

Interactive comment on “Top-down analysis of collated streamflow data from heterogeneous catchments leads to underestimation of land cover influence” by A. I. J. M. van Dijk et al.

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Dear editor

Some of the comments make it clear that we have not been able to explain our objective and conclusions well. We have tried to address this in revising the m/s. We appreciate that our synthetic experiment is rather different from more common conventional papers that typically attempt to evaluate model performance or analyse observations. Our goal was neither. To hopefully avoid any misinterpretation, in our revised m/s we have added a Caveats section directly after the objective, in which we make explicit

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what our objectives were NOT. It addresses several of the issues raised by the editor and reviewers. It reads (line 197- 222):

“1.3 Caveats.

The way in which we use models in this experiment is not unique but somewhat unusual in the hydrological literature, and comments on earlier versions of this paper suggest our objectives can be misunderstood. It may be worthwhile to state what our objectives are explicitly not:

- We do not aim to validate or falsify the dynamic process model (AWRA-L) we used in this experiment. We also do not aim to prove that the model structure and parameter values used here are the best possible description of reality, or better than other model or models. Any model can only ever be a flawed and simplified abstraction of reality (Oreskes et al., 1994). We only use the AWRA-L model because we understand its behaviour well and because it is able to reproduce two key features also observed in real data sets that are discussed in more detail further below. Any other model able to meet this criterion would have been suitable for the experiment.

- We do not aim to prove that the methodological issues described are the only or even the main cause for the paradox discussed. Their presence certainly would not negate the plausibility and presence of additional methodological or physical explanations, and we will discuss some of these.

- Similarly, we do not propose that we can use the more complex model to detect or demonstrate a land cover influence. This is neither necessary (we refer to the empirical evidence discussed) nor possible (a model cannot provide proof). We will discuss this point in more detail further on.

- We do not aim to falsify or discredit Budyko type models as a useful and predictive theory, and do not question the usefulness of ‘top-down’ analysis as a paradigm. We focus here on only one very specific application, that is, whether analysing collated data

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from heterogeneous catchments by fitting a form of the Budyko model (a composite Zhang curve model) is able to accurately detect land cover influence.”

We trust that this also addresses the comment referred to by the editor, about how we dealt with ‘ecohydrology’. (While the process model we used includes a range of ecohydrological processes, fundamentally we did not pretend to prove whether they are important. As we explain in the text above, the importance of such effects does not affect our objective.)

To further avoid misinterpretation or misrepresentation, we have tried to carefully revise statements around the objective, limitations and conclusions, including in the title and abstract.

As to whether we actually ‘reconciled’ the paradox introduced in the beginning, there is probably a semantic argument there. We would argue that we are able to reconcile the paradoxical results, in the sense that we provide a plausible explanation. As hopefully is now clear from the Caveats, we readily concede that we do not prove that this explanation is the only or main cause. It should help future studies to avoid wrong interpretation of top-down analyses of the type investigated here, however.

We further interpret (perhaps wrongly) from the editor’s comments that we are giving the impression of wanting to whip up a major controversy by using the term paradox. We only used the word because it has a well-defined and useful meaning and did not consider it an ‘elevated’ or ‘dramatic’ concept (as suggested by reviewer 3). To avoid wrong impressions, in the revised version we have replace some instances of ‘paradox’ with (near) synonyms such as ‘paradoxical results’, ‘apparent contradiction’ and ‘seemingly contradictory’; though we are unsure if this improves the clarity of the manuscript. Perhaps the use of single quotation marks around ‘land cover paradox’ contributed to this impression. We used this as a textual convenience but it is obviously not essential and we have removed them to be on the safe side. We hope these changes address the editors concern.

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Detailed point-by-point responses are provided in responses to the individual reviews.

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