Summary MISMIP+ ElmerIce Grenoble for Full Stokes

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1 Summary

1-Model: Elmer/Ice [2] (mostly based on release 1ae908a)

2-Englacial stresses: Full Stokes, Glen's law, $n = 3$, $A = 2 \times 10^{-17} Pa^{-3} a^{-1}$.

3-Basal traction: Schoof law , $\beta^2 = 10^4 m^{-1/3} a^{1/3}$, $\alpha^2 = 0.5$.

4-Space discretization: Finite elements. 250m of prism-element-mesh horizontal resolution inside a domain containing the evolution of the grounding line. Element horizontal resolution increases with the distance to the grounding line domain. The finite element mesh considered has 7 layers of elements distributed between the upper and lower surfaces of the glacier. All these layers share the same footprint horizontal discretization. The vertical size of the prism elements increases from the bottom to the surface of the glacier at a rate of about 1.4 (the vertical size of an element is 1.4 times larger than the element just below).

5-Time stepping: constant time steps of 0.1 a.

6-Grounding line: Explicit computation of the contact problem, considering the local water pressure and the full stress tensor.
7-MISMIP3d name: MISMIP3d was run in Full-Stokes using Elmer/Ice and related experiments were named LFA. Convergence with lateral resolution was further studied in [1].

2 Mesh resolution

We present results for the resolution 250m. However Ice1r has been also ran for 500m of resolution at the grounding line. Results for 250m and 500m of resolution at the grounding line are very similar each other exhibiting a good model convergence at least from 500m of resolution for the Fulls Stokes model in Elmer/Ice. However we have chosen to send data produced with the best model resolution which have been used.

References

[1] O. Gagliardini, J. Brondex, F. Gillet-Chaulet, L. Tavard, V. Peyaud, and G. Durand. Impact of mesh resolution for mismip and mismip3d experiments using elmer/ice. *The Cryosphere*, 10(1):307–312, 2016.

[2] O. Gagliardini, T. Zwinger, F. Gillet-Chaulet, G. Durand, L. Favier, B. De Fleurian, R. Greve, M. Malinen, C. Martín, P. Råback, et al. Capabilities and performance of elmer/ice, a new-generation ice sheet model. *Geoscientific Model Development*, 6(4):1299–1318, 2013.