Atmos. Chem. Phys. Discuss., 10, C12519–C12521, 2011
www.atmos-chem-phys-discuss.net/10/C12519/2011/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "The effect of sea ice loss on sea salt aerosol concentrations and the radiative balance in the Arctic" *by* H. Struthers et al.

Anonymous Referee #2

Received and published: 18 January 2011

General comments:

This study uses the CAM-Oslo model to relate the reduction in Arctic sea ice to increases in sea salt aerosol emissions and calculate the resulting change in direct and indirect radiative forcing. This process is proposed as a strong climate feedback mechanism in the Arctic region which could act to reduce the positive albedo change feedback already recognised in global models. The increase in aerosol optical depth due to this feedback was quantified by running climate simulations using both 2000 and 2100 SST and sea ice fraction climatologies allowing the authors to separate the effects of the proposed climate feedback from other processes.

The paper is written and structured well, with a methodology that allows the authors to accurately decouple the effect of sea salt emission changes from other climate processes. Due to both the offline calculation of the aerosol radiative effects, which prevent changing aerosol concentrations from feeding back into the climate model, and the decision to fix all other emissions to a year 2000 average, the paper is unable to predict the significance of this feedback relative to the general effects of climate change. However it does introduce a new and interesting avenue of research in polar atmospheric science and I recommend publication after consideration of the points outlined below.

Specific comments:

1.Section 2-The authors when describing the CAM-Oslo Model briefly discuss the comprehensive evaluation of the model through the Aerocom initiative but give no specific examples. It would be useful to provide a more detailed description of the models performance in the polar regions particularly.

2.Section 4-The labelling and description of the simulations is confusing and requires some clarification. It would help if the meteorology fields of each run were explicitly declared at this point. Reading further into the paper its stated that the P1-ICE and P2-ICE-SALT simulations use identical met fields while CTRL does not despite being described as identical to P1 in this section. It would be clearer if all differences between the runs was discussed in more detail here rather then throughout the results sections.

3.In section 5.1 its stated that the meteorological fields in P1-ICE and P2-ICE-SALT are identical to each other but not to the control run, is this the reason for the consistent increase in sea salt number flux seen in figure 7(a,c,e) between the control and P1-ICE? If this is the case can the authors justify there statement in section 5.2.1 that the difference in aerosol direct forcing between P1-ICE and CTRL is entirely attributable to change in surface albedo. Although it is stated that the the sea-salt emissions in both runs are essentially the same it would be good to see the results from a control run with 'nudged' meteorological fields to confirm this conclusion. It would also be interesting

to separate the change in sea spray resulting from larger open ocean area from the change caused by differing wind speeds.

Technical comments: 4.section 5 Line 19- sentence begins The 21:00 SST believe this should be 2100?

5.Simulation names are not used consistently throughout paper with P1-ICE described as P1 etc

---

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 28859, 2010.