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SHORT NOTE

FRONTAL RECESSION OF SERMIKAVSAK, WEST GREENLAND

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Abstract. The results of two surveys of the frontal margin of a valley glacier in West Greenland are reported. If they indicate a constant or decreasing mass loss rate, the glacier shows similar behaviour to that of the nearby ice lobes on the ice sheet.

Résumé. *Recul frontal du Sermikavsak, Groenland Occidental.* On rapporte les résultats de deux campagnes d'observation sur la marge frontale d'un glacier de vallée dans le Groenland Occidental. Que les résultats montrent une perte de masse constante ou décroissante le comportement du glacier reste semblable à celui des blocs de glace de l'indlandsis dans le voisinnage.

Zusammenfassung. *Der Frontrückgang des Sermikavsak, West-Grönland.* Die Ergebnisse zweier Aufnahmen der Frontlagen eines Talgletschers in West-Grönland werden vorgelegt. Sofern sie auf einen zeitlich konstanten oder abnehmenden Massenverlust hindeuten, zeigt der Gletscher ähnliches Verhalten wie die nahen Eisloben des Inlandeises.

It is known that the glaciers of Greenland have shown considerable fluctuations in their frontal positions within historical time. Weidick (1968) has annotated and correlated the behaviour and regional variations within the glaciers of West Greenland and, of particular interest in the present work, he has given data on the local glaciations within the Umanak district. There the local glaciers have shown stability or slight recession from their maximum extent during A.D. 1920–30; and in particular on Upernivik Ø the glaciers have shown a large re-advance around 1930 followed by a subsequent retreat at about 30 m year^{-1}. However, since 1960 there is evidence that a new re-advance may be under way on the larger nearby glacial lobes from the ice sheet, and it is of interest to see whether the local glaciations of Upernivik Ø, which are known to show relatively large or second-order fluctuations, are responding in any way with the suggested ice sheet fluctuations.

Our work on a selected glacier, Sermikavsak (Weidick, 1968; locality 119 IV) at lat. 71° 11′ N., long. 53° 03′ W. on Upernivik Ø near Umanak, was carried out to see if a local valley glacier was starting to respond to the climatic changes indicated to be taking place on the ice sheet.

Sermikavsak is a typical valley glacier of Ahlmann type II and represents a transition form between a polar and a temperate glacier. The recent behaviour of Sermikavsak has been documented by Fristrup (1960), who compared its characteristics with three other glaciers situated in the different geographical provinces of West Greenland. The last survey of its front was carried out in 1957 by Møller (1959[b]), and our work in 1968–69 was to re-survey the frontal margin to see if the retreat had started to slow down. Other projects on this glacier that have been carried out are on the periglacial features of its foreland plain by Møller (1959[a]), on the climatic pattern during the ablation season by Kuhlman (1959), on the temperature distribution within the ice reported by Fristrup (1960), and on plant colonization on the foreland by Gribbon and Meldrum (in press). Unpublished work by St Andrews expedition members on the growth rates $\approx$0.16 mm year^{-1} of the thalli of the lichen species *Rhizocarpon geographicum* on the plain, and on the a.c. conductivity $\sigma_0 \approx 10^{-5}$ mho m and the relaxation times in *névé* in the soaked facies of the upper basin at 1 200 m has been carried out.

The frontal margin of Sermikavsak was surveyed by plane-table methods using the fixed points established by the 1957 survey. Our measurements, made in August 1968 by D. T. Meldrum and F. George, and in August 1969 by J. N. Ross and K. F. Avery, are mapped accurately in Figure 1, while the 1969 position of the front with respect to both its earlier positions and to the fixed control points are located in Figure 2.

The control points in Figure 2 were plotted from the 1968 and 1969 plane-table maps by using the longest common distance, i.e. the distance between point 1 and the gravel cone, to bring the two maps to a common scale. The point positions are correct relative to each other but apart from point 1 and the gravel cone they may not be correct with respect to the existing detail of Figure 2.

