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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Spatio-temporal assessment of WRF, TRMM and in situ precipitation data in a tropical mountain environment (Cordillera Blanca, Peru)" *by* L. Mourre et al.

Anonymous Referee #2

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The manuscript describes a comparison of hourly, daily, and annual rainfall products based on observations, WRF simulations, and rain gauge observations over a watershed in Peru during 2012-2013. The analysis is conducted in great detail and the topic is of great interest to a large research community. The manuscript needs some major revision but it suitable for publication in HESSD. I would like to see more discussion or analysis in the following areas. The manuscript and figures including captions lack some clarity, which makes the paper in parts hard to read and discussion on strengths and weaknesses of observations versus model simulations. The quality of numerical

simulations strongly depend on the choice of parameterizations and boundary conditions, which need to be discussed in more detail – see detailed comments. The quality of the rainfall fields strongly depends the spatial separation and on the quality of the measurement itself, which should be quantified. I would like to see some statistics between the differences, e.g., transforming Table 1 into a scatterplot and show derivations. Detailed comments: - P. 6638, o line 3: change to "westerly flow causing dry conditions due to the cold Humboldt current"; o lines 10-12: explain how SST and ENSO affect rainfall; o lines 15-20 windward and leeward depends on the flow, which can be easterly or westerly, I assume that authors mean easterly flow when they use windward or leeward, but it is not really clear throughout the paper - P. 6639, o lines 3-4 clarify what are the common features and what are the socio-economic stakes in Peru, o lines 15-25: provide more detail about QC and information about the average distance between rain gauges (this can also be addressed in sec. 2.2); o lines 25ff since TRMM only passes 1-2 per day, the daily data are basically surface observations. - P. 6641 o Line2: indicate Huascaran in Fig. 1 (so that it is visible) o Lines 13-14: What would be the desired distances between rain gauges in order to account for spatial variability in Peru? o Lines 15ff: What is the study area, the watersheds or rectangular boxes? Need to be indicated somewhere. Also is 2012-2013 a good representation for rainfall in Peru, it needs to be somehow put into relation to other years. - P. 6642 o Line 24: explain pluviometric index o What QC is applied to the data? What is the error bar? - P. 6644 o Lines 18-22: clarify and be more specific - P. 6645 o The simulations strongly depend on the choice of parameterization. Why did the authors choose this set op parameterizations? Authors should show how sensitive the results are to the choice of parameterization at least for the microphysical scheme. Provide some results from sensitivity studies - P. 6648: lines 14-21, Table 6; clarify and explain what A, B, C, D are - Section 3.3 o The performance of rain gauge vs model strongly depends on the weather type. If the rainfall is more convective (or has embedded convection, which is very likely in orographic rain) than we would expect the model maybe to outperform the observations, in particular when the observations are coarse. Maybe

WRF3 does not overestimate rainfall but the rain gauges underestimate rainfall, which is typically the case in orographic rain. Justify your argument that KED3 is better than WRF3. - P. 6652: o lines 11-14 - Quantify why WRF overestimates rainfall and show that it is related to NCEP-FL if you claim this. o Line 15: TRMM product includes in-situ observations therefore it is not surprising that TRMM and KED27 are almost identical, please state this in the text o Line 16: Where is the Maranon watershed? - P. 6655: o Lines 24-27: Show that WRF is capable of retrieving mountain circulations. I personally doubt it. The better representation of the 3 km run is solely due to resolving the terrain, i.e., better vertical velocity and adiabatic cooling both creating more clouds and precipitation. - Figures, Tables, and captions need major revision and maybe some of the tables could be removed: o Fig. 1left: enlarge figure; what are all these lines and which ones are 500 and 3500m? o Fig. 1right: outline all watersheds and domains that are discussed in the paper (also watershed in 1b looks different than in 2a?) o Fig. 2 outline the coast and water sheds o Fig 3: light gray is hard to see o Fig. 5 what exactly are the yellow, black and white lines? Which ones are the altitude lines and what altitude is it? o Fig. 6a: enlarge; Fig. 6b-c: dashed line is impossible to see and light gray is hard to see as well; change “is in dark” to solid black line, in caption mention the black bars o Table 1: remove table and put rainfall information in scatter plot and provide a statistics about the differences. o Table 6: don’t understand it and maybe can be put in the main text

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