



Geomorphological evidence towards a deglacial control on volcanism

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A number of theoretical, conceptual and numerical models exist for deglacial controls on volcanism, but geological evidence is scarce. We describe and explain a regional topographic and geomorphic expression of subglacial volcanism, namely that at Kverkfjöll, Iceland. This area comprises a series of parallel subglacially-erupted volcanic edifices, which together give excellent 3D geological exposure. These ridges are orientated north-south or along the most probable line of LGM ice margin retreat. We combine topographic and geomorphic observations to explain the changing style of volcanism in space, and attribute this to the recession and downwasting of the LGM ice sheet. Specifically, we observe that there is no spatial pattern to pillow lava edifice heights or volumes, indicating that fissure eruptions beneath the LGM ice sheet were of similar dynamics in space. However, hyaloclastite and hyalotuff deposits are restricted to proximal and high elevation positions. Furthermore, lithofacies are split by erosional contacts and hyalotuffs are faulted and intruded. These observations together suggest that as the overlying ice sheet became thinner volcanic activity became more explosive. Volcanic activity also appears to have 'retreated' towards the Kverkfjöll central volcano. Glacial outburst floods or 'jökulhlaups' were prevalent during deglaciation, partly because subglacial meltwater could not be impounded due to the high gradient bedrock topography. For northern Iceland, our proposed sequence of landscape development suggests two major glacial advances during the Holocene, at least one of which at Kverkfjöll probably coincided with volcanic activity and a jökulhlaup. Future work should look to establish an absolute dating control and/or chronology.