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The main point of interest is that, although the average retreat rate of the active ice is being maintained at 43 ± 8 m year^{-1} compared to the average retreat rate of 42.5 ± 3 m year^{-1} for 1953–57 and 37 ± 2.5 m year^{-1} for 1957–68, the rate at which the ground area is being freed from the ice cover $\approx 2 \times 10^4$ m^2 year^{-1} has decreased by about 30% since the mid 1950's. Although this may be partly due to differences in the ice-flow velocities and to an increase in the amount of ice held in the core of the southern moraine-covered lobe of dead ice with time, the main reason could be that the mass balance of

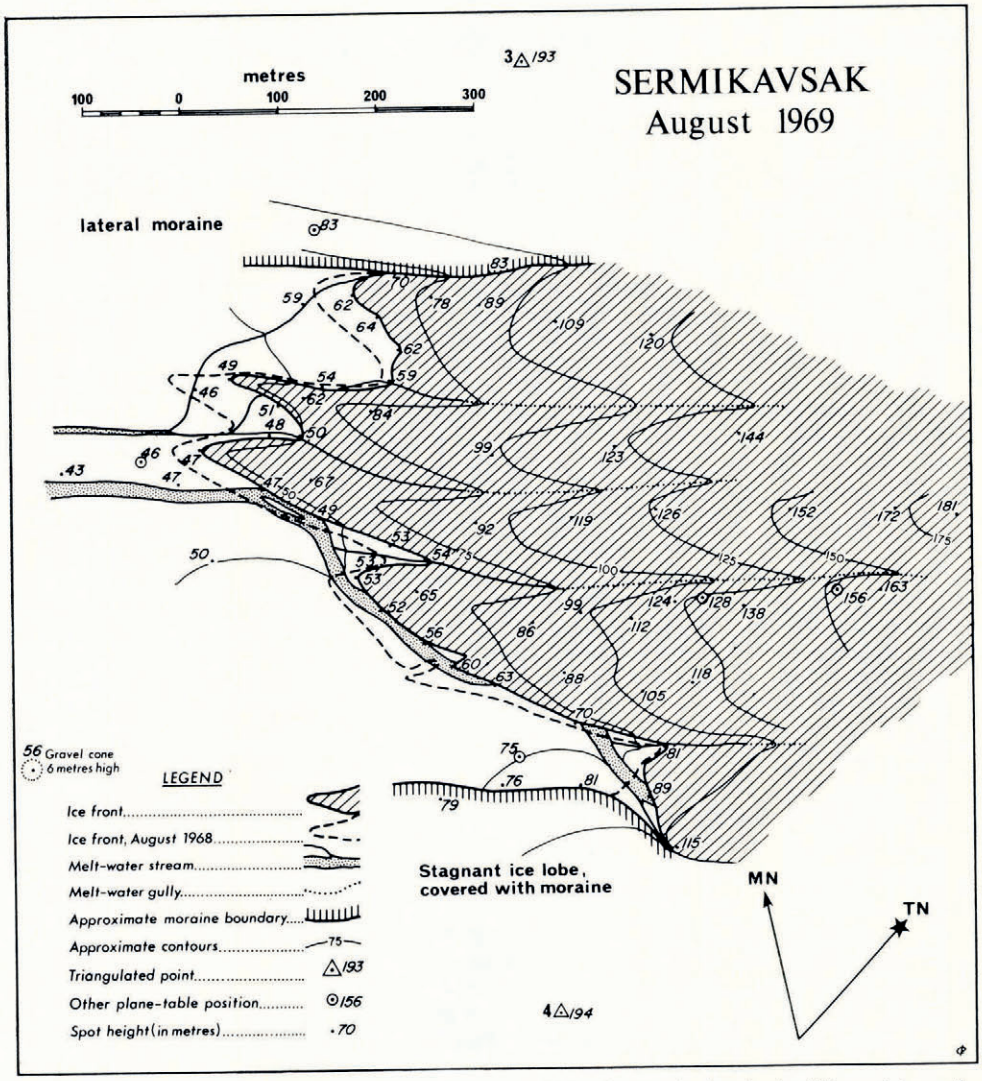

Fig. 1. Map of the Sermikavsak front in August 1969. The annual frontal retreat is given by the difference between the 1968 and 1969 positions.

the frontal margin of the glacier is changing with a decrease in the mass loss rate. This may indicate a slowing down of the retreat due to the response of the glacier to local climatic changes similar to those that have been experienced by the neighbouring ice lobes of the ice sheet. It is recognized also both that the frontal fluctuation of a single glacier should not be over-emphasized, and that the response of a valley or ice sheet lobe to climatic change implies a certain time delay, often of the order of many years, yet the problem of interpreting a frontal trend is of interest.

