

Petrological comparison between products of large caldera-forming eruptions and their precursory events

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We report precursory volcanic events of large caldera-forming eruptions from Kyushu, which include (1) a series of tephra occurring 3500 years and 1000 years before the Aira pyroclastic eruption, and (2) Takayubaru lava flow extrusion just before Aso-4 pyroclastic eruption. (1) The compositions of pumice of small-scale eruptions 3500–1000 years before Aira eruption are almost identical to those of Aira pumice. (2) The compositions of lavas from Takayubaru lava lying below Aso-4 tephra without recognizable soil show a little silica-poor composition when compared to Aso-4 earliest pumice. Although both show small but definite fractionation trends, the two trends are unrelated with each other by crystal fractionation. Magma mixing, as observed in the later stage of Aso-4 eruption, was not obvious in both precursory eruptions.

Magma reservoir model of Hildreth (1981) was the first to depict the relationship between large silicic magma reservoir in shallow crustal level and the mafic magma originated from deeper source. This model is a good springboard for discussion of precursory event of the large caldera-forming eruption, which was tested by the above observations. The case (1) corresponds to the spill out of magma from the upper part of shallow silicic crustal reservoir. The case (2) follows the estimation of spill-out event of an independent branch reservoir of large silicic magma body.

Keywords: Takayubaru Lava, Aso caldera, Aira caldera, Aso-4 pyroclastic eruption, magma supply system, Precursory eruption