Ocean Sci. Discuss., 4, S148–S153, 2007
www.ocean-sci-discuss.net/4/S148/2007/

Ocean Science Discussions

Interactive comment on "On the assimilation of ice velocity and concentration data into large-scale sea ice models" *by* V. Dulière and T. Fichefet

V. Dulière and T. Fichefet

Received and published: 4 May 2007

egu times graphicx

V. Dulière and T. Fichefet V. Dulière (duliere@astr.ucl.ac.be)

Université Catholique de Louvain, Institut d'Astronomie et de Géophysique Georges Lemaître, Louvain-la-Neuve, Belgium Ocean Science

Dulière V. Dulière
Institut d'Astronomie et de Géophysique Georges Lemaître
Louvain-la-Neuve
Belgium

12345

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

EGU

Dear Walt,

Thank you very much for your very constructive review of our manuscript. Here is a detailed answer.

Specifics Comments

1. about the thickness discussion in the introduction :

You are right. This was changed (p267, line 22) :

Recently, a detailed analysis of submarine and modeled ice thicknesses Holloway2002 has demonstrated that ice motion and high interannual variability make inference of trends from sonar transect data ambiguous, suggesting that the available sonar data are insufficient to resolve the variability of the Arctic ice thickness. Later, the thinning of the Arctic ice cover has been reconfirmed. Comparing 8 cruises spanning the years 19871997 in the Arctic Ocean, Rothrock2003 found a decrease in draft data of about 1 m over the 11-year span. Several other studies point towards a thinning of the Arctic ice cover (i.e. Yu et al. (2004), Perovich et al. (2003), Rigor and Wallace (2004), Fowler et al. (2004), Comiso (2002).

2. Why was 1992-1993 forcing used to replace the 1995-1996 fro the assimilation experiment?

This was added to the second paragraph in the Section "experimental design" (p274, line 1) :

The chosen perturbations are fairly strong. However, we also forced the model with weighted mixes of forcing from 2 different years. We ran several tests combining different years (not only 1992-1993 and 1995-1996). We also tested several weights. Nevertheless, all experiments pointed towards the same conclusions. In this paper, we focused on the 1995-1996 period because it gives a good summary of all the experi-

OSD
4, S148–S153, 2007

ments we have run.

Actually, we first wanted to add some white noise to the forcing but the noise needed to be coherent (at least for the wind forcing) to avoid model instabilities. For simplicity, we decided to run the experiments described above.

3. Is there any reason why only one "observation" is used for each grid? (perhaps just simplicity? or perhaps it makes it easier to assess the assimilation?

Indeed, the 2 suggested reasons have led us to assimilate data in a way that only one observation is used for each grid cell. The purpose of this study is really to get a first draft of how the model reacts to data assimilation scheme. Morover, the "observations" that are assimilated in this study are error-free and available at each grid cell for each model time step. Therefore we assumed that the improvement brought by data assimilation of several "observations" at each single grid point would be minor. However, in specific cases where model estimates sea ice and "observations" do not, observations at about 100km grid spacing are assimilated at the model grid point with an inverse-distance weighting function.

4. It should be noted that the passive microwave observations also have biases in concentration, particularly during summer where surface melt is seen by the algorithms as reduced concentration

Thank you for the precision. This was added (p 276, line 12):

However, it is worth noting that passive microwave observations underestimate the ice concentration, particularly during summer where surface melt is seen by the algorithms as reduced concentration (Steffen and Schweiger, 1991).

5. The authors may wish to look at the just-published paper that discusses similar issues: Dai et al. (2006)

OSD
4, S148–S153, 2007

Thank you very much for the information! We updated our introduction with (p 269, line 23):

Very recently, Dai et al. (2006) showed that efforts to adjust a sea ice model by altering the frictional loss parameter have limited effects in the cases where observed ice motions are assimilated because the assimilation essentially bypasses the model dynamics.

Figure comments

Fig2: the dashed line is very thin. Suggest making this thicker

done

Fig3a: It would be nice if the grid marks from where there isn't ice could be removed

done

Fig4: Just for clarity, suggest that the caption explains that the pole hole in the observations is due to lack of satellite coverage

done

Technical corrections

1. P 268, l 29: "does not allow to correct" -rephrase

Rephrased to "does not correct"

2. p 270 l 17 : "abovementioned" to "The studies mentioned above"

done

3. p 271 l 3: "Sect. 3" suggest spelling out "Section"

OSD

4, S148–S153, 2007

"Sect." is written according to the journal style.

4. p272 l 16: "Un upstream" to "An upstream"

done

5. p 273 l 6: "Ice is not allowed is grid" to "Ice is not allowed in grid"

done

6. p 275 l 19-20: "runoff and motionless" to "runoff and a motionless"

done

7. p275 l 26: "flagrant" suggest another word, E.g., "substantial", "significant"

done

8. p 276 l 1: "too thin an" to "too thin of an"

done

9. p 279 l 21: "supposed", I believe the authors mean "assumed"

Yes, thank you for remarking it.

10. p 279 l 28: "deteriorates a bit the ice thickness" -awkward, rephrase

Replaced with "slightly deteriorates the ice thickness"

11. p 208 l 13: "To be total", assume authors mean "To be complete"

Yes, changed

12. p 281 l 3: "When time times goes by" extra word

corrected

13. p 284 l 8: "pretty good analysis" -colloquial and unspecific, suggest rewording

OSD

4, S148–S153, 2007

Changed to "detailed analysis"

We hope to have answered your comments in a satisfying way. Do not hesitate to contact us if you have any question.

Best Regards,

Valérie Dulière and Thierry Fichefet.

OSD

4, S148–S153, 2007