HALLET: I agree that your measurements suggest that water is percolating through low-permeability ice. However, the data do not indicate whether this is due to overall percolation of water from the surface or due to squeezing out of water from stressed basal ice, as Dr Robin suggests.

SOUCHEZ: There is no significant difference in major cations between surface glacier ice and basal glacier ice along the vertical above the regelation layer. If selective entrainment of alkalis by overall percolation is the dominant feature, one would expect a gradient to be present in glacier ice.

G. HOLDSWORTH: Where were the melt-water samples taken for which the chemical analyses are given in the table? The minimum and maximum values of the chemical analyses given would presumably reflect the nature of sampling site(s) and these should be related to the sites of the ice sampling.

SOUCHEZ: At all the sampling sites (supraglacial, subglacial, or in the front of the glacier) all the values of the alkali–alkaline-earth ratio are lower than 0.15, i.e. a factor of four less than that of regelation ice. This means that simple refreezing of these waters cannot explain the situation.

M. M. HERRON: Have you measured pH or specific conductance on your samples to check on the applicability of the ion-exchange mechanism?

SOUCHEZ: No, we have not. In this case, pH measurements are difficult to interpret because of pCO_2 fluctuations during melting. On the other hand, specific conductance is strongly affected by the dirt content.

IMPORTANCE OF PLASTIC DEFORMATION IN REGELATION OF ICE

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ABSTRACT. It is well known that regelation may occur by pressure-melting in front of a wire and refreezing at the rear. The velocity of the wire has been observed to have values ranging from 10^{-5} to 10^{-1} mm/s. However, there have always been large discrepancies between experiments and any theory based on this mechanism, and, when moving at a comparable velocity, hard balls slid on an ice surface leave grooves made by plastic deformation. So, we conducted experiments to test whether regelation phenomena might be explained by plastic deformation of ice around the wire.

(1) Two single crystals of ice were vertically connected to a rigid base and a loop of copper was hung over the top of the ice with a weight attached. The velocity in the lower ice block which had its basal plane horizontal was 20% faster than that in the upper ice block where the basal plane was vertical, this result strongly suggests plastic deformation as the mechanism of regelation.

(2) An elliptical wire which had its long axis vertical moved five times more rapidly than one with its long axis horizontal, and when the long axis is inclined, the wire was deflected along the direction of the long axis.

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(3) Under the same conditions of wire diameter and load, the velocity only showed a difference of a factor or two in spite of changes in thermal conductivity of the wire by more than a thousand times. These small differences of velocity when compared to thermal conductivity may be explained by the surface roughness, flexibility of the wire, and other physical properties of the interface.

(4) A thin wire moved faster than a thick wire even if the same pressure was applied. Under constant load, the velocity decreased as R^{-n} where R is the radius of the wire and n takes a value between 1.3 and 2.

These four effects suggest strongly that plastic deformation is responsible as they cannot be understood by the classical theory of regelation. However other observations show that we cannot completely give up the classical theory.

(5) Many cracks occurred in the ice in front of the wire and then filled by melt water, and melt water moved upwards around the wire in places. If dyes were dropped on the top surface of ice, coloured water diffused to the rear of the wire. These observations give fine evidence of the existence of melt water.

(6) Different weights were hung on each end of the wire and the weight difference at which the wire started to slide horizontally was determined. Friction coefficients of *c.* 0.001 for nylon and 0.01 for copper were obtained. The coefficient for silk string, however, was extremely high so that the string could not move even though string showed regelative movement as compared to nylon.

It may be concluded that part of the regelation occurred by plastic deformation although the classical theory cannot be completely abandoned as a mechanism of regelation.

GLACIER-BED LANDFORMS OF THE PRAIRIE REGION OF NORTH AMERICA

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ABSTRACT. Two major types of terrain that formed at or near the bed of Pleistocene continental ice sheets are widespread throughout the prairie region of Canada and the United States. These are (1) glacial-thrust blocks and source depressions and (2) streamlined terrain.

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