

Interactive comment on “Improved simulation of precipitation in the tropics using a modified BMJ scheme in WRF model” by R. Fonseca et al.

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Reply to comments by B. Samala (Referee):

1. Why authors have changed the model domain and resolution for different runs like 1day and 10 months.

REPLY: In the 1-day and 4-month experiments we used a smaller domain for the purpose of testing different versions of the BMJ scheme. Once the best configuration of the scheme was found we used a tropical belt to check whether the improvements in the simulation of the observed precipitation were also seen in other tropical regions, in particular in the Western Hemisphere, and for both monsoon seasons. In the tropical belt experiments we decreased the resolution as we could not afford computationally a

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24km horizontal resolution with this large domain.

2. The model domain is very big, whereas real application of WRF is for a regional small domain.

REPLY: We have used a tropical channel domain as we are interested in studying the Madden-Julian oscillation (MJO). In order to fully capture the MJO we need the whole tropics and sub-tropics given that in the boreal summer season it also exhibits northward propagation over Asia (Lee et al., 2013). Although running WRF in a tropical belt configuration is not very common, there are a few papers where the authors set up WRF in this way (e.g. Ray et al., 2011; Evan et al., 2013).

3. Why authors have used 2008 for 10 months run? Is there any specific reason?

REPLY: We have chosen the year of 2008 as, according to Ummenhofer et al. (2009), it was a neutral year with respect to both El Niño-Southern Oscillation (ENSO) and Indian Ocean Dipole (IOD). By choosing a neutral year we minimize the impact of climatic anomalies. We will make it clear in the paper why we chose this particular year for the model experiments.

4. In general GFS overestimates rain which is ICBC for WRF. These sensitivity experiments may not work for different ICBC like GFS.

REPLY: We have only used CFSR data, downloaded from CISL RDA's website (<http://rda.ucar.edu/>), to generate initial and boundary conditions for WRF and we agree that if another dataset (or set of physics options) is used our modified BMJ scheme may not give such good results. However, with the information available in this paper users will know how to modify the BMJ scheme so that it gives a good estimate of the observed rainfall for the particular model configuration used.

5. Already GFS 25km resolution data is available. I would have been better if authors could have run the model with higher resolution of 9km using 25km GFS data.

REPLY: We were not aware that the GFS data is now available at 25km resolution. We

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plan to perform higher resolution runs, with boundary conditions generated either from the output of a coarser grid or the new ERA-5 (~30km) re-analysis dataset, to be presented in a subsequent paper. However, there is always the question of whether a cumulus scheme should be used in those runs: e.g. Fujita et al. (2013) performed nested WRF experiments over the eastern Indian Ocean off Sumatra with 17.5km and 3.5km grids both run without a cumulus scheme while Evans and McCabe (2010) ran WRF over Southeastern Australia at 50km and 10km resolution with a cumulus scheme. For the horizontal resolutions used in the experiments discussed in this paper (24km and 30km) there is a general consensus that a cumulus scheme is needed.

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