



Force Balance of Narrow Ice Shelves

Richard C.A. Hindmarsh

British Antarctic Survey, Physical Science Division, Cambridge, United Kingdom (rcah@bas.ac.uk, +44 1223 221 226)

Narrow ice shelves are defined as those with a low width-to-length ratio. Scale estimates of the force-balance of such ice-shelves indicate that the total back-force transmitted across the grounding line is independent of the length of the shelf, but depends upon the difference between the thickness at the grounding line and calving front.

A boundary layer analysis at the calving front shows that there are two such layer, one for the stresses that are flow parallel, and a much thinner one for stresses tangential to the ice front.

Implications for the coupling between ice-stream dynamics and sub-ice-shelf seas are discussed. A numerical model is used to investigate the validity of the scale analysis by varying the width -length ratio in idealised ice-shelf models. The question of whether the Pine Island Glacier shelf is narrow is addressed.