FOLDING IN STRONGLY ANISOTROPIC LAYERS NEAR ICE SHEET CENTERS

Throstur Thorsteinsson and Edwin D. Waddington

Department of Earth and Space Sciences University of Washington, Seattle, USA

ABSTRACT

Conditions for passive folding near ice sheet centers are derived treating the ice as an anisotropic viscous medium. Vertical uniaxial compression at a dome, or pure shear stress near a ridge divide, both tend to stretch and flatten folds, while horizontal simple shear deformation tends to overturn folds. Overturned folding is likely in a given vicinity in steady state flow field, if the initial slope of a layer disturbance exceeds the ratio of compressive/extensive deformation to shear deformation. Analytical equations for particle tracks in steady state allow us to model the evolution of layers with initial slope disturbances (``wrinkles"). The effects of anisotropy are explored using an analytical solution for the strain rate as a function of a vertically symmetric c-axis orientation distribution, called a cone fabric. Stronger anisotropy (small cone angle) makes the material softer in horizontal shear, and facilitates folding, i.e. elements with smaller slopes can be overturned for the same stress. The relation between anisotropy and folding is complicated by the fact that, for a range of cone angles, the material is also softer in compression, which opposes folding. Simulating a layer with spatially variable tilt of cone symmetry axes, and accounting for fabric development, demonstrates that variations in the fabric cause localized flow variations that could create the initial perturbations.

Published in

Annals of Glaciology, **35**, in press, 2001.

Þröstur Þorsteinsson, Science Institute, University of Iceland, Hofsvallagotu 53, 107 Reykjavik, ICELAND.
Tel: 354-525-4817 | Fax: 354-552-1347 | E-mail: throstho@turdus.net | Web http://turdus.net