

Interactive comment on “Regional Simulation of Indian summer Monsoon Intraseasonal Oscillations at Gray Zone Resolution” by Xingchao Chen et al.

Anonymous Referee #2

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The study investigates Indian summer monsoon and its intraseasonal variability from 2007 to 2011 using the WRF regional modeling system. Model evaluation against observational dataset shows that the model is able to simulate precipitation and large-scale circulation associated with the seasonal and intraseasonal variations of the monsoon system. In contrast to 27 km simulations with convective parameterization, the 9-km gray resolution simulations show significantly less bias in mean precipitation. The manuscript is presented with clarity. Figures are of high quality. I have a number of comments and suggestions.

General comments:

1. The main message of this study is that the gray resolution simulations have some advantages over coarse resolution simulations with cumulus parameterization. The manuscript attributes most of the difference to the use of the cumulus parameterization in the 27 km simulations. However, another potentially important factor is that topography is much better resolved in the 9 km simulations, which is potentially crucial for producing rain in the Himalaya foothills and Indian subcontinent (discussed several times in the manuscript). From reading the current manuscript it is unclear whether or not the 9-km simulations use the same topography as the 27 km simulations, and to what extent fine topography could have contributed to improvement. The revision may include some discussion on this issue.

2. The manuscript uses the MISO index constructed from the nonlinear Laplacian spectral analysis technique to evaluate model simulated MISOs. I suggest compute the MISO index from the model simulations (both the 27 km and 9 km simulations). This seems to be straightforward using projection of model data to the MISO mode. The benefit is that this would significantly simplify model evaluation and comparison between model simulations.

Specific comments:

Lines 74-77: This discussion is out of context. Why it is more complex than the MJO? Is there a reference for this?

Lines 84-85: a few GCMs can go down to 25 kilometers for TC (e.g., GFDL HiRAM)

Figures 4,5: The same quantities from the WRF-27 may also be included to show that the WRF-gray also improve temporal variations of circulation and rain in addition to the mean. Correlation coefficient may be computed to quantify the performance of simulations.

Figure 9: Year for each panel is missing in either title or caption.

Section 4.2 & Figure 10: The MISO index is computed with the GPCP precipitation, but

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the phase composite is constructed with TRMM. There seems to be an inconsistency. Shouldn't the same rainfall observation data be used consistently?

Lines 120: 12 km is not considered as CRM resolution. Suggest change "CRM" to "cloud-permitting modeling"

Line 330: here GPCP is used, but the rest paper use TRMM. There seems to be some discrepancy.

Other technical comments:

Line 67: foothills

Line 72: in another world?

Line 337: delete "it"

Line 351: Phase -> phase

Line 371: Phase -> phase

Line 375: delete "should"

Line 377: what is "real one"? Need to be reworded.

Line 397: access -> assess

Line 443-447: this sentence is repetitive and unclear. Suggest rewrite this.

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