

Interactive comment on “On the sensitivity of meteorological forcing resolution on hydrologic metrics” by Fadji Z. Maina et al.

Anonymous Referee #2

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General comments: The manuscript addresses the sensitivity of hydrologic variables to the spatial resolution of meteorological forcing inputs. Analysis of multiple components of the hydrological cycle in time and space makes the current study fit within the scope of HESS. While the overall objective is to compare how the resolution of meteorological forcing data impacts hydrologic variables, it would be helpful to see how WRF model output from the simulations compares to actual observations. The study year is said to be the wettest on record, so the WRF simulations are not being performed for a typical year, but rather one that lies in the tails of the distribution. As such, are there inherent errors associated with simulating an anomalous case versus typical? Comparison to observations may support whether WRF simulations are similar to reality, such that any biases are recognized before simply comparing model simulations

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to one another. Some of the background is given without any supporting sources. One example is the paragraph from lines 107-130. While some of the information may seem like common knowledge, it is still important to state where this information came from. For example, in lines 114-115, the authors state something is ranked “among the highest in the world.” This is highest according to what? Similarly, lines 117-118 state that the majority of water resources in the region originate from snowmelt. How do we know this? Many readers will likely be familiar with such concepts, but those of interdisciplinary backgrounds may not be. Paper is generally well organized, however within the results section tends to jump around a bit. Many of the paragraphs in the results section start with “Figure x shows...” This reads more like a listing of results based upon figures and seems to contribute to some of the disorganization within discussion of individual results. The results may be much clearer if figures were used to support the main points that the authors were trying to communicate rather than the authors trying to find main points to support each figure. Use the figures to tell your story and convince the reader of your main conclusions. It is difficult to keep track of whether figure A and figure B (not actual figures, just an example) both supported the same conclusion as many figures are discussed independently of one another. The authors present two main questions to be addressed by the manuscript, however there was very little mention of how the results addressed question 2 (lines 137-139) within the conclusions. It isn’t clear how everything ties together. The last statement in the conclusion paragraph is worded such that it seems to pose this question for future work rather than show how the current work addressed it.

Specific Comments: Lines 64-68: Reword if possible. Starting with “because” throws the reader off. Otherwise, if “Because” remains at the start the comma should be omitted, or use of the word “Because” should be omitted itself.

Lines 70-73: This could be split into two sentences to improve readability, otherwise I found myself trying to circle back to the beginning to understand what the point was. Splitting the two after “accuracy” seems logical.

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Lines 82 and 83: Why does this study matter to the current work? It ties in later, I think, but it would be helpful to quickly tie your literature review into the current work.

Lines 114-115: Please reword. I'm not sure what exactly is ranked highest in the world. Is it the agricultural sustainability or the necessity for understanding water resources? Please also provide a source to support this conclusion.

Lines 127-128: What is the period of record when stating "wettest on record." How do the authors know this?

Lines 227-232: The authors state that 2017 is representative of a wide range of weather conditions, but also that it is a climatological anomaly. Why isn't a year that is more near-normal used to demonstrate an annual range of meteorological conditions? Swain et al. (2018) suggests a greater number of rapid transitions from dry to wet periods is likely in future climate scenarios. This may support the use of water year 2017 if the authors intentions were to capture a year that rapidly transitions from dry to wet but that is not clear in the current draft. This is the paper cited above: <https://doi.org/10.1038/s41558-018-0140-y>

Line 349: The authors state that error increases as resolution of the meteorological forcing increases. Does this mean that finer resolution, i.e., lower grid spacing results in greater error, or higher grid spacing (coarser resolution) does? Readers that are unfamiliar with numerical weather prediction models may get confused, and minor elaboration would ensure that the main point the authors are trying to communicate is not misinterpreted. It looks like this is touched on in lines 367 to 369, but it would be easier to interpret if these statements were all grouped together.

Lines 617-648: This part of the manuscript is well organized, and I appreciate how the main points are separated into individual bullets points.

Lines 630-632: The statement that the meteorological model should have the same resolution as the hydrologic model is made here, however, it does not appear that any

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simulations of WRF were performed with the exact same resolution as the hydrologic model. Line 197 says that the horizontal resolution of the hydrologic model is 200 meters while the finest horizontal resolution WRF simulation was 500 meters, so how is this conclusion supported by the current work when there were still differences in resolution? If there are past studies that support such a conclusion, please add relevant citations.

Lines 666-668: This statement is somewhat unclear. Is this referring to what climate models do in general, or is this referring to how they will be employed in future work? Please reword the statement for clarity.

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