Geoscientific Model Development Discussions

Geosci. Model Dev. Discuss., referee comment RC1
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Comment on gmd-2020-435

Anonymous Referee #1

Referee comment on "Non-Hydrostatic RegCM4 (RegCM4-NH): model description and case studies over multiple domains" by Erika Coppola et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2020-435-RC1, 2021

This paper introduces the development of RegCM4-NH, and shows three simulation cases. It is an important paper introducing a new member to the convection-permitting simulations. The manuscript is well organized and easy to follow. Before the paper can be accepted, more details should be further clarified.

Major comments:

- Authors state that the stability is a quite important factor to be considered when the RegCM4 is switched to NH core. Ten major modifications are implemented comparing to the original MM5 code. The explanations on why each modification is added should be provided. For example, the proper choice on the schemes of horizontal advection and diffusion and their combination is quite important for the computational stability. The dynamical core used here relies on explicit numerical diffusion to be numerically stable. How the advection term chosen here considering both the stability and accuracy should be introduced more clearly, and the proper references are needed here.

- Different observation datasets are chosen for three cases. But in fact, both the CHIRPS and CMORPH can cover all three cases, and the NCEP data can cover two US cases. It is necessary to use the same observation references to evaluate the simulations. Suggest to show all the observation data considering the uncertainties. Or necessary

explanations on such choice are needed.

- In the case LKV, the proper simulation on the contrast between land temperature and lake temperature is important on reproducing the local circulations. So figures on surface temperature from both 3-km and 12-km simulations are necessary to check whether the underestimation on rainfall from 12-km simulation is induced by the biases in surface temperature. And similar figures based on 12-km simulation should be added in the Figure 7.

Other comments:

- The domains of 12-km simulations can be shown.
- The namelist files used for three cases should be included in the model codes, then the RegCM-NH can be easily used by the RegCM modeling community. And the choices on schemes of other physical processes should be introduced in the manuscript, such as the PBL.
- L50: REGCM should be RegCM
- L52: rcp should be RCP
- Table 1: The year is missing in case 2
- L319: Era should be ERA
- It is hard to get the values from Figure 4 under the current color set.