Interactive comment on "The value of ASCAT soil moisture and MODIS snow cover data for calibrating a conceptual hydrologic model" *by* Rui Tong et al.

Anonymous Referee #1

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Comments on "The value of ASCAT soil moisture and MODIS snow cover data for calibrating a conceptual hydrologic model"

The authors calibrated a conceptual hydrological model by using ASCAT soil moisture and MODIS snow cover data jointly or separately, and improvements of related variants have been achieved in varying degrees. The efficiency improvement was also analyzed under different scenarios and catchment attributes. Overall, the results seem convincing and the study is valuable for related research. However, there are several issues that still exist and need to be clarified further as indicated in the following.

First, the manuscript needs further editorial work to improve the paragraph structure

and some vague expressions. A single sentence definitely cannot be a paragraph (e.g., line 286), and a paragraph should not be too long or too short. In addition, please pay attention to vague expressions in this manuscript, such as line 84 " to compare the multiple objective calibration to soil moisture and runoff to three different calibration variants", which is really confusing. There are other similar sentences, so I hope the authors make a thorough change to improve the clarity of the manuscript.

Another major issue in this manuscript is that conclusions in the Results section can be presented in a more straightforward way. At its current form, the conclusions are over detailed and have too many numbers, which do not have much value. It is hard for the readers to get the key messages from the authors. Furthermore, the figures and tables contain too much information (e.g., Fig5-6, Table 7-8), also leading to the difficulty in deriving the key information. So please make more concise and clearer conclusions, and improve the presentation of all figures and tables to make sure the key messages stand out.

Technically I have a couple of comments that might be useful for improving this study and manuscript:

L45-46 This sentence does not have an obvious relationship with the context and needs further description.

L68-69 Then how well does the ASCAT soil moisture perform in Austria compared to other soil moisture products? Is it the best one? Have you had a chance to look at ESA CCI soil moisture product that blends a variety of passive and active microwave soil moisture products and seems to be more widely used.

L71 "The launch of the Sentinel-1 series provides observations at a high spatial resolution of 5x20 m". Can you clarify this further? Even though with higher spatial resolution using radars, does Sentinel-1 have sufficient spatial coverage to implement research like yours?

Table 1 This table can be moved to supplement materials.

L167-168 Were the parameters for different catchments different or the same? And how was the calibration scheme carried out? Were parameters for all catchments calibrated together or one by one?

L253 Why was this calibration period chosen? Typically, the calibration period should include historically wet, dry and average years.

L247-248: 0.3 seems to be a threshold value, is there any reason behind this?

L272-274 So can we pick out which weight allocation has the best performance for all three components. When do these components have the same weight? The conclusion would be easier to follow with fewer numbers.

L279-281 What does it mean with larger regional variability? This needs to be clarified further.

L283 "OSC tends to increase and the regional variability decreases for the variants involving SSC". Is there any reason behind this?

L289-293 The time coverage of soil moisture is nearly the same in the calibration and simulation periods (four water years), then why is the performance metric smaller in the calibration period than the simulation period? And why did the snow model perform better with fewer below zero temperature days?

L308-311 How did you derive this conclusion? Fig. 5 only shows the correlation between model performance and changing wQ, and readers cannot obtain information about changing attributes and their impacts on model performance.

L390-392 What does this stand for and what is the reason behind this? Given all the comments and issues indicated above, I recommend major to moderate revision prior to the acceptance of this manuscript into HESS.

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