

Mechanism of phreatomagmatic eruptions associate with caldera collapse:

Nobuo Geshi[1]

[1] GSI, AIST

Circular collapsed caldera is a common structure observed on some basaltic volcanoes and some of the collapse events produced fine-grained ash deposits on these volcanoes. Textural characters of the essential fragments in the phreatomagmatic-tephra will tell the eruption mechanism associating with caldera formation. A series of phreatomagmatic eruptions occurred during the caldera growth. Tephra produced during the caldera collapse consist mainly of poorly-sorted volcanic breccia and ash at the caldera rim, and can be divided into some fall unite with the difference of color and grain composition. All of the tephra was deposit as air fall and no surge deposit is recognized. Although the tephra consists mainly of accessory fragment derived from the previous volcanic edifice, juvenile materials of fresh scoria fragments are recognized in the eruptive materials of 14-15 July, 13 August, and 18 August. The essential fragments of the Miyake 2000 eruption are characterized with low and heterogeneous vesicularity. Vesicularity of the essential fragments is ranging 10-50 vol% and heterogeneous in individual grain. Judging from the high water content in the groundmass glass of the essential fragment, phreatomagmatic explosion occurred under a pressure several 10s MPa, corresponding to the several 100s m depth. Keanakakoi ash of Kikauaea volcano, by contrast, contains well vesiculated vitric essential fragment, suggesting the rapid ascent of magma and explosion by surface water (Mastin 1997). These textural differences of the essential materials reflect the change of the cooling condition of magma in aquifer during the caldera collapse of these two events. In Miyakejima 2000 eruption, chaotic collapse of the caldera floor entrained both the underground water and intruded magma, and caused explosive phreatomagmatic eruption during the caldera growth. By contrast, the existence of the surface water is the major cause of the steam explosion during the Keanakakoi ash eruption and the caldera collapse did not play important role on the unique eruption. Difference between the two caldera-forming eruptions shows the variation of the eruption mechanism of the caldera eruption on basaltic volcano.