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ABSTRACTS OF PAPERS ACCEPTED FOR THE SYMPOSIUM BUT NOT PRESENTED

MATHEMATICAL MODELS OF ICE SHELVES

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Abstract. The flat form and high ice velocity of floating glaciers are explained by the absence of shear stresses at the lower surface. In orthogonal co-ordinates with one axis normal to the upper and lower surfaces shear stresses in these glaciers are absent. Another important peculiarity of ice shelves is their essential non-isothermality. Among them two dynamically different types are distinguished, which are described by different models.

A. *External ice shelves* join the coast at one edge and at some distance from it can expand freely in all directions. They can be considered with sufficient accuracy as flat plates without any physical differences between the directions of the horizontal plane, except that strains lead to the movement relative to the fixed edge. Thus the problem of thermodynamics becomes one-dimensional. In the affine dimensionless system of co-ordinates, the equations of the dynamics are simplified and together with the rheological equation lead to the non-linear integro-differential equation involving the reduced temperature. For the quasi-steady case, the boundary problem for this equation is solved by means of the method of sewing together of asymptotic expansions. It is shown that the stability of the thermodynamic regime in external ice shelves takes place only when the stream lines pass through both glacier surfaces, because in this case the advection removes the dissipative heat. In the case of ice coming from the upper and lower surfaces in opposite directions, the regime is unsteady because of the internal accumulation of heat.

B. *Internal ice shelves* are limited by coasts from various sides and interact with them dynamically. In the boundary zone coasts provide a braking action and outside it they prevent sideways spreading. The relation between horizontal stresses is conditioned by the configuration of coasts, therefore the angle between the coasts, or between the directions of ice flow from them, is included essentially into the equations of thermodynamics. Another complication is connected with the considerable change of the temperature and of the accumulation–ablation rate at the upper and lower surfaces of the glacier along flow lines. Integro-differential equation for the temperature in this case is more complicated, but its solution is analogous to the case above. In the coastal zone the thermodynamics are described by other equations in connection with the predominance of the shear stress in the plane parallel to the coast.

ELECTRICAL RESISTIVITY PROFILES AND TEMPERATURES IN THE ROSS ICE SHELF

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Abstract. During the 1973–74 Antarctic field season, two electrical resistivity profiles were completed along directions perpendicular to each other at a site in the south-eastern