



## **Fatal hazards caused by subglacial volcanism in Iceland**

E. Sturkell (1) and M. J. Roberts (2)

(1) Institute of Earth Sciences, University of Iceland, 101 Reykjavík, Iceland, (2) Physics Department, Icelandic Meteorological Office, 150 Reykjavík, Iceland (E-mail: sturkell@hi.is Fax: +354 552 8911)

Little is known about the fatal risks posed by subglacial volcanism. Here we evaluate the fatal hazards caused by subglacial volcanism in Iceland. Data on fatalities attributed directly to subglacial eruptions were gathered and verified from published literature; that is, human deaths resulting from short-term exposure to lethal phenomena such as volcanogenic flows, ballistic impacts, lightning strikes, and volcanic gases. Victims were assigned to a fatality location and a specific event. Deficiencies in the accuracy and quality of the data were considerable, due primarily to a systematic lack of descriptive precision in pre-1500 accounts. Against an historic record of 230 volcanic eruptions over a millennium, at least 82 victims have resulted from the direct effects of four lethal subglacial eruptions. Collectively, fall, dispersal, and electrical processes are the cause of 6% of the fatality record, whereas meltwater floods (jökulhlaups) account entirely for the remaining 94% of the record. Erupting subglacial volcanoes can project high-risk hazards to a much greater distance than would be expected for sub-aerial eruptions of similar magnitude and scale. Volcanoes renowned for historically frequent eruptions remain geographically isolated from settlements because of human awareness of the work done by previous eruptions. For volcanogenic jökulhlaups of unprecedented intensity, the prior odds for mortality are high for both proximal and distal reaches of an inhabited flood tract. Subglacial volcanism in populated regions constitutes the greatest volcanogenic hazard in Iceland. This study illustrates the need for greater scientific and public awareness of volcanic risk. Given adequate public understanding and preparedness, modern-day volcanic disasters are entirely preventable.