Geoscientific
Model Development
Discussions

Interactive comment on "Experimental design for three interrelated Marine Ice-Sheet and Ocean Model Intercomparison Projects" *by* X. S. Asay-Davis et al.

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I think this intercomparison is a great idea and i applaud the authors' efforts. I agree with the philosophy of the experiments and think it is the right way forward. I have no high-level objections with any part.

I would only like to make a few comments about Section 3, the ocean experiments.

Section 3.1.1: If an ocean model is using a lat-long grid (rectangular in the lat-lon space), it might be tricky to conform to the cartesian dimensions you state.

Section 3.1.2: I think some mention could be given to what is "allowed" for any model

which attempts synchronous coupling, i.e. evolution of ice thickness at the ocean time step). An instantanreous removal of 100 m of ice over a grid cell may wreak havoc in the ocean. MITgcm, for instance, will need to interpolate in time from an ice-covered to ice-free state. I don't know if GFDL is participating but from offline conversation with Alon Stern it sounds as if their ocean model needs to do something similar to move around large icebergs.

Also, MITgcm (without a rigid lid) and possibly other models specify surface pressure to control the elevation of the ice-ocean interface – would these models be allowed to specify ice mass per unit area instead (with a standard ice density)?

Section 3.1.4: any mechanical bdry conditions on ice shelf front or other vertical parts of the ice shelf?

Section 3.1.5: i think "digging" needs some explanation

Eq (3.1) – i really like this idea

Section 3.1.8: i found the boundary layer a bit confusing, and there are quite a lot of cans of worms hidden here. for one thing, you refer to a boundary layer, which at first i thought meant the viscous sublayer, but later on i thought meant the layer over which the eddy size scales with distance from the wall (i don't know what this is called, but p9885 line 11) but later surmised you were referring to the mixed layer (eg p9885 l19), which is a bit larger and involves buoyancy and rotational effects.

In this section there is mention of interpolating values (u,v,T,S) to 20m away from the interface. Should doing this not follow some prespecified theoretical boundary layer profile, as opposed to linear interpolation? My understanding is that this would be logarithmic in velocity, at least close to the wall (< 2m?); but I am not familiar enough with the theory to know what the "outer" parts of the profile are meant to be, nor do I know much about the theoretical T/S profiles.

Furthermore i am of the opinion that for a synchronous approach with a dynamic

grounding line (which ocean.3 and ocean.4 essentially are, from the view of the ocean) there should not be such a large minimum depth as 20m – but for column thicknesses below this range i would not imagie there are significant melt rates. How about rather than a minimum depth, it can be agreed that melting is shut off when column thickness is below this value?

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