

Interactive comment on “Sub-daily runoff simulations with parameters inferred at the daily time scale” by J. E. Reynolds et al.

Anonymous Referee #1

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This paper compares various numerical methods for the implementation of the HBV light model, in order to analyze the time scale dependencies of model parameters. The paper concludes that the time scale dependencies can be eliminated through appropriate choices of numerical methods, and it suggests as one of the conclusions to run the model at the time step of its intended use (e.g. hourly), even when data are available at coarser (e.g. daily) time scales.

The paper is interesting, and it brings to the attention an issue that is often overlooked. However, there are several problems, which can be overcome through a careful revision.

1. The paper does not address its main motivation, which is to produce forecasts at

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subdaily time scales, when data are available at daily time scales. In fact, the case study uses available 15-min discharge data aggregated to 1-, 3-, 6-, 12- and 24-hourly time series. The Authors used the hourly data to construct the aggregated time series, which would not have been possible if the hourly data were not available. If the Authors wanted to conduct an analysis which complies with their motivation, they should have used daily streamflow readings (i.e. the streamflow at a particular time of a day), and see how the simulation using these data would work if hourly data were available.

2. It is difficult to draw general conclusions from a single model / single catchment study. In fact, the conclusion that ‘parameter sets inferred at one time scale (e.g., daily) could be used directly for runoff simulations at other time scales (e.g., 3 or 6 h) without any time scaling’ may not be general. Such conclusions depend on the type of catchment and its associated processes, and on the difference between ‘one time scale’ and ‘other time scales’. Some catchment demonstrate processes that have a subhourly time scale, which would not be visible at daily resolution. Moving from daily to 6 hrs data is different than moving from monthly to hourly data. Arguably, it would be very difficult to reconstruct daily or hourly time series from monthly data. The use of more catchments with different processes (e.g. fast reacting and slow reacting systems) and the comparison across a wider range of time scales could help to clarify this issue, and point to more specific and constructive conclusions.

3. The Authors state that the explicit Euler method at 1 h time steps is an adequate numerical method (abstract). This conclusion is largely empirical and related to the particular conditions of the case study. Earlier work discouraged the use of the explicit Euler for the implementation of hydrological models. In light of this, the Author should not present this as a general conclusion.

4. This paper adds little to other papers in the literature. The issue of time scale dependencies has already been comprehensively discussed in earlier papers (cited in the Authors work). The authors should therefore put some efforts to bring out the novelty of their work.

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