

Infrared Emission from Kverkfjöll Subglacial Volcanic and Geothermal Area, Iceland¹

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ABSTRACT

Aerial infrared surveys with an optical-mechanical line scanner using an indium antimonide solid-state detector were carried out over the Kverkfjöll massif on the north side of Vatnajökull in 1966 and 1968. Thermal anomalies of the area, their relationship to previously known geologic features, and changes observed between 1966 and 1968 were recorded on film and videotape. Signal amplitude slices showing incremental steps in infrared emission from the earth's surface reveal at least 120 points of geothermal activity in the partly subglacial Hveradalur (solfatara valley) of West Kverkfjöll. Infrared images of 1966 and 1968 show the night position of a thermal equilibrium point for warm melt water emerging from a portal in the snout of Kverkjökull outlet tongue. The melt-water stream yields 20×10^6

cal/sec advective heat flow from a hidden subglacial geothermal source which may have a total thermal yield of $300-540 \times 10^6$ cal/sec. The energy expended in forming the 620×590 m Kverkfjöll ice cauldron is estimated to have been 1.2×10^{23} ergs; infrared data indicate continued but diminishing thermal activity on the cauldron rims between 1966 and 1968.

Aerial infrared surveys using an optical-mechanical line scan device and aerial cartographic cameras with Plus X (Kodak type 5401) and Infrared Ektachrome Aerographic (Kodak type 8443) film were conducted in August 1966 and August 1968 over the Kverkfjöll reentrant on the north side of Vatnajökull (Figs. 1a and 1b). The surveys, separated by a two-year interval, were designed as an experiment in monitoring changes in thermal activity at this partly subglacial volcanic and geothermal area by an aerial infrared technique. The present report gives a brief discussion of the thermal and related features identified and delineated by the infrared method, their relationship to previously known geologic features of the area, and changes observed between 1966 and 1968.

The ice-covered Kverkfjöll massif (Fig. 2) occupies a large part of the reentrant between

1) Presented in part at the symposium, *Volcanoes and their Roots*, International Association of Volcanology and Chemistry of the Earth's Interior, Oxford, England, September 11, 1969.

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Publication authorized by the Director, U. S. Geological Survey.