Summary of IceOcean1–2_COM_POPSICLES_SSA Results

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1 Ice-Sheet Component Details

- Ice-sheet component and version: BISICLES (**?**) svn revision r3048

- Englacial stresses: SSA, Glen's law, $n = 3$, $A = 2.0 \times 10^{-17} \mathrm{Pa}^{-3} \, \mathrm{a}^{-1}$.

- Basal traction: Power law (**?**) $|\tau_b| = \beta^2 |u_b|^{1/3}$, $\beta^2 = 10^4 \, \mathrm{Pa} \, \mathrm{m}^{-1/3} \, \mathrm{a}^{1/3}$.

- Space discretization: Finite volume, adaptive non-uniform grid, block structured AMR, square cells with $0.5 < \Delta x < 4.0 \, \mathrm{km}$

- Time stepping: Piecewise Parabolic Method (**?**), explicit, $\Delta t < \Delta x / (4|u|)$

- Grounding line: One-sided differences of surface elevation.

- MISMIP3d name: DMA6 (different mesh resolution)

2 Ocean Component Details

- Ocean component and version: Parallel Ocean Program v. 2x (POP2x)

- Repository: not publicly available.

- Vertical coordinate: z level with partial top and bottom cells.

- Horizontal mixing: harmonic (del2) along geopotentials.

- Vertical mixing: del2 with COM constant viscosity and diffusivity.

- Advection schemes: momentum: centered, tracers: flux limited Lax-Wendroff.

- Equation of state: linear with ISOMIP+ coefficients.

- Convection parameterization: enhanced vertical mixing (ISOMIP+ values of ν_{unstab} and κ_{unstab})

- Melt parameterization: T_w and S_w are computed by averaging T and S with $20 \, \mathrm{m}$ of the ice draft. u_w is averaged over 4 "horizontal" neighbors (at the ice–ocean interface) from the velocity to the tracer grid but is not averaged vertically.

- Modifications to Topography: Interpolated from 1-km BISICLES grid to 2-km POP2x grid with conservative interpolation scheme, smoothed with a Gaussian filter with half-width of $2\,\text{km}$. A minimum thickness of 2 grid cells ($40\,\text{m}$) was maintained by deepening bathymetry near the grounding line. Partial top cells thinner than $5\,\text{m}$ are either thickened or removed. Ice draft and bathymetry are automatically adjusted to ensure required connectivity between neighboring cells (e.g.removing or horizontally expanding cells with no horizontal neighbors).

- Maintaining sea level: Using virtual salt fluxes, so sea-level change is negligible.

- Moving boundaries: Monthly coupling interval: At coupling intervals, T and S were progressively extrapolated first horizontally, then vertically into new ocean cells. Barotropic transport was maintained by re- distributing barotropic velocity across the expandedor contracted water column. Velocities are initially zero in new ocean columns. T, S and v are simply zeroed in cells removed from the ocean.

- Deviations from COM: none.

- Parameter values:

Γ_T	0.1146
Γ_S	3.27429×10^{-3}
$C_{D,\text{top}}$	2.5×10^{-3}

3 Coupled Model Details

- Model and version: POPSICLES v. 0.6

- Coupling scheme: Offline coupling through python scripts and modifying restart files. Each coupling interval, new POP2x topography is computed based on BISICLES snapshots. Melt rates from POP2x are conservatively interpolated to the BISICLES grid. Any melting that is found below grounded ice is redistributed to the closest floating cells.

- Parameter values: coupling interval   1 month