Bægisárjökull, North-Iceland

Results of glaciological investigations 1967–1968

Part II. The energy balance

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ABSTRACT

The energy budget terms for a melting glacier were estimated for periods in July and August in 1967 and 1968. The turbulent energy fluxes were computed by application of the Monin and Obukhov theory. Evidence showed that this method gave better results than assuming logarithmic profiles of wind, temperature and specific humidity. The relative importance of net radiation, sensible heat, and latent heat in supplying energy at the glacier surface was found to be about 51%, 33% and 16% respectively during the observation period in 1968. For the observation period in 1967 the net radiation was found to be responsible for about 57% of the ablation.

For a period of 36 days midsummer in 1968 calculated and measured ablation were found to be in good accordance. By assuming the first one to be representative for the latter, averaged over shorter time intervals, the glacier system response to input of meltwater and rain could be illustrated. Further it is demonstrated that the discrepancy between the results obtained using the hydrological method and the glaciological method for mass balance measurements reported by Björnsson (1971) might partly be caused by the release of delayed water melted earlier in the summer and was partly due to an underestimate of the rain volumes.

INTRODUCTION

A general description of meteorology on Bægisárjökull for the observation periods during the summers of 1967 and 1968 has been given by *Björnsson* (1971). It appeared that net radiation, sensible heat and latent heat were all important sources of ablation. The purpose of the work presented by this paper was to estimate these components in the energy budget and determine the quantitative importance of each process.

Recorded global radiation was used to find an areal estimate for the incoming short-wave radiation for the whole glacier. The long-wave radiation balance was estimated empirically with the aid of cloud observations. The turbulent energy fluxes were estimated at the micrometeorological site at 1100 m a. s. l. These point values were used as representative mean values for the glacier. The results were compared with measured ablation on the glacier and with the run-off in the glacier river.

Fig. 1, 2 and 3 give a view of the glacier.

THE ENERGY BUDGET

The equation of the energy budget at the air-snow interface was considered in the simple form

$$L \cdot a = Q_r + H_d + H_l \qquad (1)$$

where

Q_r is the net radiation balance
H_d is the vertical eddy flux of sensible heat
H_l is the vertical eddy flux of latent heat
a is the ablation of the ice phase in the weathering crust
L is the specific latent heat of melting ice

All terms are expressed in cal/cm² min (langley/min). Only periods with melting were considered and the glacier was assumed to be in