

## ***Interactive comment on “On the influence of model physics on simulations of Arctic and Antarctic sea ice” by F. Massonnet et al.***

### **Anonymous Referee #2**

Received and published: 8 July 2011

Review of “On the influence of model physics on simulations of Arctic and Antarctic sea ice” by Massonnet et al. for The Cryosphere.

Pls keep my review anonymous.

#### General comments

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This manuscript is concerned about investigating the physical parameterisation between two sea-ice codes, that have been run as coupled ocean-ice models forced with daily NCEP/NCAR-2 Tair and winds, and monthly climatological data (from various sources) for rel hum, clouds, precipitation and freshwater input. The ocean model, OPA V9, remained unchanged in this comparison, and a global tripolar grid, ORCA1,

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was employed. The two sea-ice models differ in a number of aspects, with LIM3 being an advanced version of LIM2. Differences include a much improved thermodynamic treatment of sea ice and snow, explicit salinity prognostics and a an explicit ice thickness distribution in LIM3, as well as a switch from a VP (LIM2) rheology to EVP in LIM3. Different vector grids are also employed between LIM2 and LIM3.

After introducing the various models and their componenets, the authors proceed to define numerous metrics (separately derived for the Northern and Southern hemispheres) to evaluate the model performances. The authors find that improved parameterisations employed in LIM3 lead to better simulation results especially with regard to the ice-thickness distribution, while LIM2 outperforms LIM3 in simulating ice motion.

#### Specific comments

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\* I would like to see a bit more information on the model setup. For example, what is the frequency at which parameters are exchanged between the sub-model.

\* The authors need to include a justification as to why it is sufficient for them use hourly atmospheric forcing and even some monthly climatologies. Daily forcing is expected to considerably affect the modelled quantities.

\* The authors need to explain why the model comparisons are carried out from 1981 onwards but why the runs start in 1948. Surely the model realizations do not require a 30years + spinup.

\* More emphasis should be given to the albedo effects.

\* Need to give a justification why Rampals et al.'s (2009) spatio-temporal averaging scales are considered valid in the Antarctic sea-ice zone.

\* It would have been useful to see the metrics for a single grid cell or small region (each in the Arctic or Antarctic) in addition to the hemispheric metric. Are these available to

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inclusion?

\* Any comments on model performances in the marginal seas (Baltic, Okhotsk etc.)??

\* Fig. 4: Use SI units (not cm/s).

\* Fig. 6: What is the physical motivation for the outline of the area assessed?

\* Fig. 7: Caption reads "(LIM3, purple)" but in the figure that appears green.

\* Figures: They are generally too small. Pls make use of the white space on the paper.

\* Figures: Fig. 2 and those displaying geographical distributions are just too small to allow the reader to check on necessary details. This is especially true for Fig 4. The vector fields are just too sparse to derive any conclusion of the model data.... plotting 1 out of 49 vectors is not sufficient here.

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Interactive comment on The Cryosphere Discuss., 5, 1167, 2011.