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Discussions

(GMDD)

Interactive

comment

Interactive comment on "Sensitivity of precipitation and temperature over Mount Kenya area to physics parameterization options in a high-resolution model simulation performed with WRFV3.8.1" *by* Martina Messmer et al.

Anonymous Referee #1

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Summary

The study "Sensitivity of precipitation and temperature over Month Kenia area to physics parameterization option in a high-resolution model simulation performed with WRFV3.8.1" by Messmer et al. submitted to GCM focuses on the analysis of several sensitivity experiments with the Weather Research and Forecasting model version 3.8.1 for Mont Kenia for the year 2008. This work analyzes different parameterization options as well as different nesting strategies (number of nests and nesting ratios). The evaluation of the model performance is carried out in terms of precipitation and tem-

perature by comparing the outputs from the WRF model with observational products from different gridded products but also using observational station datasets.

General comments:

The manuscript is very well written, making it easy to follow. The structure is appropriate with a complete description of the methodology and an adequate list of references. This kind of study is essential before completing climate simulations, being the area of study of high interest as it is a topographically complex region poorly study until now that requires high-resolution climate information to be properly described. In my opinion, the results found in relation to the nesting strategies are very interesting, this being a relevant aspect for properly configuring climate simulations at high resolution. Also, the method used to evaluate the model configurations by comparing the outputs of the model with different observational products seems to be adequate. However, there are several major aspects of the manuscript that should be clarified before its publication.

My major concerns are mainly related to two aspects. The first one is the period used to analyze the WRF model performance for the different configuration options. Being the final goal of the study the selection of a "good configuration" to use WRF for climate runs, why did the authors select a 1-year period (the year 2008) to carry out this study? Did the authors test the model performance in other years with different precipitation characteristics? In my opinion, further analyses could be needed in order to corroborate the results from 2008. To do this, analyses for an additional year, for example, a year considered to be a wet year (as 2006) could be carried out.

On the other hand, I am a little bit confused with the "no cumulus" experiment setup. If I understood well, the authors here have used the WRF model with the cumulus parameterization switch off in all domains (from the 27km_D04/25KM_d03 to the finer domain of 1km of spatial resolution), but, did the coarser domains (i.e., 27km and 25km) also run without convection scheme? I think that more information is required in this regard. Also, why for this parameterization configuration option are there three of

the nesting schemes (i.e., 27kmD04, 25kmD03, 9kmD03) instead of the four used in the other cases (i.e., 27kmD04, 25kmD03, 9kmD03, 25kmD02)?

Additionally, I think that some analysis concerning the ability of the model at a sub-daily scale would be nice to clarify if the "no cumulus" option provides an added value in relation to the other options used with convection physic schemes at this temporal scale.

Specific comments:

L248-250: Please, indicate the method used to interpolate the gridded products. Figure 5: The colors selected for "cumulus3 1-way", "no cumulus", and "ERA5" are hard of difference sometimes, so I would suggest using an additional way (e.g., dotted lines for observations) to clearly show what data are represented in each case. Figure 6 onward: In order to clearly show what option is better, I would suggest adding the correlation patterns between CHIRPS and the different parameterization options, for example, at the bottom of each figure.

Technical corrections:

L115: Velasquez et al. 2020? L178: Please, move the Climatic Research Unit (CRU) definition from L215 to L178. It is the first time that CRU is named.

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