CORRESPONDENCE

The Editor,

Journal of Glaciology

SIR,

A patterned marginal plain in Norway

On a visit in August 1961 to Omnsbreen, a dying—if not already dead—glacier lying to the north of Finse in south Norway, I was surprised to find that the morainic and outwash debris at the edge of the ice mass was arranged in a series of parallel ridges and hollows of a regularity which is quite remarkable in such a situation.

Figure 1 is a sketch map corrected from photographs of the area. At its edge the surface of Omnsbreen slopes down at gradients between 1 in 6 at the eastern end and 1 in 2 at the western end. There are no crevasses and shear planes appearing at the surface are widely separated. The lowest 2 to 3 m. of the ice surface were covered by a layer of wet snow a few centimetres in depth, the mid-August remnant of a winter snow bank.

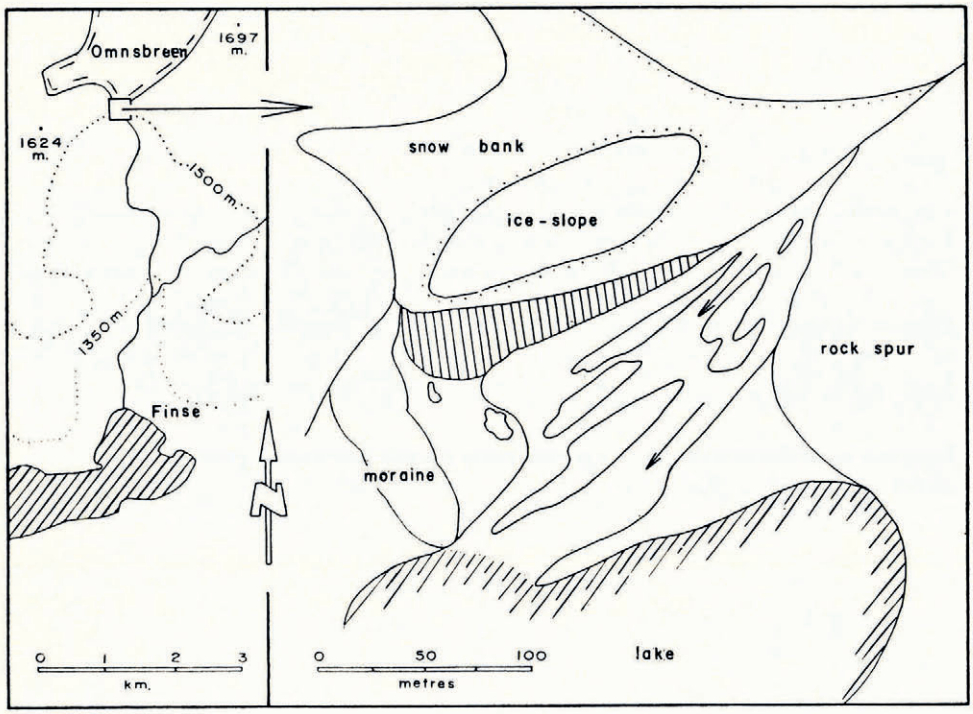

Fig. 1. The southern margin of Omnsbreen showing the location of the feature described

A morainic ridge, 3 to 5 m. in height, extends from the western end of the ice edge, while a large melt-water stream flows from under the eastern end and, deflected by a low rock spur, spreads out in a winding braided channel southwards to a shallow lake. Between the morainic ridge, the braided stream and the ice-edge snow bank lies the plain of debris shown in Figure 2, which was sketched from a colour photograph taken from the ice.

The debris consists of rubble, gravel and mud in an inconsequent mixture. At the time of my visit the material was saturated with melt water and rain-water, and would not carry the weight of an average person unless he stood on one of the large stones which are indiscriminately scattered on the surface.

The surface morphology of the plain is a series of parallel ridges and intervening hollows (it is the hollows which are marked on Figure 2). The ridges extend away from the ice, at right angles to its edge, for up to 30 m. until terminated by the braided channel of the melt-water stream. The distance from one ridge axis to another is about 80 cm., and the height difference between ridge axis and hollow axis is about 10 cm.

