MISMIP+ Summary of ISSM_CB_500m_SSA_Coulomb_Sub2

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1 Model Description

1. Model name: Ice Sheet System Model (*Larour et al.*, 2012)
2. Stress balance approximation: SSA, Glen's law, n=3, $A = 2.0 \times 10^{-17}$ Pa^{-3} a^{-1}
3. Basal friction: Coulomb limit power law (*Tsai et al.*, 2015) with $\alpha^2 = 0.5$ and $\beta^2 = 1.0 \times 10^4$ Pa m$^{-1/3}$ a$^{1/3}$
4. Spatial discretisation: finite element with triangular mesh, uniform 500 m unstructured mesh
5. Time discretization: semi-implicit with $\Delta t = 0.25$ yr
6. Grounding line: position based on hydrostatic equilibrium, sub-element parameterization of grounding line position (SEP2 in *Seroussi et al.* (2014))
7. MISMIP3d: HSE improved with sub-element grounding line parameterization

2 Convergence study

Convergence is tested with models of varying resolution, starting from a 4 km uniform unstructured mesh to a 500 m unstructured mesh. The grounding line position at the start and end of experiment Ice1r is plotted in Figure 1 (top panel). The beginning and ending position of the grounding line is progressively closer together as the mesh is refined. The ice volume above flotation (VAF) is shown in the bottom panel of Figure 1 for experiments Ice1r and Ice1ra for the same mesh sizes. The decrease of VAF for Ice1r and recovery for Ice1ra are progressively closer together as the mesh is refined.

References

Larour, E., H. Seroussi, M. Morlighem, and E. Rignot (2012), Continental scale, high order, high spatial resolution, ice sheet modeling using the Ice Sheet System Model (ISSM), *J. Geophys. Res.*, *117*(F01022), 1–20, doi:10.1029/2011JF002140.

Seroussi, H., M. Morlighem, E. Larour, E. Rignot, and A. Khazendar (2014), Hydrostatic grounding line parameterization in ice sheet models, *The Cryosphere*, *8*(6), 2075–2087, doi:10.5194/tc-8-2075-2014.

Tsai, V. C., A. L. Stewart, and A. F. Thompson (2015), Marine ice-sheet profiles and stability under Coulomb basal conditions, *Journal of Glaciology*, *61*(226), 205–215, doi:10.3189/2015JoG14J221.

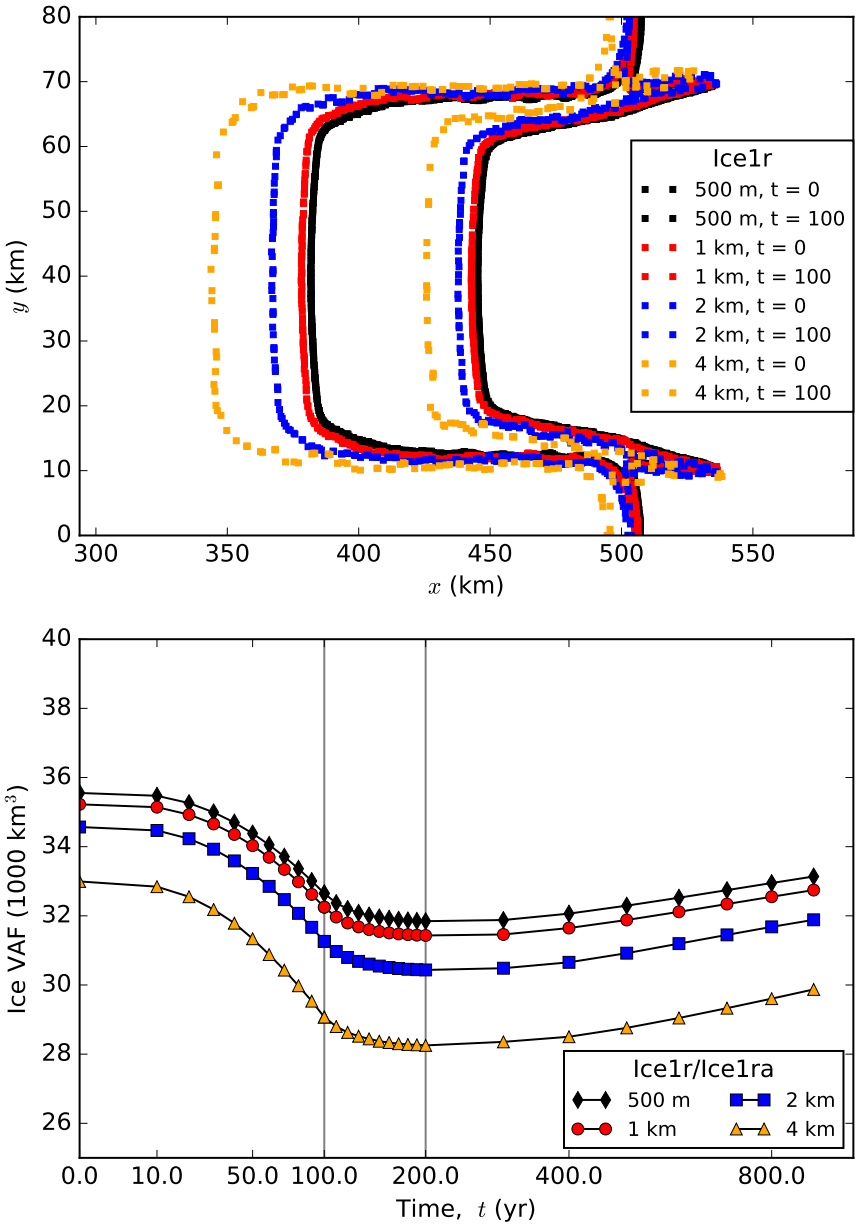

Figure 1: Results of mesh convergence study for experiments ISSM_CB_500m_SSA_Coulomb_Sub2.