Geosci. Model Dev. Discuss.,
https://doi.org/10.5194/gmd-2020-12-RC2, 2020

Geoscientific Model Development Discussions

Interactive comment on "Effects of spatial resolution on WRF v3.8.1 simulated meteorology over the central Himalaya" *by* Jaydeep Singh et al.

Anonymous Referee #2

Received and published: 6 July 2020

This study use WRF v3.8.1 to explore the effects of spatial resolution on local meteorology. It is very interesting that they found the finer spatial resolution can reduce the biases in simulated meteorology and improve representation of CH through domain feedback into regional-scale simulations. However, in this study, there are too many descriptions of the simulation, but no enough physical explanation to the simulation. It's difficult to make sense that why it occurred. In my view, this manuscript still needs major revision before it can be accepted.

section 2.2: How do you process the different temporal resolution of datasets, using the mean value or instantaneous value?

Line 182-184: It is available of ERA interim at 0.125°×0.125°, but it's the interpolation results, which may not represent the true performance of ERA interim, especially over

the complex terrain regions. It's better to add the comparison between WRF and ERA interim at 0.75°×0.75, even there is much less grids of ERA in D03.

Please update the figure captions: i.e., units of all the variables in Figure 3; caption of Figure 6 is not clear (Fig 6a is the comparison between WRF simulation at D01 and the observation?) ; Figure 8 is only focused D01, etc. you should make them clear in figure caption.

Line 259-262: Why did it happen? The different vertical distribution and the lower correlation at lower altitudes mostly come from the influence of land-air interaction. Please discussing the possible factors of your results.

How do you process the different spatial representation of different simulation and observation? For D01, one grid can indicate the mean situation of 15*15km area; meanwhile, for D02, it only indicates that in 5*5km area, etc. please show details of your methods to compare the grid simulation and the in-situ observation.

Line 286-287: It's very interesting that WRF shows a warm bias south side of Himalaya. Many previous studies pointed that there is obvious cold bias over Tibet (including Himalaya), i.e., Zhou et al. (2017) and Gao et al. (2015). Did you check your location of observation site and WRF grids? The warm bias in your WRF simulation is due to the lower terrain height of the grids than the Observed, please check if they are located over valley and the observed located over ridge

Figure 5: as the WRF resolution increasing, the diurnal cycle simulation of T and RH are better, but it didn't work for wind speed. please check the location of the WRF grids and observed station, if both them located valley or ridge? Besides, Zhou et al. (2019) stressed the importance of turbulent orographic form drag (TOFD) on the diurnal cycle simulation of wind speed. It's better to give more explains of inconsistent diurnal cycle of wind between simulation and observations.

RH is also dependent on Temperature. What's the performance of the WRF in simulation Specific Humidity (Q) ? Please compare the Q between WRF simulation and observation.

Section 3.4: What are the effects of feedback on the wind direction? In WRF-WF experiments, there are obvious difference among the simulated wind direction at three resolution. Is there any improvement in the WRF-F experiments?

Section 3.5: You should check the orographic variation in WRF model output, when you input different geographic data. multi-scale orographic variations are key factors of Wind and moisture simulation over complex terrain, i.e., south side of Himalaya (Wang et al., 2020)

References: Zhou, X., Yang, K., Beljaars, A. et al. Dynamical impact of parameterized turbulent orographic form drag on the simulation of winter precipitation over the western Tibetan Plateau. Clim Dyn 53, 707–720 (2019). https://doi.org/10.1007/s00382-019-04628-0

Gao YH, Xu JW, Chen DL (2015) Evaluation of WRF mesoscale climate simulations over the Tibetan Plateau during 1979–2011. J Clim 28(7):2823–2841. https://doi.org/10.1175/Jcli-D-14-00300.1

Wang, Y., Yang, K., Zhou, X. et al. Synergy of orographic drag parameterization and high resolution greatly reduces biases of WRF-simulated precipitation in central Himalaya. Clim Dyn 54, 1729–1740 (2020). https://doi.org/10.1007/s00382-019-05080-w

---

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2020-12, 2020.