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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The Arctic summer atmosphere: an evaluation of reanalyses using ASCOS data" *by* C. Wesslén et al.

Anonymous Referee #2

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This is overall a good paper on a relevant topic: there remain many challenges with understanding Arctic climate from both a modeling and observation standpoint, and this paper adds a new reanalyses dataset towards understanding the Arctic.

I suggest publishing after implementing several minor suggestions:

Abstract: The first two paragraphs can be condensed into a single paragraph, and I would like to see the third paragraph expanded to provide more details on the assessment of the new dataset. Also, it seems like it should be stated in the abstract that more improvements need to be made before ASR-Polar WRF can be recommended instead of ERA-interim.

And some line-by-line comments:

p16496 line 2: "...any region on earth.." define "region".

p16497 line 12: Suggest you cite more recent papers too; e.g. (Holland and Bitz, 2003; Karlsson and Svennson, 2013; Liu et al., 2013).

p16497 line 18: "..at least partly responsible." This seems a bit too strong, as models are supposed to be physically based. I would suggest you phrase as lack of observations inhibits a more thorough evaluation and improvement of model parameterizations.

p16498 line 29: "..most of the data were not assimilated". Which data was?

p16499 section 2.1: are there citations for reanalysis?

p16508 lines 22 and 24: what are the "systematic" errors you refer to? Would they bias the results in one direction or another?

p16511 line 20: there are numerous other refs that suggest the cloud microphysics scheme you use converts liquid to ice too quickly; e.g. Liu et al. 2011.

p16511 line 22 define "noisy".

p16515 line 10: are you sure these fluctuations in ASR2 indicate cloudy and clear? It is possible that the model predicts clouds but they are thin ice clouds and don't perturb longwave. e.g. Cesana et al. 2012

p16515 line 20, it may be useful to say that it is well known that the cloud microphysics scheme produces too little liquid (Liu et al. 2011, Prenni et al 2007, Cesana et al 2012).

p16522 line 8: Sub-grid scale processes are at least loosely related to spatial resolution; you might want to re-phrase this sentence.

References: Cesana, G., J. E. Kay, H. Chepfer, J. M. English, and G. de Boer, 2012: Ubiquitous low-level liquid-containing Arctic clouds: New observations and climate model constraints from CALIPSO-GOCCP. Geophys. Res. Lett., 39, L20804, doi:10.1029/2012GL053385.

Karlsson, J., and G. Svensson, 2013: Consequences of poor representation of Arctic sea-ice albedo and cloud-radiation interactions in the CMIP5 model ensemble, Geophys. Res. Lett., 40, 4374–4379, doi:10.1002/grl.50768.

Liu, X., and Coauthors, 2011: Testing cloud microphysics parameterizations in NCAR CAM5 with ISDAC and M-PACE observations. J. Geophys. Res., 116, D00T11, doi:10.1029/2011JD015889.

Liu, J., M. Song, R. M. Horton, and Y. Hu, 2013: Reducing spread in climate model projections of a September ice-free Arctic. Proc. Natl. Acad. Sci. USA, 110, 12 571–12 576, doi: 10.1073/pnas.1219716110.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 16495, 2013.