Challenges in modeling polythermal ice in large-scale ice sheet problems

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ABSTRACT

Accurate modeling of the dynamics of Greenland and Antarctica ice sheets is essential to provide estimates of sea level rise in next decades to centuries. In this talk we present an implicit, three-dimensional, finite element computational model for polythermal ice. The model is based on the enthalpy formulation proposed by Aschwanden et. al. [1], with the addition of the gravity-driven moisture drainage model proposed by Schoof and Hewitt [2]. The enthalpy model is implicitly coupled with an approximation of Stokes equations for ice flow model. We will focus on the numerical and computational challenges that this model poses, which originate from the nonlinearities associated with phase changes, the advection-dominated nature of the temperature equation and the coupling with the flow model. We will present results on simplified geometries as well as on large-scale ice sheet problems, and compare them with results present in the literature or obtained with other formulations.

REFERENCES

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