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# Structural controls on the emplacement and evacuation of magma from a sub-volcanic laccolith: Reyðarártindur Laccolith, SE Iceland

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Laccoliths play a significant role in the transport and storage of magma in sub-volcanic systems. The construction and geometry of laccoliths can influence host rock and surface deformation patterns that may precede and provide warning of active magmatism and impending eruptions. Yet how laccolith construction and internal magma dynamics controls the location and form of magma ascent conduits (e.g., dykes and inclined sheets), which facilitate magma evacuation and may feed volcanic eruptions, remains poorly documented in natural examples.

The excellently exposed silicic, sub-volcanic Miocene Reyðarártindur Laccolith in SE Iceland offers an opportunity to investigate how magma ascent within inclined sheets, which emanated from the laccolith, related to intrusion construction and deformation in the surrounding host rock. We combine detailed structural mapping with anisotropy of magnetic susceptibility (AMS) analyses, which allow us to map magnetic rock fabrics that reflect magma flow patterns, to show that the laccolith comprises of several distinct magma lobes that intruded laterally towards the south-west. Each lobe intruded, inflated, and coalesced along a NE-SW primary axis facilitated by doming (i.e., forced folding) of the host rock. We also shown that pre-existing NNE-striking, left-stepping, en-echelon fault/fractures, as well as those generated during intrusion-induced host rock uplift, host moderately to steeply inclined rhyolitic/granophyric sheets that emanate from the lateral terminations of some flow lobes.

Based on the observed geometrical relationships between AMS fabrics and the sheet margins where magnetic foliations subparallel sheet contacts, or characterize an imbrication fabric, we suggest that magma evacuated moderately to steeply upward via these fault/fracture-controlled sheets. As these inclined sheets dip towards the laccolith, any eruptions they may have fed would have been laterally offset from the laccolith and any overlying surface deformation driven by forced folding. Our study shows that magma evacuation and ascent from laccoliths can be facilitated by inclined sheets that form at the lateral terminations of magma lobes that are spatially controlled by laccolith construction (e.g., flow direction and doming of the host rock) and the presence of pre-existing structures.