

Deep Structure of Fuji volcano

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Fuji volcano is known for its perfect cone shape and it is the largest among Japanese Quaternary volcanoes. In the last 100kya, Fuji has erupted only basalt magma (>>99 vol%), but its eruption style changed (from debris flow and tephra dominant Ko-Fuji or Older Fuji, to lava flow dominant Shin-Fuji or Younger Fuji) at ~15 kya BP. Origin of the voluminous yet monotonous basalt production in Fuji volcano have been discussed but remain unanswered. Here we report the first high-pressure melting experimental results on Fuji basalt (Hoei-IV, AD1707) and demonstrate that its main magma chamber is located at ca.25km depth. We show seismic tomographic images of Fuji volcano for the first time, which reveals the existence of strong upwelling flow in the mantle and its connection to the voluminous lower crustal magma chamber .

Very frequent low frequency earthquakes just above the magma chamber may be due to the injection of basalt magma and/or fluids. The total lack of silica-rich rocks (basaltic andesite and andesite) in Fuji volcano must be due to the special location of the volcano. The plate boundary between the Eurasia plate and the subducting Phillipine sea plate is located just beneath Fuji volcano (~5 km depth). Large tectonic stress and deformation associated with the plate boundary inhibit the survival of a shallow level magma chamber, which would allow the evolution of basalt to silica-rich magma (as observed in all other volcanoes in Japan, e.g., Hakone, Izu Oshima).

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