Some Observations on the Characteristics of the Drainage System of Kverkjökull, Central Iceland

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ABSTRACT
At the beginning of a glaciological investigation of Kverkjökull in August 1981, the subglacial stream emerging from a large cavern in the snout was found to be cold. On August 11th, the temperature of the stream rose rapidly to a maximum of 25.5°C, discharge fell, and electrical conductivity rose to a maximum of 500 μS/cm, 10 times that of other nearby outflow streams. A strong smell of sulphur was noted at a meteorological station some 23 km. downwind from the Kverkjökull caldera at 1800h on the same day. This suggests a change in the geothermal/drainage system in Kverkjökull.

INTRODUCTION
As part of the scientific programme of the 1981 expedition of the British Schools' Exploring Society, based to the north of Vatnajökull, a small party studied the Kverkjökull outlet glacier which drains the ice-filled caldera of Kverkjökull through a breach in its northern wall. Traces of geothermal activity remain in the caldera and on its north-western rim (Hveradalur thermal area), as described by Friedman and others (1972).

The group's main aim was to study the hydrology of the supraglacial streams on the outlet lobe of Kverkjökull, and the hydrogeomorphology of their proglacial extensions. The main stream issuing from the large cavern in the centre of the glacier terminus was considered too large and swift for safe investigation in the early stages of the expedition (late July, early August). Measurements of flow discharge and water quality were, however, made throughout the study period (27 July to 14 August) on the two outflow streams issuing from the snout of the glacier approximately 250 m either side of the main outflow stream. Hourly records of discharge were determined through velocity-area rating methods (Fig. 1). Hourly records of turbidity, electrical conductivity, pH and water temperature were determined from the analysis of water samples using Horiba U7 and WPA EV1 water quality meters.

OBSERVATIONS ON THE NATURE OF THE DRAINAGE SYSTEM OF KVERKJÖKULL
The dominant features of the drainage system of the Kverkjökull outlet tongue are a huge bottom-connected „moulin“ (Fig. 2) and a well-developed „Röthlisberger type“, subglacial channel which emerges from a large semi-circular cavern in the centre of the glacier snout as the main outflow stream from the glacier (Fig. 3).

The „moulin“ was measured as being some 21.5 m in diameter and approximately 50 m in depth (as ascertained via a controlled abseil descent). The surface morphology of the feature closely resembles that of the active (water-filled) and abandoned (bottom-connected) supraglacial lakes found on the Gor Garang group of glaciers in the N.W. Himalaya by Kaul and others (1982) (compare their Figure 4 with Fig. 2 here), suggesting that the Kverkjökull „moulin“ may at one time have been a supraglacial lake which later achieved a bottom outlet.

The characteristics of the subglacial stream system were studied during periods of low flow, when it proved possible to enter the cavern at the glacier snout and follow the internal drainage system to and beyond the base of the „moulin“ for a distance of some 400 m. The system remains semi-circular throughout, narrowing irregularly, being floored mostly in subglacial tills but occasionally being carved into solid rock. A waterfall from the roof of the channel was encountered at one point. A number of dry tributary caverns were also found.