



Revisiting petrology and geochemistry of Merapi volcano, Central Java, Indonesia.

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Many recent studies on Merapi volcano are concentrated on the domes and recent eruptive activities. Examination of older generation lavas may also provide some relevant information.

One of the initial petrology and geochemistry studies (del Marmol, 1989) from the Proto-Merapi, Old Merapi and the recent domes, showed the interaction of the descending oceanic slab material, the "mantle" olivine and the crustal gabbros and sediments.

The stratigraphic columns constructed by Newhall (2000) does not show any strong correlation of the (major element?) chemistry of the samples with the characteristics one might observe in abrupt magma changes typically associated with a "catastrophic" event.

Magmatic processes are revealed by textural and compositional trends found in examining in Merapi rocks. Hammer et al (2000) observed plagioclase microlites surrounded by alkali feldspar in the dome samples. A close examination now of early basalts (e.g. 49 wt% SiO₂) reveals two populations of oval/round melt (?) inclusions in orthopyroxene phenocrysts: compositions very much like plagioclase (~An₆₀) and also of anorthoclase (~Ab₅₀Or₄₆An₃). Within the alkali-feldspar-rich bodies are found small (~4 μm) empty vapour bubbles and euhedral apatites (with abundant F and Cl) with up to 2 wt% non-feldspar elements. Evidence of coexisting magmas are reaction relationships: Fo₆₇ olivine is being engulfed by orthopyroxene (Mg#73), whereas in other parts of the thin section orthopyroxene is rimmed by olivine microphenocrysts.

P, f O₂, T and XH₂O can be deduced from experimental studies and of modelled crystallization (e.g. MELTS) of similar melt compositions and compared to the observed phase compositions in the Merapi rocks. These parameters help to define the conditions under which the minerals crystallized. del Marmol (1989) inferred that the magmas are undersaturated with water at depth, although they apparently reached volatile saturation as they arose in the upper volcanic plumbing system.

As recent events (2006, 2010) have demonstrated explosively, detailed studies to help clarify the water content and crystallinity of the magmas feeding the Merapi domes are important parameters for understanding and predicting the eruptive behaviour of the volcano.