

## MASS FLUX AND DYNAMICS OF TOTTEN GLACIER, ANTARCTICA

### (Abstract)

by

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Surveys of ice thickness, surface elevation, velocity, and accumulation rate were made on the upper part of Totten Glacier by oversnow traverse during 1987. Measurements were made along one longitudinal section and three cross-sections of the deep broad valley the glacier occupies along the south-east margin of Law Dome in Wilkes Land. The valley connects with Vanderford Glacier to the west and separates Law Dome ice cap from the main Antarctic ice sheet. The lowest measurements were made about 125 km inland from where the glacier tongue emerges from the coastline. Other measurements made on the grounded ice sheet in Wilkes Land (Young and others, 1989) provide data on the flow immediately inland of Totten Glacier.

The ice thickness in the glacier valley varies between 1400 and 2800 m, but it is typically about 2000 m over a large part of the survey area. The thickest ice, 2825 m, occurs where the surface elevation is only 300 m, and the base of the ice is 2525 m below sea-level, which suggests that the ice stream could be floating at this point. The greatest measured velocity,  $730 \text{ m a}^{-1}$ , occurs within 4 km of

this point. By contrast, the velocity on the southern boundary is  $710 \text{ m a}^{-1}$  in ice only 1400 m thick. The maximum down-slope shear stress of 1.8 bar occurs about 40 km up-stream of the lowest cross-section where the ice is about 1500 m thick, with surface elevation about 1000 m and surface velocity of  $333 \text{ m a}^{-1}$ . Extrapolation of the trend in velocity and longitudinal strain-rate to the glacier front suggests that the outlet velocity could be of the order of  $2\text{--}3 \text{ km a}^{-1}$ .

The mass flux through the lowest cross-section is estimated to be in excess of  $40 \text{ Gt a}^{-1}$ . Snow accumulation on the surface of the glacier of the order of  $1000\text{--}2000 \text{ kg m}^{-2} \text{ a}^{-1}$  contributes about  $1 \text{ Gt a}^{-1}$  to the total flux.

### REFERENCE

- Young, N.W., I.D. Goodwin, N.W.J. Hazelton, and R.J. Thwaites. 1989. Measured velocities and ice flow in Wilkes Land, Antarctica. *Ann. Glaciol.*, 12, 192-197.