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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Central Arctic atmospheric summer conditions during the Arctic Summer Cloud Ocean Study (ASCOS): contrasting to previous expeditions" *by* M. Tjernström et al.

Anonymous Referee #2

Received and published: 29 March 2012

Recommendation: Minor revision

The manuscript will make an important contribution to the ASCOS Special Issue. Evaluation of the ASCOS observations with respect to synoptic-scale meteorology and inter-annual differences will put the whole data set in a broader context. Reading this manuscript will be very important for all those involved with more focused studied based on ASCOS data. In general, the manuscript is well written and progresses logically. The figures are of a high quality with an intelligent design to present a lot of information in a single plot. It could, however, be improved in some respects, which I explain below.

Major comments:

1. It is important to evaluate the synoptic-scale conditions during ASCOS. I particularly liked the summary presented on page 24. What I am missing is a brief summary on how the synoptic-scale conditions differed between ASCOS, AOE-2001, AOE-96, and SHEBA.

2. The manuscript includes a plenty of statistical material comparing the four expeditions. The presentation of so much statistics would be better justified, if sufficient attention is paid also on the physical interpretation of the differences. This can probably be partly achieved by the summary I suggest in item 1 above, but also other aspects contributing to the differences should be considered. I recommend to somewhat shorten the text (Sections 4 and 5) that more or less directly explains what is seen in the figures, and adding more physical interpretation.

3. The comparison of ASCOS results against AOE-2001, AOE-96, and SHEBA is good. The comparisons are extensive and detailed; there is no reason to add much in the same level of detail. However, there have been many more meteorological field expeditions in the Arctic Ocean in summer, which are not mentioned in the manuscript, although they have included analogous, although less extensive, mutual comparisons. For example, our knowledge on climatology of temperature inversions over the Arctic Ocean has so far relied much on the studies by Serreze et al. (1992) and Kahl et al. (1996), based on Russian drifting station data. The ASCOS results should be evaluated also with respect to these classical studies. In addition, Lüpkes et al. (2010, GRL) compared meteorological observations from three RV Polarstern cruises in the Arctic Ocean in August 1996, 2001, and 2007; two of the summers were same as in the Oden cruises. Vihma et al. (2008, GRL) compared the meteorological observations made at Tara in summer 2007 against the SHEBA and Russian drifting station data. The main outcome of these and other previous studies should be summarized, either in the Summary and Conclusions section or in a separate section before it.

4. Comparisons between the results of the Oden expeditions and SHEBA suffer from the fact that SHEBA was drifting at lower latitudes. Therefore some conclusions remain somewhat open. This is the case especially for solar radiation. Adding a comparison of the atmospheric transmissivity for solar radiation would therefore be useful.

5. Cloud-top radiative cooling is mentioned several times in the manuscript. As it is not any new finding, some comparisons against previous studies in the Arctic should be presented.

Minor comments:

P8, line 2: data are

P8, line10: drop comma from the end of line

P15, line 21: heights, strengths and occurrences of low-level jets may have ...

P15, line 27: Add period after "between"

P19: the title of Section 5 is misleading: nothing is written about ice drift, i.e. kinematics and dynamics of sea ice motion.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 4101, 2012.