating they coexisted with melts ranging from basaltic to rhyolitic composition. Pyroxenes also exhibit a wide range in composition and a variety of zoning patterns consistent with multiple sources. These results suggest that a stratified magma chamber exists beneath the volcano, consisting of a lower basaltic layer, an upper rhyolitic layer and an episodically-present, thin middle layer of andesite. Variations in the chemistry of the Iwodake and Showa-Iwojima mafic inclusions suggest that multiple injections of very similar basaltic magma have occurred since the growth of the Iwodake dome. More extensive textural disequilibrium shows that the Showa-Iwojima rhyolites formed through more extensive interaction with mafic magma. The mafic-felsic interaction is consistent with degassing model of a magma chamber, which consists of degassing of upper rhyolitic magma by convection in a conduit and supply of a CO₂-rich volatile phase from underlying basaltic magma to the rhyolitic magma.