

Interactive comment on “Comparison of ERA5 and ERA-Interim near surface air temperature and precipitation over Arctic sea ice: Effects on sea ice thermodynamics and evolution” by Caixin Wang et al.

Anonymous Referee #1

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This paper described a comparison of two reanalyses ERA-Interim and the newly released ERA5, which is supposed to replace ERA-Interim. Two meter temperatures and precipitation (both total and snowfall) were compared with multiple IMB and snow buoys between 2010-2015 in the Arctic Ocean. Both reanalyses produced too warm air temperatures when conditions were below -25C compared to the buoys. Although the accuracy of precipitation, especially snowfall is difficult to assess in the Arctic due to the lack of in situ data available, a method of snow water equivalent was used to compare the buoy SWE with those from reanalyses. In some cases the reanalyses

C1

produced too much SWE and some cases produced too little. ERA5 appeared to produce less precipitation compared to ERA-interim overall. A freezing degree day, and a simple 1-d thermodynamic model were also used to assess how the errors in the air temperatures and snowfall would affect sea ice growth in models because models are forced with reanalysis data. Precipitation was found to matter more in the sea ice pack growth compared to the 2-m air temperatures.

This paper was well written, and provided a good background. The results are also of importance because ERA5 is a new reanalysis and snow on sea ice in the Arctic is such an uncertainty. I did not see any major issues with this paper, just a few minor comments below.

In the abstract, I would not say that ERA-I is drier than ‘most’ reanalyses, I will say ERA-I is drier than ‘some’ reanalyses - see Boisvert et al., 2018 Journal of Climate

Figure 3 caption. Do you mean panel (D), not (K)? Because there is no panel K in the figure.

It would be great to see a little more conversation dealing with the differences in Temp and Precipitation compared to the buoys and to themselves. It seemed like some regions where the buoys were/times of the year produce larger differences between the buoys and the reanalyses. For example, there appeared to be larger differences between reanalyses and the buoys in the Beaufort sea areas.

Figures 2 and 3. It would be beneficial to also have the differences between ERA5 and ERA-I and the buoy temperatures perhaps in a different figure? Because it is a little hard to see how well the reanalyses compare with the buoys the way it is now. Or perhaps provide a table with the differences and biases for each buoy.

Page 4, line 16: Might be best to say where these 2 buoys are located in the text. 2013 E and 2012 J? Perhaps the reanalyses are better at producing accurate temperatures in certain regions of the Arctic and perhaps this could be elaborated on more.

C2

I know that snow depths are fairly uncertain, but perhaps instead of taking a constant snow density of 350 kg/m³, why not time vary it throughout the winter season and based on locations based on the Warren climatology. This might improve your results.

Line 18 page 6 should be ERA5

Interactive comment on The Cryosphere Discuss., <https://doi.org/10.5194/tc-2018-245>, 2018.