

# ABSOLUTE MOVEMENTS, MASS BALANCE, AND SNOW TEMPERATURES OF THE

## RIISER-LARSENISEN

(Abstract only)

by

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### ABSTRACT

During the Norwegian Antarctic Research Expeditions 1967-77 and 1978-79 a land party worked on Riiser-Larsenisen, an ice shelf 120 km wide on the coast of Dronning Maud Land (15° to 20°W). In February 1977 three patterns of six stakes each were laid out over areas of about 4 km<sup>2</sup> as part of a combined investigation into absolute movements and strain-rates. Eight stakes for absolute movement were also laid out. The stakes were also used for determination of mean snow accumulation together with a stake line across the ice shelf. The positions of the stakes were determined by theodolite observations from the stake points and from trigonometric stations located on land and on an ice rise near the ice front.

In February 1979 all these measurements were repeated, and absolute movement, deformation, and mean accumulation were calculated. The absolute velocity of the ice shelf varied from 30 m a<sup>-1</sup> near the grounding line to 130 m a<sup>-1</sup> near the ice front. The mean annual accumulation was 510 mm water equivalent

on the outer part of the ice shelf and 580 mm at the grounding line. Based on these measurements, together with snow-density measurements down to 16 m and measurements of the height of the ice shelf, the mass balance of the ice shelf was studied.

The stake pattern across the grounding line showed considerable expansion. This is interpreted as a result of water freezing in bottom crevasses made by the tides.

In 1979 snow temperatures were measured in eight bore holes down to 10 m depth. The snow temperatures at 10 m depth were used as a measure of the annual mean air temperature. The annual mean air temperature ranged from -16.8°C near the ice front to -19.2°C at the grounding line. Snow temperatures in bore holes on the slope of the ice rise and inland indicate a mean atmospheric temperature inversion of 0.28°C 100 m<sup>-1</sup> for a 440 m layer near the grounding line, and 0.30°C 100 m<sup>-1</sup> for a 160 m layer near the ice front. Here a mean inversion of 2.8°C 100 m<sup>-1</sup> was found for the lowest 40 m layer of the atmosphere.

# ICE FLOW ALONG AN IAGP FLOW LINE, WILKES LAND, ANTARCTICA (Abstract only)

by

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### ABSTRACT

Trilateration and single line surveys have been made to about 900 km inland of Casey, Wilkes Land, to measure surface elevation, ice thickness, horizontal velocity, and other parameters. On the large scale the velocity  $U$  increases smoothly from 8 m a<sup>-1</sup>, 800 km inland, to 280 m a<sup>-1</sup> inland of the fast outlet streams. This increase in velocity is associated with a corresponding increase in the large-scale smoothed (over about 30 ice thicknesses) basal shear stress  $\tau_b$  from 0.4 to 1.5 bar. The mean shear strain-rate through the ice sheet  $U/Z = k\tau_b^4$ , where  $Z$  is the ice thickness (range 4 500 to 1 700 m).

At scales of one to several ice thicknesses large variations occur in surface slope and ice thickness

without proportionally large velocity variations, because of the effect of the longitudinal stress. Detailed measurements made over a 30 km section indicated that the surface longitudinal strain-rate gradient varied from -1.7 to +1.3x10<sup>-6</sup> a<sup>-1</sup> m<sup>-1</sup> along with variations in surface slope of from -3.5 to +1.5%.

A multilayer model, based on the solution of the biharmonic equation for the stream function, was used in a study of the ice flow associated with these surface undulations. Given the bedrock topography and large-scale flow parameters, the model closely predicted the measured surface profile when the variation of the surface accumulation rate over an undulation was also considered.