

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

Anonymous Referee #1

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In this opinion paper, Melsen et al. argue for a process-based evaluation of large-domain hyper-resolution models. The authors analyzed metadata for the VIC model and revealed the mismatch between development of spatial resolution and calibration/validation time interval over the years. Based on this meta-analysis, the authors proposed a more robust process-based model evaluation based on “time concepts”. First of all, I would like to give a shout-out to the authors for writing this much-needed commentary on a very important topic in water resources/hydrology. I think this commentary raises a very important issue in hydrologic modeling field. Over the years, advancement in remotely sensed data acquisition techniques have helped increase the spatial resolution at which hydrologic models are applied. However, the temporal reso-

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lutions of hydro-meteorological data have remained unchanged for a variety of reasons. The issues raised by the authors can only be resolved by a collective engagement between the stakeholders and modelers that can only be achieved by making sure that this message gets across wide range of audiences.

I have given a careful read to the write-up and here are few specific and minor comments that requires some attention before the final publication:

Specific Comments: (1) Although you have acknowledged the lack of fine-resolution data availability in section 2, I think it requires a bit more discussion in terms of how to deal with the current challenges. What are the ways forward? A little more discussion in terms of potential new data acquisition techniques and investments from utilities and natural resource agencies would be helpful. (2) On page 13362 L25 you argue for resolving “the dominant processes”. But this may or may not accurately capture the processes relevant (e.g. low flow or floods) to the end-user. What we really need is a bit of both- resolving dominant and most relevant processes. I guess this is what you mean by “process-based calibration and validation” in the preceding sentences but its not entirely clear to me. (3) On page 13364 you list lack of computation power or a lack of (using) observation as the two causes of the discrepancy highlighted in the paper. However, the one item that is missing from this list is the resource (other than computing) availability and motivation/need to calibrate and validate the model at fine temporal resolution. From your meta-analysis what is not clear to me is how many of the VIC studies listed in Table 1 have violated the pathways shown in Fig. 1. In other words, what proportions of the listed studies have attempted to describe the processes that are not captured at the temporal scale at which model was calibrated and validated, e.g. predicting flashflood with monthly model calibration.

Minor Comments P13364L10 change “VIC models” to “VIC model” P13368L27 for consistency provide citation or e.g. for “structural uncertainty” P13369L1 suggest “process-based evaluation and validation”

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