

Geosci. Model Dev. Discuss., referee comment RC1  
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## **Comment on gmd-2021-243**

Anonymous Referee #1

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Referee comment on "WRF v.3.9 sensitivity to land surface model and horizontal resolution changes over North America" by Almudena García-García et al., Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2021-243-RC1>, 2021

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This manuscript explores the effect of horizontal resolution and land surface model (LSM) choice on the simulation of WRF surface energy fluxes and conditions. This is a very well written paper on a topic that is not a focus for WRF. Most WRF sensitivity tests deal with the various combinations of the atmospheric parameterizations. I like that they analyze not just mean air temperature and precipitation but also minimum and maximum temperature and convective and non-convective precipitation as well. The authors find that CLM4 is the best LSM to use with WRF. They find that model horizontal resolution most affects precipitation.

I think the description of the WRF sensitivity tests in this manuscript is a perfect fit for GMD. Practically speaking, this is very helpful for WRF users who want to run regional climate simulations. Scientifically, it lends no information to what aspects of the LSMs beyond just simply model complexity causes the improved simulations with CLM4, but that would require a deeper dive into offline LSM simulations that would go beyond the scope of GMD. It is interesting that the authors suggest that further sensitivity tests should be performed at convective-permitting resolutions. What would be the horizontal resolution for that? Are such resolutions computationally achievable for continental-scale simulations as is done here at this time?

Additionally, I would suggest one minor change to the manuscript: The authors use the abbreviation RAIN for total precipitation (rainfall + snowfall). I would suggest using PRECIP (or something similar) instead to avoid confusion for the casual reader.