Journal of Glaciology, Vol. 15, No. 73, 1975

ABSTRACTS OF PAPERS PRESENTED AT THE SYMPOSIUM BUT NOT PUBLISHED IN FULL IN THIS VOLUME

BOTTOM CREVASSES IN THE ROSS ICE SHELF

By John W. Clough

Abstract. Bottom crevasses were detected at many locations in the southern portion of the Ross Ice Shelf during the 1973–74 austral summer. The crevasses which extended up about 100 m from the bottom of the shelf were detected by radio-echo sounding. These linear features were mapped in some detail at the RISP Camp. Wide-angle reflection velocity measurements, airborne radio-echo sounding, and other results of the RIGGS program will be included in the discussion.

DISCUSSION

C. W. M. Swithinbank: Do you find surface undulations in positions corresponding with your bottom crevasses?

J. W. Clough: No obvious surface undulations were observed over bottom crevasses. Some of these features are apparently quite thin and extend upward about one-third of the ice thickness and we would not expect any surface expression. Some of the bottom features are, however, wider, and have affected the internal reflecting layers above them, but little or no trace of this effect is indicated at the surface.

S. Evans: I note the strength of the echo from the top of the crevasse and call attention to the fact that the crevasse can be indefinitely thin, so long as it is opaque (which requires a few centimetres of brine), and still produce strong echoes over a wide range of angles of view. The echo arises from diffraction at the discontinuity.

G. de Q. Robin: How do ice thicknesses found by RIGGS compare with those of the SPRI–NSF flights in the same area? There appears to be a significant difference of interpretation of the 750 m contour off a major ice stream entering the ice shelf.

Clough: In general the agreement with the SPRI map is quite good. We have been able to map portions of the shelf in detail (at a 10 and 20 m contour interval). The map I have shown is a preliminary one using our data only and does not include all our flight data near Siple Coast. Revision of the map in that area may modify the contour considerably.

Swithinbank: We have found bottom crevasses particularly associated with the inland boundary of ice shelves, and have assumed that they were caused by tidal bending forces.

T. Hughes: If you can separate bottom crevasses caused by tidal flexure along the Ross Ice Shelf grounding line from crevasses due to other causes, you might have a built-in record of surges in ice streams and outlet glaciers feeding the ice shelf: the whole system being analogous to a strip-chart recorder of variable velocity equipped with a pen (hinge-line tidal flexure cracks) that marks constant time increments on the strip (ice shelf). One method of distinguishing such tidal-flexure cracks is by the thick sea-ice wedge frozen into their walls. Could seismic or radar sounding, therefore, detect such sea-ice wedges of about 20 m thickness?

CLOUGH: We could detect such bottom crevasses by radio-echo sounding but could not accurately determine their width. We have detected bottom crevasses at the hinge line of the ice shelf and believe they are formed by this mechanism although our survey did not extend up-stream far enough to determine positively that the hinge-line is the point of origin. It is unlikely that we can discriminate between these crevasses and those that may form by other mechanisms unless their physical characteristics are quite different (e.g. height of formation, width, etc.).

RADIO DEPTH SOUNDING ON BARNES ICE CAP

By R. A. O'NEIL *and* S. J. JONES

(Glaciology Division, Inland Water Directorate, Department of the Environment, Ottawa K1A 0E7, Canada)

ABSTRACT. In May 1974 two radio depth sounders were used on the Barnes Ice Cap, Baffin Island. One was a S.P.R.I. 35 MHz sounder and the other was a unit operating at 620 MHz. Bottom reflections were observed with both systems at similar depths, indicating no significant velocity change between the two frequencies. Used with a Motorola range positioning system, the 620 MHz unit proved an excellent depth-survey vehicle. Results along the so-called surge profile (Holdsworth, 1973) are presented. Depth and attenuation values are compared with previous data.

REFERENCE

Holdsworth, G. 1973. Evidence of a surge on Barnes Ice Cap, Baffin Island. *Canadian Journal of Earth Sciences*, Vol. 10, No. 10, p. 1565–74.

DISCUSSION

J. W. CLOUGH: Was the wide-angle velocity measurement you report a fixed-end profile or a common-reflection-point profile? Do you have any plans to measure the anisotropy in relative permitivity ϵ for single ice crystals or ice with strong fabric?

S. J. JONES: The velocity measurements were made with a fixed-end profile. We have made preliminary tests on two single ice crystals and found an anisotropy of $<2\%$ in the low-frequency value of ϵ.

J. G. PAREN: Your measurement of the attenuation at 35 MHz on polycrystalline ice grown in the laboratory is indeed in accord with the measurements of Westphal (unpublished, reported by Evans (1965)) on polar ice at 150 MHz and the measurements on ice from polar regions obtained by Paren (1973) and Fitzgerald and Paren (1975) at lower frequencies. The measurements do not correspond, however, to those expected from pure, slowly grown laboratory single crystals if there are no further dispersions above the Debye dispersion. They would more likely correspond to polycrystalline ices grown by Boned and Barbier (1973). Were your ices formed from supercooled water?

JONES: The ice was not deliberately formed from supercooled water.

P. GLOERSEN: You mentioned "inverse-cube scattering"; for what variable?