



Grain size distribution and characteristics of the tephra from the Vatnaöldur AD 871±2 eruption, Iceland.

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Basaltic explosive eruptions in Iceland are frequent and often occur from vents in regions of surface lakes, large groundwater reservoirs or within glaciers. The recent Eyjafjallajökull eruption in 2010 and Grímsvötn eruption 2011 highlighted the vulnerability of passenger jet aircraft to ash in the atmosphere. Iceland's volcanoes are the most potent producers of tephra in Europe, and the frequent occurrence of basaltic explosive eruptions is a major factor in causing this. As a step in increasing the knowledge on the tephra erupted in basaltic explosive eruptions, we study the grain size distribution of a large (~5 km³) explosive basaltic eruption that occurred in AD 871±2. The source is the 25 km long Vatnaöldur crater row in south-central Iceland. The crater row lies within the Bárðarbunga-Veiðivötn volcanic system, one of the most productive volcanic systems in Iceland in recent times. Samples for grain size analysis were collected at six different locations along the broad northwest-trending dispersal axis. Sampling sites ranged in 1.5 km to 120 km distance from the largest vent Skyggnir, near the southern end of the crater row. The Vatnaöldur eruption has been classified as phreatomagmatic, erupting through fractured bedrock composed of recent lavas, hyaloclastites and pillow lava in an area characterized by a high groundwater level and surface lakes. Explosive activity dominated the ~ 25 km long discontinuous fissure, as tuff cones were formed and conduits reached under groundwater table. During the eruption the tephra layer was dispersed in all directions. The area within the 0.5 cm isopach is 50,000 km² and this tephra has also been identified in Greenland ice cores. The grain size analysis indicates that one dominant characteristic of the tephra is the scarcity of pyroclasts over 1 mm in diameter. In the ash sampled more than 4 km from source larger grain sizes are absent. The dispersion in the more distal parts, at distances of 60 - 120 km is dominated by peaks between 0.250 and 0.063 mm, with the deposit showing slight tendency for progressively higher proportion of fines with distance. In the more proximal sections different phases in the eruption have been identified.