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Pre-Holocene glaciovolcanism in the Katla area, south Iceland

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The Katla volcanic system is one of the most productive in Iceland. Frequent basaltic and occasional silicic phreatomagmatic eruptions through the ice cap Mýrdalsjökull have provided a rich Holocene tephra record. Understanding of pre-Holocene eruptions and the thickness and extent of ice cover during glacial periods is much more limited.

We present eruption and emplacement models for three formations exposed on the flanks of the Katla volcano. Two are rhyolitic nunataks and one is an alkali basaltic sequence. These formations rise above the surrounding ice and topography, respectively, and show evidence for ice-confined emplacement, indicating their formation at a time when ice cover was thicker and more extensive.

Our models of each formation are based on field study, a photogrammetry survey, and major element geochemical analyses. The basaltic formation of Morinsheiði is an intercalated sequence of volcaniclastic rocks, pillow lavas and pillow breccias, entablature-jointed and lobate lavas, and more massive pahoehoe lava sheets, intruded by several dykes. The top of the sequence is a glacially eroded surface and it is bounded on all sides by deep valleys. The Enta nunatak is a kinked ridge or possibly two *en-echelon* ridges. A silicic volcaniclastic unit is intercalated with and intruded by fluidal and heavily jointed rhyolite lobes, spines and sheets. This formation is capped by a segment of crater wall composed of scoria. The Kötlujökull nunatak is tabular in shape, has a clastic base and is capped by jointed lava with lobate margins and breakout lobes descending the steep slopes.

Each formation exhibits evidence of multiple eruption styles in varying hydrological conditions, and at least for Morinsheiði a fluctuating water level. These are the preliminary results from the project “SURGE: Uncapping subglacial eruption dynamics and glacier response”, which aims to better understand the relative influences of magma chemistry, eruption style and glacial conditions on meltwater production and retention, glacial response, and the feedback effects for continued eruptions. These models, combined with new ^{40}Ar-^{39}Ar dating of the lavas, will also provide greater insight into the form of Katla and the glacial conditions that prevailed during the late Pleistocene.