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Geoscientific Model Development Discussions

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

Anonymous Referee #2

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This paper presents a 5-month convection-permitting simulation for a very wide latitude band, from -57deg to 65deg. The authors compared the simulation results with observations/reanalysis and a simulation with coarse resolution, focusing on tropical precipitation, and teleconnection patterns. The authors concluded that the high-resolution simulation significantly improves the simulations of precipitation and will likely improve the seasonal forecast.

This paper is well-written and will be of interests to the modeling community. I would recommend publication if the authors can properly address the following comments.

1. If I take a look at Figure 1, it is difficult to convince people that (a) and (b) are really alike. (b) might be improved from (c), but there is still a significant gap. This should be fully acknowledged.

2. In Fig. 2, the lower panel of the first column shows MJO signals, but I don't see them in the Hovmoller plot. Could you clarify? In the second column, the MJO signal is quite strong, which does not seem to be consistent with Fig. 1.

3. There is a long history of why improved representation of small-scale convection can affect large-scale tropical wave-like signals. For example, Mapes (2000, JAS) argued that multiple vertical modes are key to the development of equatorial waves, which are not often excited by traditional convection schemes. This theory was further developed by Kuang (2008, JAS). Khouider and Majda (2008, JAS) presented a multi-cloud model that explicitly simulates multiple vertical modes. That model produced an improved tropical wave spectrum. Yang and Ingersoll (2013, 2014) presented a shallow water model that can simulate the MJO and equatorial waves. The authors parameterized convection as a triggered process, as opposed to a quasi-equilibrium process, which is often used to parameterize convection in GCMs. The authors proposed that the intermittent trigger of convection is key to properly simulate tropical waves and the MJO.

Refs: Mapes, B.E., 2000: Convective Inhibition, Subgrid-Scale Triggering Energy, and Stratiform Instability in a Toy Tropical Wave Model. J. Atmos. Sci., 57, 1515–1535, https://doi.org/10.1175/1520-0469(2000)057<1515:CISSTE>2.0.CO;2

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Yang, D. and A.P. Ingersoll, 2013: Triggered Convection, Gravity Waves, and the MJO: A Shallow-Water Model. J. Atmos. Sci., 70, 2476–2486, https://doi.org/10.1175/JAS-D-12-0255.1

Yang, D., and Ingersoll, A. P. (2014), A theory of the MJO horizontal scale, Geophys. Res. Lett., 41, 1059– 1064, doi:10.1002/2013GL058542.

4. Figures 4 & 7: it is difficult to define “improvement”. It would be great if there is a way to quantify the performance.

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