ISMIP-HOM: Results of the Higher-Order Ice Sheet Model Intercomparison exercise

F. Pattyn (1), the ISMIP-HOM participants

(1) Laboratoire de Glaciologie, DSTE, Université Libre de Bruxelles, CP 160/03, Av. F.D. Roosevelt 50, 1050 Brussels, Belgium (email: fpattyn@ulb.ac.be)

The ISMIP-HOM intercomparison exercise, launched in 2006, aims at comparing so-called higher-order ice sheet models to analytical solutions and -if not existing- set out a benchmark for such models. Higher-order models are models that incorporate further mechanical effects, principally longitudinal stress gradients, or the full Stokes system. These stresses become increasingly important in transition zones between ice sheets and ice shelves (ice streams), but also at the ice divide and in areas of complex basal topography.

The proposed experiments are made accessible for a variety of model types, i.e. flow-line models, vertically integrated planform models, as well as full three-dimensional models. The experiments are valid for both finite difference (FD) and finite element (FE) models. Furthermore, the grid type (regular or not) is unimportant. All thermome-chanical effects are neglected and an isotherm ice mass is considered. Experiments include ideal geometry tests as well as a real case experiment on Haut Glacier d'Arolla. Most experiments are diagnostic, i.e. time evolution is not considered. This means that for a given geometry of the ice mass, a Glen-type flow law, and given appropriate boundary conditions, the stress and velocity field can be calculated. One experiment considers time-dependent response (the experiment is run until the free surface and velocity field reach a steady state) for a constant viscosity (linear flow law). For this experiment analytical solutions exists that are developed by Gudmundsson (2003).

The results and preliminary analysis of the intercomparison are presented here.