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Interactive comment on "Near global scale high-resolution seasonal simulations with WRF-NOAHMP v.3.8.1" *by* Thomas Schwitalla et al.

Anonymous Referee #1

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This paper addresses the value of cloud-permitting grid sizes near 3 km on global scale simulations that cover a large fraction of the globe except polar regions. This is compared with a lower resolution simulation at 45 km grid size that uses a cumulus parameterization. The simulations are run for 5 continuous months with only northern and southern boundary conditions provided by analyses.

The paper is of value because it not only addresses the above questions but also addresses some of the additional hurdles presented by large simulations in especially the computational aspects and handling large amounts of data. This aspect is also of interest.

Furthermore the authors have used a variety of datasets to improve the input to the model such as surface datasets that are not part of the regular WRF package.

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Discussion paper

It is also impressive to see the wide range of verification techniques employed from looking at convective propagating features to large-scale waves, precipitation patterns and even EOF analysis.

I think this paper is publishable but I will make some comments on how this work could be improved from my perspective. The authors should consider this even though it is some extra work.

The results are very good for the high-resolution almost-global simulation that is run so long and gives confidence for future studies of such applications. Noting that the tropics is hardly constrained at all, this is a real test of the model physics both at high and low resolution.

General Comments

1. While results were shown for convective systems, precipitation, and large scale features, none were shown for thermal fields or precipitable water that would also be of value in determining how well such a long simulation captured the climatology. I would encourage addition of some of these.

2. In the conclusions the authors have attributed much of the improvement to the higher resolution which includes not having to use a cumulus parameterization. However, it can also be argued that the chosen scheme had some deficiencies that can be attributed to that scheme alone, e.g. shallow cloud issues in South America, and probably some of the tropical convective behavior. I would strongly encourage a separate run with a different cumulus scheme at 45 km to see how many of these improvements still stand when a possibly better one is used (e.g. WRF has a Tiedtke option more similar to the one in the ECMWF model). Such an additional run may add robustness to the authors' conclusions.

Minor Points

1. line 100 - "andas" sentence needs correction.

2. line 107 - "skin temperature" used for lakes. Is this at least a diurnal average? How is seasonal change handled for lakes unresolved by the SST.

3. Figure 3. This is rotated making references to upper right, etc. confusing at first. Lettering the panels would resolve this.

4. Figure 3 caption. Refers to +/- 10 N which is really just +/- 10 degrees (N and S).

5. line 213 - "same holds" maybe means "reverse holds"?

6. line 235 - should be Fig. 6b.

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