Geoscientific
Model Development
Discussions

Interactive comment on "Connecting spatial and temporal scales of tropical precipitation in observations and the MetUM-GA6" *by* Gill M. Martin et al.

Anonymous Referee #1

Received and published: 26 October 2016

General comments

This study is both concise and informative in its overview of how the intermittent behavior of parameterized precipitation is insensitive to horizontal resolution. The introduction references the appropriate literature and the methods section is clearly written (though it is easy to get bogged down with all the different geographical domains and scales). The authors' insight into how the spatial and temporal variability of parameterized precipitation influences both wet and dry biases in the model is particularly interesting (Figure 9 is wonderful), as these biases may be at the heart of the models' inability to properly represent tropical convection. Focusing on the variability of time-step precipitation in the context of extended/climate forecasts is an interesting

topic, though the authors themselves do not draw many connections between the intermittency of this short-timescale precipitation to the larger scales. The inclusion of an experiment without convective parameterization acts as a "tease" of (hopefully) future work done at higher resolution, though some interesting results were found here. Overall, the paper is well-written and presents a clever usage of the ASoP1 techniques to process a large volume of model output. Recommendation: Accept after minor alterations.

Specific comments

- While it is mentioned in your introduction that the representation of rainfall on short timescales is important to longer timescales (because of the biases they incite; Kendon et al. 2014), there is limited discussion of this topic thereafter. I think your hypothesis attributing the mean-state precipitation biases to issues with intraseasonal variability and sub-daily variability is one of the main takeaways of the paper; therefore, it would be good to include (perhaps in the discussion section) a paragraph highlighting the impact of these biases on the larger scales (e.g., a wet bias in the West Pacific may inhibit MJO propagation).

- You noted that many have observed that model biases develop fairly early on in climate simulations. Was this the case with your experiment? Did you observe any sort of spin-up time for the precipitation intermittency? Any note on the lead-dependence of the models' representation of precipitation would be a nice addition.

- In section 4.2, you only allude to intraseasonal variability (or the lack thereof) via proxy; that is, we know that if longer and longer temporal averages pull the precipitation spectra to smaller and smaller values, there must be variability on those longer timescales. A power spectral analysis of the observations vs the model, or anything directly showing this intraseasonal variance discrepancy between CMORPH and MetUM, would help drive this point home.

Technical corrections

- P4, L17-20: You use different grammar each time you introduce one of your three subdomains (see the "hereafter" bits) - Include a figure highlighting your subdomains and how they are divided up for section 3.5. - P5, L28-32: Add a figure or reference to illustrate/support your explanation of how the all-or-nothing nature of the convective parameterization is the cause of the precipitation intermittency. - P6, L30: "of this is what" to "thereof" - P7, L2: Did you look at the model output to see if this was the case? Are the differences in precipitation intermittency observable in the raw model output? - P8, L27: "(Fig. 6)" to "(Fig. 6f)" - P10, L7-9: These first two sentences of the paragraph should be earlier in the paper, as this is not the first time the data was averaged to N48 and 3-hourly to compare to CMORPH and TRMM (you did this in Figure 5 as well). - P10, L24-25: "indicates variability at the longer timescale" is awkward. Perhaps "is due to variability at longer timescales"

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