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

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.

We thank the reviewer for acknowledging the importance of this study and its fit within 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 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.

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?

We acknowledge the reviewer's point, and have added further discussion of the topic in the revised manuscript. Namely, the choice of a wet year was intentional in this work, in order to understand how changes in meteorological forcing may present themselves in a "worst-case" scenario. The errors associated with inaccurately representing precipitation will be most obvious in the simulations presented here, and thus are considered a conservative estimate of the bias associated with overly coarsened meteorological forcing in hydrologic simulation.

Comparison to observations may support whether WRF simulations are similar to reality, such that any biases are recognized before simply comparing model simulations to one another.

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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.

Some of the background is given without any supporting sources. One example is the paragraph from lines 107-130.

We have added more references in the background section and in the paragraph pointed out by the reviewer to support our statements.

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?

Agreed. We added the reference in the revised manuscript.

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.

We now add a reference to this statement. Please refer to the revised manuscript.

The Paper is generally well organized, however 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.

We thank the reviewer for acknowledging the good structure of this paper.
In lines, 85 to 93 we link the literature review to the current scope of this work to highlight both the importance and the novelty of the current study.

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.

California's agricultural productivity is ranked among the highest in the world. This statement is derived from statistics of the California Department of food and agriculture, which we now state in the revised manuscript.

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

2017 is the wettest year on record since 1895. We have added references to the revised manuscript to support this statement.

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

We selected the wettest year on California record for a variety of reasons. As stated above, high precipitation values are meant to highlight any disparities in utilizing overly coarse forcing, and thus the differences in hydrologic metrics with various scales of forcing will conservatively show this bias. A second reason for simulating 2017 is because these extremes will likely characterize the future climate in California. As stated in the introduction, this year has many atmospheric rivers and due to the intensity of the precipitation associated with these rivers, it is of interest to assess the accurate resolution required to model the impact of these conditions which are characterized as extreme now but may be considered "normal" in the future.

We cited Swain et al 2018 in the revised manuscript to support our choice. Please refer to the introduction in lines 123-126 of the revised manuscript.

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.

We modified the sentence for clarity. The correct sentence should be: "The coarsest spatial resolution (i.e. 40,5 km) of forcings shows the highest errors"

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

We thank the reviewer for acknowledging the organization of the paper.

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 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.

Point taken. We changed the text to: "The different spatial distributions obtained suggest that meteorological data with a ***resolution close to the one of the hydrologic model*** *is needed to accurately reproduce the distribution as well as the total volume of snow water equivalent"*

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.

Climate models are used to simulate the current or past meteorological conditions (like the simulations we performed in this study) and also to predict the future climate conditions. In this sentence, we are referring to the use of climate models to project into the future. Our future studies will assess the impact

of the spatial resolution of forcing on the simulated hydrology using future climate projections instead of the past meteorological conditions.