

Precursory eruptions of Aso-4 caldera-forming pyroclastic flows: melt inclusion study to characterize magma supply system

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We measured compositions of plagioclase and pyroxenes and their melt inclusions from the precursory eruption products of 89 ka Aso-4 pyroclastic eruption. Aso-4 was the last and the largest (VEI=7) of the four caldera-forming eruptions in central Kyushu island, southwest Japan. Precursory eruptions include Omine pyroclastic cone and associated Takayubaru lava flows erupted <1,000 years before Aso-4, and Aso-ABCD tephra erupted 9,000 years before Aso-4. Tephra units of ABCD have no soils between the four, thus are considered as a series of continuous eruption.

Despite similar compositional trends observed in bulk rock chemistry, melt inclusions from Aso-ABCD tephra, those from Omine cone, and those from Aso-4 main eruptions show compositional trends distinct from all the others. Silica content of melt inclusions varies from 70-72 wt.% for Aso-ABCD, 67-70 wt.% for Omine, and 73-74 wt.% for the earliest subunit of Aso-4, followed by 71-74 wt.% for the next subunit. Melt inclusions from Aso-ABCD tephra show similar composition to 123 ka Aso-3 tephra [1].

Plagioclase also shows distinct compositions between Aso-ABCD, Omine, and Aso-4. Orthopyroxene and clinopyroxene often show a disequilibrium relationship in terms of Fe-Mg exchange.

When all the data are considered, a remnant of Aso-3 magma reservoir was possibly still active 9000 years before Aso-4 eruption. Magma reservoir for Omine was similar to Aso-4, however different compositional trend indicate a subsidiary reservoir to Aso-4 main one. Eruption of Aso-4 started from the top of most silica-rich part of a reservoir, followed by mixing products of layers from a compositionally zoned large reservoir.

[1] Kaneko et al. (2015) JVGR **303**, 41-58.