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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The thermodynamic state of the Arctic atmosphere observed by AIRS: comparisons during the record minimum sea-ice extents of 2007 and 2012" *by* A. Devasthale et al.

Anonymous Referee #1

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In this contribution, the authors present satellite data on the evolution of the Arctic atmosphere in the run-up to the 2007 and the 2012 sea-ice minimum. They aim at inferring, from this data, the underlying causes of the 2012 sea-ice minimum.

Given the large variety of data that the authors have available from AIRS, this could have been a truly interesting study. However, the current analysis is in my opinion too superficial to warrant publication. This work might eventually become publishable, but then really should be improved from an almost purely descriptive presentation of satellite data to a more quantitative analysis which would then allow for "improving our understanding of the Arctic atmosphere" (p.178, l.4).

For example, at least some of the following questions should be addressed in more detail:

- How significant are any of the anomaly patterns you show?

- How are they (quantitatively) correlated with sea-ice concentration?

- How did (regionally) conditions look like in years without an extreme minimum?

- How large are the uncertainties in the observational data sets?

- How are the atmospheric anomalies related to large-scale circulation patterns?

Answering these kind of questions (or at least trying to answer them) would then indeed allow for new insight. In addition, vague statements such as "all these factors may have lead already thin and declining sea-ice cover to pass below the previous sea-ice extent minimum of 2007" or the main paragraph of the conclusions on p. 184/185 could then be strengthened. Note, obviously, that many of the questions above would warrant a publication on their own. Nevertheless, at least some attempt at answering some of them should be visible even in an overview publication such as this one.

Some other, more specific items that should be addressed:

p.179, l.7: large inter-model differences are not necessarily a sign of limited understanding. There is internal variability.

p.180, l.9: Why is it likely that this is controlled by dynamics?

p.180, l.16: Why can "commonalities" be used to improve prediction skills?

section 2: There should be much more discussion on data uncertainty.

p.181, l.18ff: Why should large geopotential heights necessarily result in a warmer atmospheric column?

l.182, l.27ff: There's a lot of previous work on sea-ice export versus circulation regimes, some of which should be cited here (e.g., Ogi & Wallace, GRL, 2012).

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 177, 2013.