Eruption in Grímsvötn 1983; 
course of events and chemical studies of the tephra.

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ABSTRACT

A short eruption took place in the Grímsvötn volcano in May – June 1983. The eruption most probably started on May 28th but was first observed in the morning of May 29th. Activity was last observed on June 1st and by June 5th it was certainly over.

The Grímsvötn volcano is situated within the western part of the Vatnajökull ice cap. It is almost totally ice covered and the caldera lake is covered by an ice shelf about 200 metres thick. The eruption site is within the caldera near the southern rim and a lake, about 500 m in diameter, formed in the ice shelf with a small island in the middle. The eruption was subaqueous and intermittent ash explosions were observed in the lake. Usually these were about 50–100 m high and a steam column rose up to about 5000 m height a.s.l.

Three small ash fans formed on the surrounding ice sheet; two by explosions, one to the south early in the eruption and another to the east most likely on June 1st; the third to the north within the caldera was most likely caused mainly by an avalanche from the overhanging caldera wall into the lake.

The glass phase of the ash was analyzed in a number of samples and found to be evolved basalt with a uniform chemical composition but minor variations are indicated. Samples from the 1934, 1922 and 1903 Grímsvötn eruptions were analyzed for comparison and show very similar chemical composition as the 1983 ash. This composition is also very similar to that of the glass phase of the eruption of the Laki craters 1783–84.

The Grímsvötn volcano is also the site of a major geothermal system, estimated at 5000 MW. The heat source of this system is assumed to be magmatic intrusions, most likely with the same composition as the ash. It appears unlikely that the heat extraction takes place in the same parts of the magmatic system as the evolution of the basalt.

INTRODUCTION

In May 1983 a short, small and little observed eruption took place in the Grímsvötn volcano in the western part of Vatnajökull ice cap. The eruption was mainly subaqueous but managed to build up an ash cone that reached the surface through a small opening formed in the ice shelf which floats on the caldera lake. Explosions formed two very thin ash fans on the surrounding ice and a third ash fan is presumed to have formed mainly by a wave caused by a snow avalanche into the lake. The present report summarizes observations made during the eruption and gives preliminary results on the chemical composition of samples of the ash. For comparison, samples from earlier eruptions 1934, 1922 and 1903 were included in the study.

GEOLOGIC SETTING

The fact that Grímsvötn volcano and the surrounding area is covered by the Vatnajökull ice cap makes our knowledge of the geologic setting uncertain. The tectonic fissures and crater rows which enter the ice cap from the south have a north-easterly direction but where they emerge