

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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We thank the referee for his constructive review, and for, ‘in principal’, agreeing with us. We do, however, want to emphasize that we not only strive to run models at higher temporal resolution, but especially also to calibrate and validate the models at a higher temporal resolution.

1. The explanation of our definition of ‘scale’ and ‘resolution’ come after the introduction. We indeed found some cases which are inconsistent with our definition later (‘hyper-resolution scale’). We will make sure to make this consistent in the next version

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and to provide it with a definition. We are considering to restructure the story, to move the definitions to before the VIC example.

In Bierkens et al., (2000) the term ‘scale’ is used synonymous to ‘support’ (Glossary, p.178), where ‘support’ is defined as ‘the largest time interval, area or volume for which the property of interest is considered homogeneous’, which basically comes down to our definition of ‘resolution’ (where we, for now, ignore the sub-grid variability that can be implemented in VIC), whereas we use the definition of ‘scale’ as a continuous variable. So, the definitions between Bierkens et al. (2000) and our manuscript are not completely consistent. We did, however, try to formulate our definitions following the terminology as it is used in practice nowadays, where ‘resolution’ is a common term in distributed modelling. We did, on purpose, use the word ‘large-domain’ in the title instead of ‘large-scale’ (which is also common current day modelling terminology) to avoid misunderstanding on the extent versus resolution (although we agree that large-extent could be an alternative for large-domain).

2. As written under (1), we are considering to restructure the manuscript to move the definitions to earlier in our plea. We agree that the time steps could also be divided into model time scale (although that not necessarily comprehends the process time scale, because the process time scale is independent from the model), observation time scale (indeed, input and validation), and ‘policy’ time scale. However, we do not completely agree with the term ‘policy’-time scale in our context, because our interpretation time interval can be much broader than for policy purposes only (e.g. interpretation by scientists, used for their research).

We do agree with the fact that daily soil moisture data on a small parcel can be useful for the farmer. We do not provide hard guide lines describing which spatial and temporal resolution should be used combined, this (amongst others) depends on the process time scale and the end user. Our main point is that the models should have been validated on the time interval at which they eventually will be interpreted.

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So, yes, daily soil moisture for the farmer at field level can be useful, but what do we know of the model credibility on a daily time step if this model has been validated on a monthly time step only?

3. This is indeed exactly the problem that we are facing; how to obtain high temporal-resolution data for a large domain? This same question was asked by Anonymous Referee 1, and we must admit that there is not a simple answer to this question (see our answer to Referee 1, Specific Comment 1). Therefore we think that this should be the first question we should try to answer as a community, before we further develop large-domain hyper-resolution models.

4. Yes, the cost of storage is indeed a challenge. But the same holds for the spatial resolution of the model and the data that is needed to support this spatial resolution. The numbers that are mentioned by the reviewer should be compared to the effort (in man-hours, computer-hours, and storage) which have been invested in increasing the spatial resolution of hydrological models over the last couple of years. We argue that the temporal resolution (and the calibration/validation!) should keep pace with the spatial resolution. If the storage is an issue, a solution could be to decrease the spatial resolution slightly in order to be able to increase the temporal resolution slightly; this is a trade-off and a choice of the modeller, and therefore not an argument or excuse not to validate/evaluate at a higher temporal resolution. We do not think that each university group should have such large data repositories. Rather, when it concerns very large-domain or global models, national organizations like KNMI or ECMWF could manage these data.

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