Geosci. Model Dev. Discuss., 3, C471–C473, 2010
www.geosci-model-dev-discuss.net/3/C471/2010/
© Author(s) 2010. This work is distributed under
the Creative Commons Attribute 3.0 License.

**Geoscientific
Model Development
Discussions**

Interactive comment on "Physically-based data assimilation" *by* G. Levy et al.

G. Levy et al.

gad@nwra.com

Received and published: 21 October 2010

Main comments: Regarding a point raised by another reviewer: I think the discussion of the sea ice model in this paper is appropriate, and required.

R.: In our response to referee #1, we deferred decision on how much of model description to leave in the paper to topical editor, and will leave the description as it currently appears in the revised version.

The clarity of the assimilation discussion could be improved by the addition of a figure. A figure showing the RGPS analysis, the model's pre-assimilation state, and the model's post-assimilation state would be helpful.

R.: The inset in Figure 2 shows the model's post assimilation state. This state matches the RGPS analysis since that is how it is created. The model's pre-assimilation state is

uniform, with zero opening displacement. Figure 3 shows how these states evolve.

In similar vein, an illustration of an unrealizable model state that another assimilation method would lead to would be helpful.

R.: Finding an actual unrealizable model state in observations is extremely difficult. A conceptual illustration (cartoon) of trajectories of realizable model states (from initializations at time, i) and unrealizable observed states (represented as x at assimilation time, a) as we attach below, could be added. Explaining such a cartoon may require additional discussion that might detract rather than add clarity, however.(?) R.: Minor writing points will all be fixed in the revised version

Why was the model initialized to 3m? That seems thick for a 2004 simulation, when 2 meters seems like a better round number. I'm concerned that this thickness might have driven some of the results – overly thick ice necessitating more cracking?

R.: The 3m thickness is the average thickness of the intact ice, and does not include averaging in areas of open water. This may be a little high, but it does not drive the results. The main point is still illustrated – the one step assimilation positively impacts model skill.

The extraordinary number of digits precision for the decohesive parameter deserves mention. Is the model/assmilation exceedingly sensitive to this number?

As explained in the text following equation (A2), the value of kappa comes from solving the equation (tau_sf/tau_sm)ˆ2 + eˆ(-kappa)-1=0. So kappa=-ln(1-(tau_sf/tau_sm)ˆ2). It is not necessary to report so many digits, but we use this formula for kappa in the simulations.

Note 1: The value of tau_sm in Table 1 should have been 60.0 not 4.0.

Interactive comment on Geosci. Model Dev. Discuss., 3, 517, 2010.

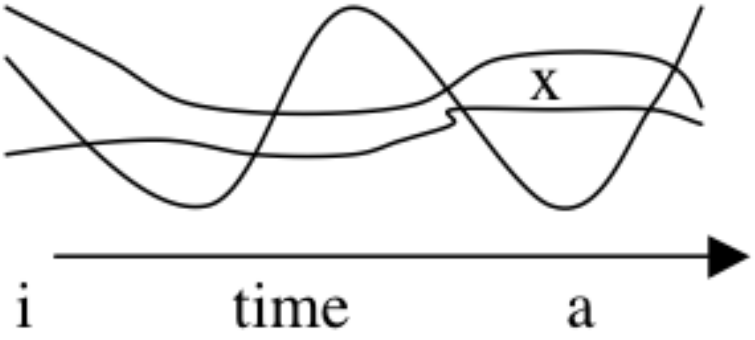

Fig. 1.