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Atmospheric Chemistry and Physics
Discussions

Interactive comment on "Sensitivities of the MJO Forecasts on Configurations of Physics in the ECMWF Global Model" *by* Jun-Ichi Yano and Nils P. Wedi

Anonymous Referee #1

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This study tries to answer the scientific questions related to 1) the possibility of interpreting the MJO as a free nonlinear Rossby wave through the sensitivity test to the diffusion terms, and 2) the MJO initiation process. Although a lot of sensitivity tests are done in this study, I think the overall interpretation and description are insufficient. Also, it was hard to figure out the scientific questions and related conclusions. I mention below in detail and hope to get more clear information in the revised manuscript.

Major comments

1. Please explain the physical meaning of the difference between the results in Section 3. Figures in Section 3 show some differences between the experiments. For exam-

ple, what is the role of momentum dissipation and vertical eddy diffusion to make the difference (Figs. 4, 5)? How do they affect the simulation of MJO propagation and magnitude? Also, in my opinion, the convection in Fig. 4a is stronger than those in Figs 4b, c. Because more momentum dissipation is turned off in Ma than in Mbe & Mbb, it is obvious regardless of the physical meaning.

2. How many ensemble members are used to obtain the result? It needs more than only one ensemble member to ensure that the results are robust and meaningful. Also, in general, the MJO prediction skill has been defined by the bivariate correlation coefficient (e.g., Gottchart et al. 2010; Rashid et al. 2011; Kim et al. 2014; Lim et al. 2018). It should be noted that the prediction skill used in this study is not the same as those in the previous studies. I recommend using the word "pattern correlation analysis" rather than the word "correlation analysis."

3. L231-232: Why did you emphasize the clear-sky area? In my eyes, the stronger convection centered over 150E for 24 January – 30 January is already shown, resulting in the difference in the clear-sky area. It might affect the clear-sky area (related to the suppressed convection).

4. L246-249: Why does the convective friction suddenly influence the prediction only over the last days, not over the whole forecast lead time? In my opinion, it seems to be related to the above sampling issue and does not have a physical meaning.

5. Section 3.5 (L321-340): How does the cyclone propagate from 80N to 30N directly? Based on your explanation, the cyclonic circulation comes out from the polar vortex and straightly propagates from 80N to 30N in a limited and fixed longitudinal band (20E-60E). Is it possible? Please show the longitude-latitude section of the 150-hPa stream function in each time step. It will be more helpful for examined the intrusion of a Rossby wave train. Also, why is the intrusion shown only in the longitude band (20E-60E)? Please explain it in detail.

Minor comments

1. L230-231: Could you add a line from the CF into not only the Figure 4 but also all other hovmoller diagrams for comparison?

2. L235–236: The better propagation in Figs. 4b, c than in Fig. 4a might be related to the weaker amplitude of enhanced convection (Seo and Kumar 2009). If you explain the result kindly, it would be more helpful for readers.

3. Figure 6b: Please check the label in Y-axis.

4. Figure number in Figure: Figure 1d → 1c, Figure 3d → 3c.

5. L361: What is "the radiation of an anticyclonic Rossby-wave train"?

6. L16: "to be forecast" → "to be forecasted"

7. L185: Wang et al. 2018 → Wang et al. 2019?

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