

Temporal variation of mineral composition of Hanafusa Formation distributed in the western area of Aso caldera

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Aso volcano made four large-scale pyroclastic eruptions, with magma composition changing with time, so that hornblende phenocryst appeared in the latest Aso-4 pyroclastic flow deposits (Watanabe, 1979). Hornblende becomes a key mineral to detect the physicochemical change, as it also appeared as microphenocryst in volcanic products of Omine volcano and associated Takayubaru lava flow, which erupted just before Aso-4 event (Kurokawa et al., 2012). Hanafusa Formation is a lake deposit forming 20 km west of Aso caldera just before Aso-4 pyroclastic eruption, thus it is suitable for finding the appearance time of hornblende from the minerals included in the deposits.

Hanafusa Formation consists of silt and sand with thickness of up to 10 m, and formed between Aso-3 and Aso-4 pyroclastic flow events. We collected samples from pumice deposit and overlying sand in Kajisako, Kikuchi city. We also collected samples from silt layer just below the contact with Aso-4 pyroclastic deposit, and from the type locality of Hanafusa Formation in Kikoji, Kikuchi city. We divided silt layer into upper unit and lower unit with boundary at the tephra layer, which we identified as Ata regional tephra by its mineral assemblage and existence of abundant bubble-shape glass and estimated age of 100 ka.

(1) The lower unit contain plagioclase, clinopyroxene and orthopyroxene. Plagioclase crystals indicate anhedral and have the surface which give a dirty impression.

(2) The upper unit contains euhedral hornblende and euhedral plagioclase crystals which are not observed in the lower unit. The upper unit contains clinopyroxene and orthopyroxene crystals. The mineral assemblage and their ratios are the same as observed among Aso-4 pyroclastic flow deposit.

(3) Chemical compositions of pumice fragments in Pumice layer resembled those of all Aso-4 pyroclastic flow deposits. However, in detail, Oyatsu pumice flow deposit, Benri scoria flow deposit and Omine volcanic products show distinct compositional trends from this pumice layer (Kurokawa et al., 2012; Yamasaki et al., 2013).

(4) Observed crystals in sand just above the pumice layer include plagioclase, clinopyroxene, orthopyroxene, opaque minerals and olivine, which is not included in the lower pumice layer.

Our findings suggest that the appearance of hornblende was 10,000 years before Aso-4 pyroclastic eruptions, however their source is unknown, because we did not find obvious tephra layers other than Ata regional tephra.

Keywords: Hanafusa formation, hornblende, Aso-4 tephra, Aso-4 pyroclastic flow