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Interactive comment on "Quantifying the added value of high resolution climate models: A systematic comparison of WRF simulations for complex Himalayan terrain" *by* Ramchandra Karki et al.

Anonymous Referee #1

Received and published: 3 May 2017

General Comments: In this manuscript, the authors study the 'Added value (skill) of high resolution climate models (WRF simulations) in simulating the rainfall and temperature over Himalayan region'. Study of model resolution over complex hilly terrain is indeed important especially over the Himalayan mountain ranges where the rainfall is largely influenced by both the local factors as well as large scale circulations. In addition to that the paper also explains some of the important feature of precipitation over study region such as diurnal variations and spatial variability.

Specific Comments: The authors have selected a year of data with two initialization

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conditions and compared the results of different horizontal resolution across different seasons viz. winter, pre-monsoon, monsoon, and post-monsoon. The skill of model resolution (25 km, 5km, and 1 km) is compared with observational station dataset at different altitudinal ranges. The description of the model setup and configuration part is nicely written in the manuscript. Although the manuscript is well written and results are properly explained for most of the cases, there are few areas where the explanation is inadequate (see the discussion in the comment section), nevertheless they are acceptable if revised. Therefore, I am suggesting a minor revision of this manuscript. I have some very minor comments provided below.

Minor comments: 1. The biases or spurious influence of the boundaries in the regional climate model can be reduced by nudging. Here authors can provide little more information about the details of the nudging.

2. In figure 3 'Daily station averaged precipitation' during mid-monsoon season (July-August) is not very well represented by D3, when compared with the observations. Authors need to comment on this finding. Again it will be really interesting to know why authors chose to use 10-day moving average.

3. In figure 5 'Diurnal precipitation during monsoon seasons' across D2 and D3 are close to observed in lower valley regions. However, for the remaining cases except for the morning precipitation, the precipitation is either overestimating (after noon) or underestimating (before morning). Authors can provide a little explanation on this.

4. In the explanation of figure 9 the authors have commented on west-east gradient during winter precipitation. However, I do not find a clear west-east precipitation gradient in all the three domains as well as in the observations. In fact I can see a north-south gradient. Authors needs to explain this with more clarity.

5.Figure 9: The difference between D2 and D3 is less for the winter season, pre-monsoon season and the monsoon precipitation.

6. Figure 10: For monsoon season the bias is more over southern region which is comparatively low elevation region... please provide a comment on this?

7. The authors argued that the pre-monsoon precipitation over the study region is mostly due the local scale circulations from local moisture source. If possible please provide an explanation with figure.

8. I see most of the local scale features in D2 and D3 are closely resemble with each other. How good is D3 compared to D2? The authors can briefly state this in the conclusions.

9. Although, it is not in scope of this manuscript, the authors can briefly comment on interaction between the westerlies and monsoonal circulation.

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