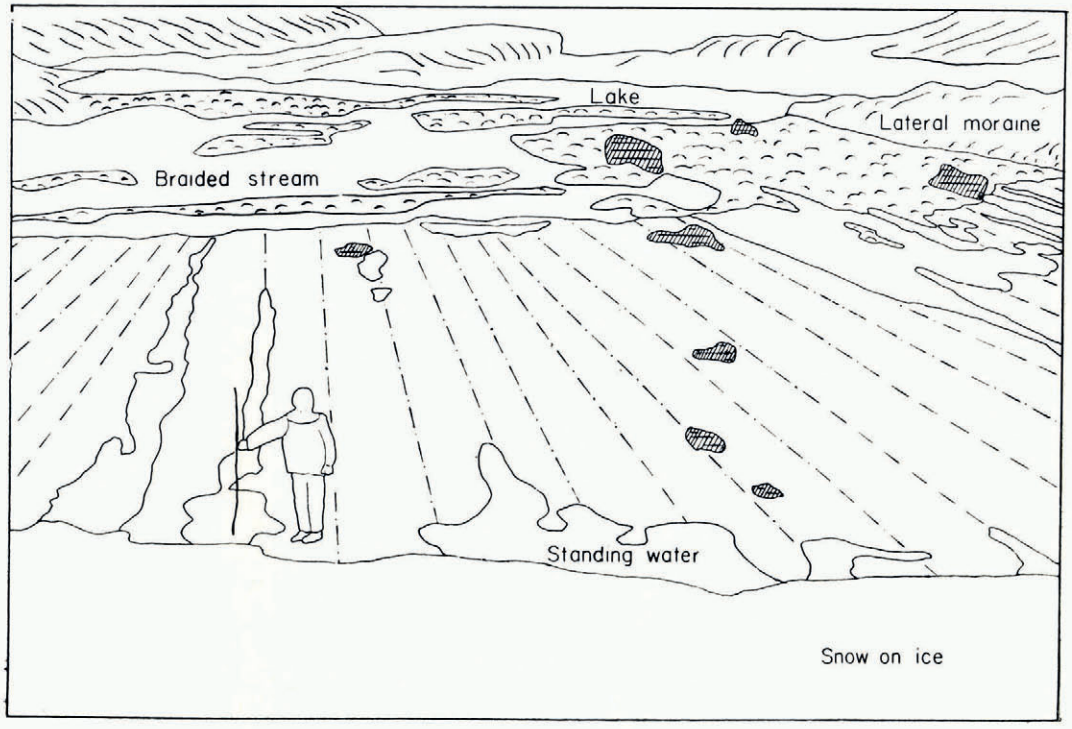

Fig. 2. Sketch from a photograph of the area of parallel ridges and hollows

In some of the hollows there was standing water, and in most cases these pools were widest and deepest nearest to the ice edge. At one point a pool was sufficiently deep to extend across several of the ridges. This must indicate that the general slope of the debris plain is slightly towards the ice.

A topography such as this suggests the result of frost-heaving. There is no evidence of a concentration of stones in the hollows, but this is likely to be a function of youth in a feature which may not yet have undergone more than one or two seasons of frost action. The distribution of standing water in the hollows indicates that there is little overall gradient. If frost-heaving were to act on so flat a surface it would surely result in polygonal formations rather than rectilinear stripes. No such polygonization was observed. Stone stripes are found on sloping ground—a linearity such as exhibited on this plain would require a gradient of at least four or five degrees, so there is little likelihood that these are incipient stone stripes.

It is clear from Figure 2 that at Omnsbreen there is an unusual feature for which an explanation is not readily forthcoming. It is not the result of erosion and it seems unlikely that it is due to the action of frost. Indeed the area is probably protected from atmospheric agents for much of the year by a blanket of snow. The glacier itself has every appearance of a dead mass melting away *in situ*, and is therefore unlikely to have caused this unusual phenomenon.

As I have the impression that this may be a transitory feature I wish to record these notes in the hope that some explanation may be forthcoming from observations of similar features in other areas.

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20 April 1962

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