

Magma Chamber Processes and Conditions in the Tatun Volcano Group (TVG): Insights from initial data from Mount Shamao

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The Tatun Volcano Group (TVG) in northern Taiwan, long regarded as inactive due to the absence of historical eruptions, has sparked concerns about potential volcanic resurgence. Increasing interest in the TVG is also due to its proximity to Taipei, the capital city of Taiwan. We investigated one of the youngest considered lava flow deposits of TVG in Mount Shamao to assess various magma chamber processes and conditions. New $^{40}\text{Ar}/^{39}\text{Ar}$ dating of groundmass separates suggests a minimum age of 15 ± 6.3 Ka for the hornblende andesite porphyry samples from Mount Shamao, which coincides with younger eruption episodes confirmed from existing radiocarbon ages. Petrographic analysis of these samples revealed typical features, showcasing plagioclase phenocrysts with disequilibrium textures, variable pyroxene contents, and opacitic-rimmed hornblende phenocrysts, suggesting magma mixing or decompression. Various magmatic conditions were calculated for the lava flow samples using the major element composition of hornblende phenocrysts. Based on the analyses, the hornblende phenocrysts were formed at depths ranging from 4 to 6 km, corresponding to pressures ranging from 100 to 220 MPa and under a temperature range of 790 to 870°C. Magmatic water content was also calculated to be around 4 to 6 wt%. Lastly, oxidation states were estimated within the NNO+1.2 to NNO+2.2 buffer range. This suggests that the lava flows from Mount Shamao are sourced from a relatively shallow, water-rich, oxidized magma chamber.

Keywords: Tatun Volcano Group; Magma conditions; Mineral chemistry