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Preliminary ice shelf-ocean simulation results from idealized standalone-ocean and coupled model intercomparison projects (MIPs)

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The second Ice Shelf-Ocean MIP (ISOMIP+) and the first Marine Ice Sheet-Ocean MIP (MISOMIP1) prescribe a set of idealized experiments for ocean models with ice-shelf cavities and coupled ice sheet-ocean models, respectively. ISOMIP+ and MISOMIP1 were designed together with the third Marine Ice Sheet MIP (MISMIP+) with three main goals, namely that the MIPs should provide:

1. a controlled forum for researchers to compare their model results with those from other models during model development.
2. a path for testing components in the process of developing coupled ice sheet-ocean models.
3. a basic setup from which a large variety of parameter and process studies can usefully be performed.

The experimental design for the three MIPs is currently under review in Geoscientific Model Development (Asay-Davis et al. 2015, doi:10.5194/gmdd-8-9859-2015).

We present preliminary results from ISOMIP+ and MISOMIP1 experiments using several ocean-only and coupled ice sheet-ocean models. Among ocean models, we show that differences in model behavior are significant enough that similar results can only be achieved by tuning model parameters (e.g. boundary-layer transfer coefficients, drag coefficients, vertical mixing parameterizations) for each models. This tuning is constrained by a desired mean melt rate in quasi-steady state under specified forcing conditions, akin to how models would be tuned based on observations for non-idealized simulations.

We also present a number of parameter studies based the MIP experiments. Again, using several models, we show that melt rates respond sub-linearly to both changes in the square root of the drag coefficient and the heat-transfer coefficient, and that melting is relatively insensitive to horizontal-mixing coefficients (perhaps because the resolution is sufficient to permit eddies) but more sensitive to vertical-mixing coefficients. We show that the choice of the equation of state (linear or nonlinear) does not have a significant impact as long *as the linearization is made around a representative value of temperature and salinity*.