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LOCAL FLOW MODELLING OF ANISOTROPIC ICE

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An efficient and *easy-to-use* anisotropic viscous law depending on the fabric of the ice polycrystal has been implemented in the finite element (FE) code ELMER. Polycrystalline ice is assumed to behave as a linearly orthotropic material. Its fabric is described by using only two fabric parameters and the three Euler angles which define the position of the orthotropic frame with respect to the global frame used for computing the ice-sheet flow. The six viscosities of the anisotropic flow law are computed on a regular ordered grid of the two fabric parameters using a micro-macro model. The resulting Stokes-equation for an incompressible fluid including the anisotropic stress-strain relation as well as the convection dominated evolution equation for the fabric parameters are implemented in the FE package ELMER. We apply the residual free bubble stabilization method to the FE formulation of the Stokes problem. In the order to obtain the stress-tensor components, viscosities for any value of the two fabric parameters are interpolated from the previously obtained viscosity grid. The solution of the transport equation of the fabric parameters utilizes a stabilized FE method.
The mean assumptions of the law, *i.e.*, orthotropy and the form adopted for the orientation distribution function (fabric parameters), are discussed. Preliminary results of a local flow simulation are presented.