Comments in plain text, response to comments in *blue italics*.

Anonymous Referee #1

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General comments

This paper tested the sensitivity of the spatial resolution of meteorological forcing data on hydrologic model results. The paper addresses a classic scientific question which is within the scope of HESS. The descriptions of experiments and calculations are complete. However, the idea and findings of this paper are not novel. Moreover, the conclusions are derived from one meteorology model and one hydrologic model, the results to me are insufficient to support the conclusions. Lastly, the paper is not well written and the presentation of results analysis is unclear.

We thank the referee for acknowledging the scientific question highlighted in our work, as well as the experiments and the computations we performed. To the best of our knowledge, there aren't any existing studies, which utilize physics-based models to simulate both atmospheric and hydrologic processes in this coupled fashion with the goal to understand biases in resolution on hydrologic flow metrics. We have thoroughly revised the manuscript to highlight this novel approach and the importance of the study's findings. We have thoroughly revised the manuscript for clarity and worked to make the writing more succinct and clearer. We feel that these changes had improved the manuscript and made it more suitable for publication in HESS.

Specific comments

1. Supportability of the findings. As mentioned above, the conclusions are derived from one meteorology model and one hydrologic model. These are not sufficient to provide a general conclusion. For example, the conclusion that ". . . the meteorological data should be at the resolution of the input data as well as the physics-based model to ensure a good precision and accuracy in the representativity of the snow dynamics." (Lines 333-335) may not be applicable if modelers adopt hydrologic response units, not grid cells, to build hydrologic models. For irregular computational unit based hy- drologic modeling, what is the appropriate input data resolution? I hope to see more experiments or discussions on it.

We did not focus on the hydrologic units in this study because we used physics-based models, which provide a spatial distribution of hydrologic variables. We, however, study the hydrologic responses at the watershed scale. Indeed, for each of the hydrologic variables we simulated (snow water equivalent, infiltration, evapotranspiration, surface water, and groundwater), we compared the results at both watershed scale and single point. We clearly explain in the manuscript the differences at both scales.

2. Moreover, the accuracy of the WRF meteorology model and the downscale and upscale techniques are very important to this paper's results. The authors validated the quality of different resolution forcing data at the watershed lumped level and the distributed level in Appendix A. However, in Figure A.2 and Figure A.3, the meteorology at 40.5km look bad as the pattern becomes very blurry. I would encourage trying a finer resolution, such as 27km. In addition, is it possible to validate the WRF and downscaled

meteorology with measured precipitation and temperature data for this research area? This will better valid your modelled and calculated meteorology forcing.

We performed simulations with WRF data at 40.5 km resolutions because this is the resolution close to the global climate models (their resolution is ~50 km and above). The resolution is indeed very coarse but it is that resolution that most of the hydrologic models are using to project the evolution of hydrology in the future.

The comparison between WRF outputs and ground observations is not relevant to the conclusions of this study as these conclusions are in essence derived from comparisons between (equivalent) forcing data produced at different resolutions using nested-domain configuration of WRF. Validation of WRF could be relevant in the context of consistency of physics represented in the WRF in terms of atmospheric and land surface processes and their interactions. As mentioned in the manuscript, the WRF configuration used for this study has been tested against a variety of ground-based observational datasets could be found in previous publications by the authors. However, to address this concern of the author, in the revised version of the manuscript, we further elaborate these established validations.

3. Title issue. It would be better to change "hydrologic metric" to something more ap- propriate. I suggest this because some hydrologists may understand "hydrologic met- ric" as hydrology model performance metrics, such as Nash–Sutcliffe efficiency (NSE) or Kling–Gupta efficiency. An alternative could be hydrologic prediction. Moreover, is the first word "on" redundant? Please correct me if I'm wrong.

We agree with reviewer and we changed the title: "Sensitivity of meteorological forcing resolution on hydrologic variables"

4. Presentation of the results. The writing of this paper needs to be improved. I found it hard to understand some sentences, the definitions of several terms and the full name of an abbreviation are missing, and some citations and captions are not standardized. Please see below for details.

We have made a genuine effort to thoroughly check the manuscript for areas of writing improvement.

5. In section 2a, I suggest specifying the areas of the Sierra Nevada Mountains and the Central Valley in Figure 1.

Agreed. We now specify the two main areas of the watershed in the revised manuscript.

Technical corrections

1. Line 268, "5 spatial resolutions". Change 5 to five. Similarly, to line 271.

Changed.

2. Equation 7 and Equation 8, are the two φ the same? I guess one is surface pressure head, and nother is subsurface pressure head. Please be consistent with the terms in Equation 1 and Equation 2, and be specific.

Yes, both represent pressure-head. Parflow-CLM is an integrated hydrologic model as such the surface and subsurface pressure heads are the same. Please refer to lines 174 to 197 of the original manuscript for more details.

3. Line 341, citation (Rasmussen et al., 2011) should be Rasmussen et al. (2011).

Changed.

4. Unclear sentences list. a. Lines 330-332 b. Lines 369-370 c. Lines 493-495 d. Lines 523-524 e. Lines 527-528 f. Lines 540-544 g. Lines 624-626 h. Lines 630-632

We thank the reviewer for these specific points of potential improvement in the manuscript. We have modified each to make them clearer.

5. Incorrect caption citation list. a. Line 347, Equation 5 -> Equation 6. b. Line 686, figure xx. c. Line 687, 0.01 C.

We changed the caption.

6. Undefined abbreviation: Line 342, WY.

We now define WY (which means Water Year).

7. Unclear referent. a. Line 561, the latter. b. Line 590, the latter. 8. Line 666, Climate Models -> Climate models.

We changed these lines of the revised manuscript for clarity.