

# Magmatic processes in felsic intraplate volcanism; insights from Harrat Rahat, Saudi Arabia

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Understanding the formation processes of evolved magmas that may produce explosive eruptions is important for estimating potential volcano behavior. Intraplate volcanism is dominantly mafic and considered a low hazard due to the effusive eruptive nature [1]. However, in the volcanic fields (harrats) of Saudi Arabia, potentially more explosive felsic volcanism is abundant and more frequent than in other analogous settings [1]. Why mafic volcanic fields begin to produce evolved magmas is still under debate [1], and the harrat volcanoes therefore provide a unique possibility to investigate the evolution from mafic to felsic volcanism in an intracontinental setting. Of particular interest is Harrat Rahat, the second largest harrat in Saudi Arabia that comprises >900 eruptive centers with a broad variation of compositions and eruption styles [2]. Recent studies suggest an increased frequency of silicic eruptions and a maturation of the magmatic systems in the youngest units [3]. Older stages of felsic volcanism have, however, not been studied. Here we investigate the eruptive site of the oldest trachyte, Jabal Munawwar, that includes four trachytic to intermediate domes, pyroclastic flows, mafic cinder cones and lavas. Located between the mafic south and evolved north of Harrat Rahat, this site represents a transitional stage in maturation of the volcanic field. In order to constrain magmatic processes leading to felsic volcanism, we present new geological, petrological, and geochemical whole rock and mineral data of this location. Further, by comparing Jabal Munawwar with younger, felsic volcanism in the north, we may gain crucial insights on what processes act as a catalyst for volcano maturation and magma evolution in intraplate volcanic fields.

[1] Smith & Németh, 2017. Geological Society, London, Special Publications, 446, 1–28.

[2] Camp & Roobol, 1989. *Geological Society of America Bulletin*, 101, 71–95

[3] Stelten, et al. 2020. *The Geological Society of America Bulletin*, 132, 1381-1403