Vífilsfell, and Arnarþúfur contain structures associated with Pleistocene ice-contact volcanism. This study combines remote sensing classification of multispectral satellite imagery, field observations, and geochemical analysis to determine the relationship between these features. Remote sensing classification of SPOT 5 imagery using Geographic Information Systems (GIS) generates 22 discrete spectral signatures of which 15 are significant (cumulative proportion 94.67%). Determination of significant clusters and their spatial distribution facilitates subsequent field investigations. Ground-truthing of Northern Bláfjöll reveals a flat-topped volcano with steep sides that consist of basal pillow lavas, pillow-breccia, altered hyaloclastite (palagonite), flow-foot breccia, welded scoria, and superincumbent subaerial lava flows. Vífilsfell directly overlies Northern Bláfjöll and encompasses a conical mound of palagonite with isolated welded scoria, volcanic bombs, dykes with pillowed surfaces, and peripheral slump deposits. Arnarþúfur comprises a series of linearly oriented discrete mounds with rhythmically layered fine-grained palagonite and clast supported beds that include varying proportions of armoured lapilli. Beds typically contain flow indicators such as climbing ripples, cross-beds, and flutes. Electron microprobe analysis of major element concentrations in volcanic glass reveals that Northern Bláfjöll, Vífilsfell, and Arnarþúfur have indistinguishable olivine normative tholeiite compositions. Northern Bláfjöll is a tuya that emerged from a deep englacial melt-water lake with a surrounding ice- thickness exceeding 400 m, according to the passage zone elevation above the surrounding plain. Vífilsfell is a subglacial mound that formed beneath thin-ice conditions with episodic melt-water drainage during its emplacement. Arnarþúfur is an ice-confined hyaloclastite flow deposit that combines characteristics of pyroclastic density currents, turbidites, and eskers. Stratigraphic relationships suggest that Arnarþúfur formed in association with the Vífilsfell eruption as a result of gravity-controlled mobilization of unconsolidated volcaniclastic material into an ice-confined melt-water drainage system. The chemical homogeneity of Northern Bláfjöll, Vífilsfell, and Arnarþúfur suggest a common magma source and rapid emplacement of the volcanic edifice relative to the evolution of the melt.

Ice-contact volcanism in southwest Iceland: analysis of hyaloclastite flow deposits using remote sensing, stratigraphy, and geochemistry

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Ice-contact volcanism, and specifically subglacial volcanism, can provide information about paleo-environments such as the extent and thickness of former glaciers and ice sheets. In southwest Iceland, approximately 30 km southeast of Reykjavik on the Reykjanes Peninsula, the regions of Northern Bláfjöll,