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Our work also showed that there was an increase in the surface inclination or profile of the front from about 10% in 1957 to 20% in 1969 and this could imply a decrease in the recession due to a kinematic mass flux wave moving down the ice lobe, but again this should be interpreted with caution as these values represent Weidick's quoted minimum and maximum surface inclination values of this glacier. The maximum longitudinal velocity ≈ 16 m year^{-1} of the ice on the longest of the frontal ice-lobe features was derived from a limited survey of boulders "fixed" in 1968 on the surface of the lobe. This showed that the upper ice layers were moving much faster and possibly over-riding the lower layers. If the lower layers were of dead ice, this would indicate a re-activation of the glacier by frontal transverse shear over the lower layers.

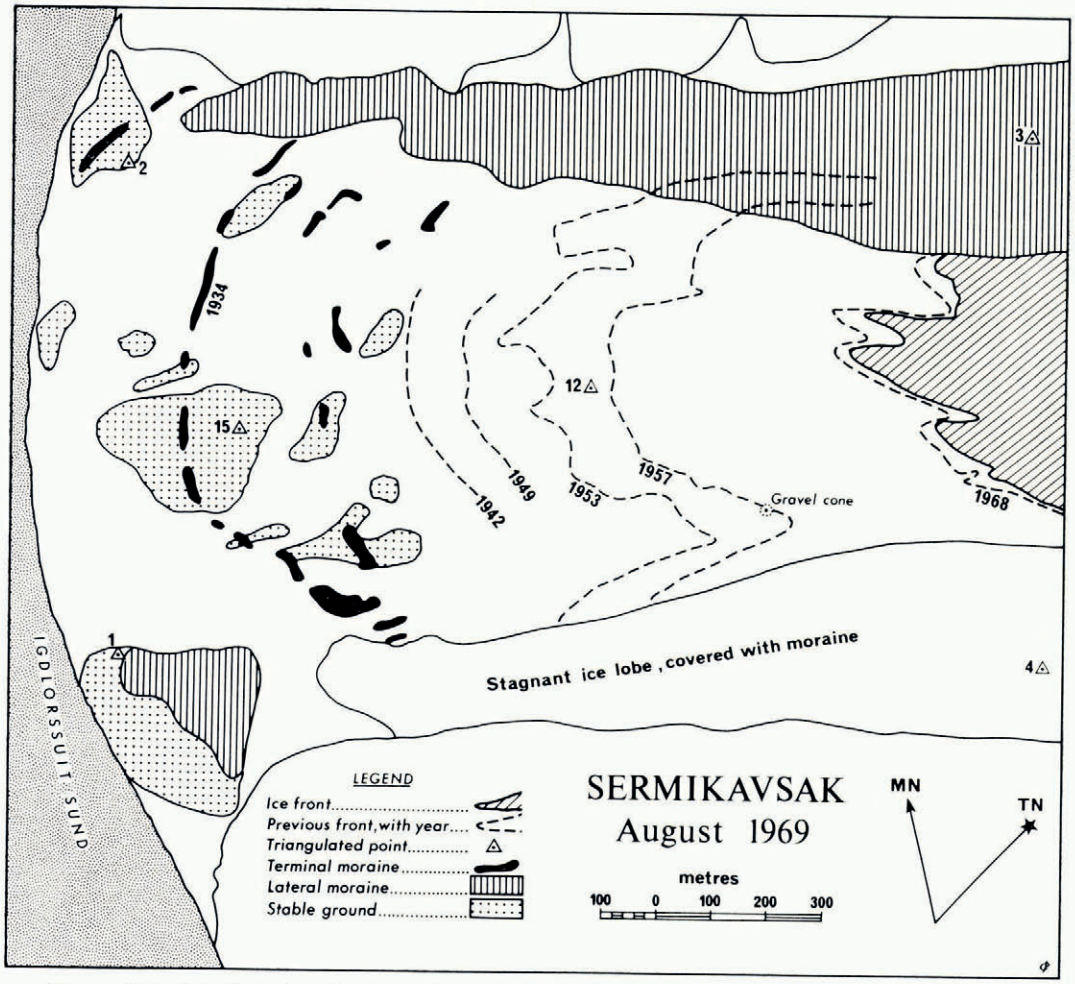

Fig. 2. Map of the foreland and the frontal ice margin of Sermikavsak. Earlier positions of the front are marked.

Although our measurements and conclusions are not inconsistent with the stability or possible re-advance of the ice, it remains true that the short-term variations of one glacier are not a reliable guide to the glaciation over a wide region and continued studies over the glaciers of the region would be of interest.

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