Dating and accumulation rate reconstruction along the Dome Fuji - Kohnen radio echo-sounding profile

Oleg Rybak (1), Philippe Huybrechts (1), Daniel Steinhage (1) and Frank Pattyn (2)

(1) Alfred-Wegener-Institut für Polar- und Meeresforschung, Postfach 120161, D-27515
Bremerhaven (orybak@, phuybrechts@, dsteinhage@awi-bremerhaven.de) / fax:
+49-471-4831-1149), (2) Departement Geografie, Vrije Universiteit Brussel, Pleinlaan 2,
B-1050 Brussel (fpattyn@vub.ac.be /fax: +32-2-6293378)

A radio echo-sounding profile of about 1200 km length was flown by the Alfred-Wegener Institute between the Kohnen and Dome Fuji deep drilling sites, providing a continuous record of internal ice layers which links both sites. Assuming these layers are isochronous surfaces, they provide an internal check on independently derived datings for both drilling sites. Here we use these internal layers to infer average accumulation rates. This is done both for the Holocene as for the last glacial period for the time intervals which separate the individual layers. Internal reflection horizons can be traced to about half the ice thickness and have a maximum age of ca. 70 ka BP. We use a high-resolution higher-order flow model of Dronning Maud Land nested into a 3D thermomechanical model of the Antarctic ice sheet to reconstruct the flow history over the last few glacial cycles. A Lagrangian back-tracing algorithm provides the times of deposition of the layers along the profile for a forward experiment with a prescribed accumulation history. We then apply an inverse method to find the accumulation history which best fits the observed layer architecture. The model predicts no basal melting at Kohnen station, but gives evidence of basal melting at the Dome Fuji drill site. We further investigate the strain history around Dome Fuji to estimate the effect of normal stresses on the derived age-depth profile.