



## **Melting rates and Jokulhlaup Hazards in Fissure Eruptions on Ice-covered Volcanoes**

**M.T. Gudmundsson** and Th. Hognadóttir

Institute of Earth Sciences, University of Iceland

Askja, Sturlugata 7, IS-101 Reykjavík, Iceland ([mtg@hi.is](mailto:mtg@hi.is) / Fax: 354-5528911 / Phone: 354-5255867)

Jökulhlaups and lahars are a major hazard associated with ice-covered volcanoes and calderas. Ice thicknesses vary widely, from a few tens of meters on steep stratovolcanoes to several hundred metres within calderas or large ice caps and ice sheets. Where ice is several hundred metres thick eruptions will melt large volumes of ice, with the melting rate in an eruption mainly controlled by the magma discharge rate. In contrast, where ice is thin (<100-200 m), eruptions quickly break through the ice cover and subsequently only a fraction of the volcanic heat flux is used for ice melting. Ice cover of several hundred metres thickness is relatively rare on volcanoes. In contrast, thin ice is found on the slopes of volcanoes in many parts of the world, posing hazard to neighbouring inhabited areas. In order to estimate the hazard related to flank eruptions on volcanoes with thin ice cover, a simple empirical model was developed, using experience from eruptions in Iceland and elsewhere to determine model parameters and constrain plausible melting rates. The model relates ice thickness, length of volcanic fissure and rate of widening of the ice chasm that forms around the volcanic fissure. Melting rates in the initial phase of moderate to large fissure eruptions are obtained. Application of the model to the slopes of the ice covered volcanoes Eyjafjallajökull and Mýrdalsjökull in Iceland suggests that flank eruptions on these volcanoes would in most instances cause maximum melting rates in the range  $10^3$ - $10^4$   $\text{m}^3\text{s}^{-1}$ .