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Hydrology and Earth System Sciences
Discussions

Interactive comment on "HESS Opinions: The need for process-based evaluation of large-domain hyper-resolution models" *by* L. A. Melsen et al.

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Dear Anonymous Referee #1,

We thank the referee for his or her positive response to our manuscript. We indeed believe that collective engagement is needed at this stage to further enhance large-domain hydrological modelling, although, as we also mention, this is just one of the many problems that have to be tackled in this field.
Specific Comment (1); We acknowledge that the way forward is not easy and clear,

there is not one simple solution. The way forward is to do more measurements at a higher interval, but we all know how difficult it is to set-up and maintain a network and distribute the data. In the paper we mention the Global Runoff Data Centre (GRDC), which is often used in large-domain studies. It would mean a leap in our capabilities to simulate the continental hydrological cycle if the data available at this centre would increase to a daily (or even hourly!) observation time interval. As we can read in the second review provided by Marc Bierkens, most large-domain models are already run at the daily or sub-daily time step. However, our study showed that they are not always validated at this time step. Especially for large-domain studies, where data collection from all the separate involved basins at different institutes is very time consuming (explaining the success of the GRDC), we need the data gathered at one point with a high temporal resolution.

Specific Comment (2); We agree with the point made herethis point. We need to resolve both the dominant and the end-user relevant processes. We will adapt this in the manuscript. Calibration and validation should be performed at a time interval smaller than or equal to the process time scale of the end-user relevant process. Specific Comment (3); Unfortunately, it is not clear to us which resources are meant. Could you elaborate on that? Concerning the number of studies that 'violate' the pathways in Figure 1; it is not clear when these pathways are violated, this of course also depends on the end-user of the data. Like Marc Bierkens wrote in his review; daily soil moisture data can still be useful for farmers at a small spatial scale. However, I can give you some examples of literature where the soil moisture was calibrated on a monthly time step, and interpreted at a daily time step (Liu et al. (HESS 17, 2013), Costa-Cabral et al. (CC 116, 2013)).

We further agree on the minor comments that were provided, they will be included in next version.