

## Reply on RC4

Jan Seibert and Sten Bergström

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Author comment on "A retrospective on hydrological catchment modelling based on half a century with the HBV model" by Jan Seibert and Sten Bergström, Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-542-AC4>, 2022

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We appreciate the positive assessment of our manuscript and the helpful list of comments. Especially we like the statement, "This is a nicely written story about the HBV model in the context of hydrological model developments in the last 50 years. The style of the paper is somewhat unusual - casual but certainly acceptable." Here we reply to the seven points raised by the reviewer:

- Good point. We are afraid to make the manuscript harder to read if we insert the model equations. However, we could add an appendix similar to the one we had in Seibert&Vis (2012).
- We agree on this potential for physically-based models like SHE, although we might be less optimistic that the additional constraints (always) compensate for the increased degrees of freedom. But of course, there are applications where we need a better representation of internal fluxes and states. We will clarify this in the revised version.
- Thanks for making us aware that we missed discussing evapotranspiration in any detail. We will add some information on evapotranspiration, especially how to derive Epot for the input, in the revision.
- The often limited sensitivity to random errors is indeed an advantage of HBV, but also other water balance accounting errors. We agree that this is another reason why such models often perform well despite not-so-good input data. We see this related to one of the three P-s and will add this valuable thought to the discussion of model performance.
- Thanks for making us aware of this interesting study. We will add the use of HBV for land-use change studies as suggested by Hundecha and Bárdossy (2004) in section 4.1
- With "insignificant subroutines" we meant subroutines that are not affecting the (runoff) simulation substantially. Following the comment, we will change this to "subroutines representing insignificant process details"
- We agree that it is an interesting question how models like HBV can make use out of different types of data and happily will make this clearer in the revision. We assume the term 'indirect data' refers to data such as soft data (Seibert and McDonnell, 2002), data collected by the public in citizen science projects, or as a by-product of social media (e.g., Twitter), or other types of 'unusual' data sources.

Hundecha, Y., Bárdossy, A., 2004. Modeling of the effect of land use changes on the runoff generation of a river basin through parameter regionalization of a watershed model. J. Hydrol. 292, 281–295. <https://doi.org/10.1016/j.jhydrol.2004.01.002>

Seibert, J., and J. J. McDonnell, 2002. On the dialog between experimentalist and modeler in catchment hydrology: Use of soft data for multicriteria model calibration, *Water Resour. Res.*, 38(11), 1241, doi:10.1029/2001WR000978.

Seibert, J. and Vis, M. J. P.: Teaching hydrological modeling with a user-friendly catchment-runoff-model software package, *Hydrol. Earth Syst. Sci.*, 16, 3315–3325, <https://doi.org/10.5194/hess-16-3315-2012>, 2012.