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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Assessment of the Weather Research and Forecasting (WRF) Model for Extreme Rainfall Event Simulations in the Upper Ganga Basin" *by* Ila Chawla et al.

Anonymous Referee #2

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The paper provides results of a case study for an extreme event in northern India using WRF with multiple physics combinations. It evaluates rainfall primarily against observational data at stations and derived from TRMM. This focuses on the heavy rain period of 15-18 June 2013, and therefore conclusions about performance of the different simulations cannot be taken to be very robust in their usefulness for other cases. This limits the usefulness of this study. While it is interesting that certain physics combinations performed well and some parameterizations did well in several different combinations, it was not clearly presented.

Some physics schemese showed greater sensitivity to other schemes combined with

them, as seen in Fig. 10 for example. But showing the absolute difference hides some information that could have been seen from the difference itself that may have negative values.

It is also hard to determine signal from noise in Figures 7,8, and 11 when a station mean might have been of value in showing overall trends.

A major problem I have is with the use of CORDEX data. CORDEX is downscaled from climate model simulations and would therefore not be expected to bear any resemblance to real weather on any specific date. These are not comparable with weather models driven by real anaysis boundary conditions. Sampling CORDEX on a particular date of a heavy rainfall event therefore will not be a fair comparison because it is more likely to miss such events entirely while it may have them on other days depending on which global data is used. It is no surprise that CORDEX runs underestimate heavy events on a particular date, which does not mean they underestimate them in general. Such data can only be used qualititively to see if they can capture heavy events over many years that they are run using frequency analyses. I therefore suggest that the CORDEX part serves no value for this case study, and if the authors are using CORDEX it can only be in the context of the climatology of heavy events and whether the observed peak can be captured at other times of those runs. Maybe these runs never have such events, which may be useful to know, or maybe they have them too frequently, also useful.

Specific Points

1. line 222. It said KF is shallow convection when it has both deep and shallow convection.

2. line 231. Both PLin and WSM6 are 6-class if vapor is included as a class.

3. Figure 5. It is noted that domain 2b has no cumulus scheme within the domain, yet shows sensitivity to cumulus schemes, presumably through its boundaries and parent

domain.

4. Figure 6. Over what period is this rainfall summed? Is it interpolated to the station point?

5. line 288. Presumably the complex terrain is also a factor in the bias at stations. Even at 3 km, there may be flow and rainfall differences because the model does not fully resolve all the terrain details.

6. Figure 7. Is this the MAE for the total 4-day precipitation at each station?

7. Care should be taken when suggesting Goddard is best especially as it has less overall precipitation. Lower precipitation itself may lead to lower absolute errors than schemes that more correct total amounts in the wrong places. Smoother precipitation fields may always score favorably in MAE. Total precip is an important factor to evaluate.

8. line 316. BMJ even does better in 2b where it is not used and only would contribute through the boundaries, and this is surprising.

9. line 354. SE has not been defined. It looks like a ratio of model to observed variance.

10. Figure 9. It is confusing that colors are used both for rainfall and CV. Perhaps rainfall can be contoured.

11. line 416-424. SLAB underestimates rainfall. This raises the issue of its moisture availability value in this region. How high is it? Can a higher value give a better rainfall?

12. Major issue with using CORDEX as it is. See above comments.

13. Major issue with conclusions being drwan from one case. See above.

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