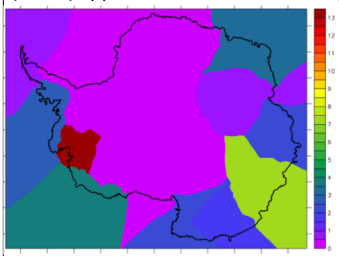
Model resolution sometimes matters.

Figure 1. Basal melt rate (m/yr) anomaly (abmb) applied to Antarctica for 200 yr.



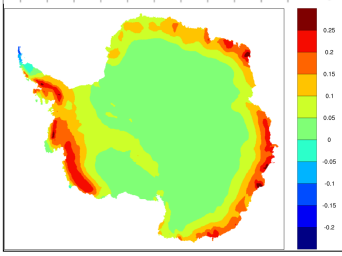
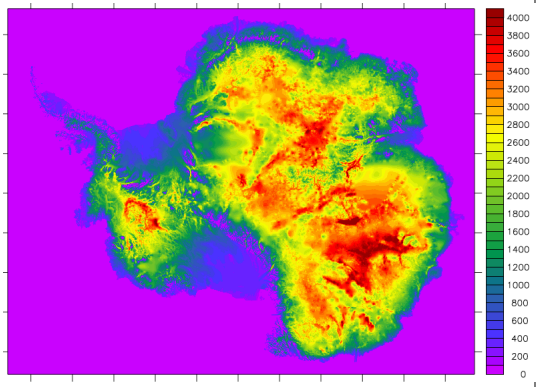


Figure 2. Surface mass balance (m/yr) anomaly (asmb) applied to Antarctica for 200 yr.

Figure 3. Antarctic ice thickness (m) (courtesy Mathieu Morlighem).



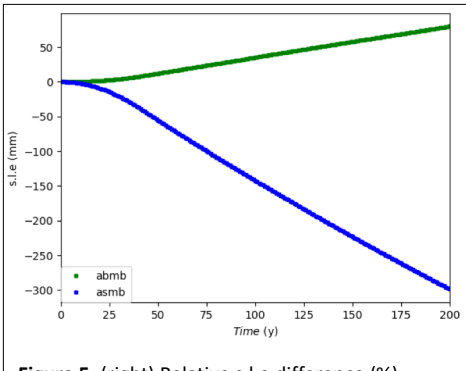


Figure 4. (left) Sea level equivalent (s.l.e) contribution (mm) when perturbing the Antarctic ice sheet with *asmb* (blue) and *abmb* (green) using the Community Ice Sheet Model (CISM) with an horizontal grid resolution of 4 km. Experiment *asmb* shows an s.l.e decrease of about 300 mm at the end of 200 yr experiment. In contrast experiment *abmb* shows an s.l.e increase of about 100 mm/yr s.l.e at the end of 200 yr which is within the error bounds of past estimations (Rignot et al. 2011).

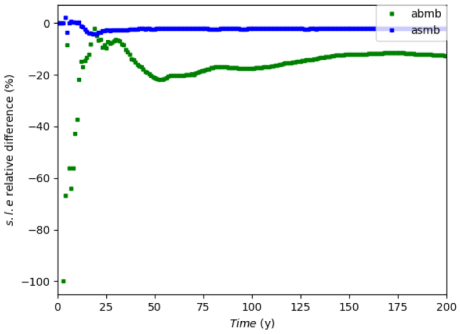


Figure 5. (right) Relative s.l.e difference (%) results between experiment runs *asmb* (blue) and *abmb (green) at* 8 and 4 km resolution. The results show a limited impact of the model resolution with *asmb perturbation*. In contrast *abmb* perturbation which involves marine base processes sees a strong resolution dependence. Higher model resolution favors more retreat with a varying difference in s.l.e of 15-25% meaning a run with coarser resolution would underestimate sea level contribution.

You performed projections for Antarctic sea level rise contribution at a resolution of 8 km or coarser? It's a good start!

Model simulations suggest that projections due to surface mass balance changes vary little with model resolution; errors will most likely be due to model physics and approximations.

However increased resolution is required when simulating marine based processes for reasons linked to ice-ocean coupling and beyond.

Let's talk about all of this.

Gunter R. Leguy
Project Scientist, National Center for Atmospheric Research (NCAR)

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