**Hydrology and
Earth System
Sciences
Discussions**

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Interactive comment on "Comparative assessment of predictions in ungauged basins – Part 3: Runoff signatures in Austria" *by* A. Viglione et al.

T. Euser (Referee)

t.euser@tudelft.nl

In this paper the authors address the quality of predictions in ungauged basins (PUB). After a decade of new ideas and research initiatives their aim is to compare some of the used techniques to assess the quality is of these new predictions and methods. In this study they compare two regionalisation methods, a process based method (with the HBV rainfall-runoff model) and a statistical method (Top-Kriging). For this comparison they used many Austrian catchments. The comparison of these two methods is based on the prediction of signatures: which method is better in predicting specific signatures.

I think that the concept of the paper is very relevant: it is good to look back and assess the quality and usefulness of previous work. In addition, I fully agree with the authors

that a comparison based on signatures is much more informative than a comparison only based on the highest Nash-Sutcliffe Efficiencies.

However, I do not think the the paper is well structured and referenced. I am wondering why the authors did not use the more 'standard' outline for a paper, starting with a proper introduction, which summarises the work of PUB and introduces the techniques compared in this study. Followed by an description of the study area, in which the main differences between the Austrian catchment can be described. In the following methodology section the two regionalisation methods and the signatures can be described more extensively. I think that this will prevent a lot of forward referring and would make the structure of the paper more clear. In addition, I would advice to split the result and discussion section into two sections. The results require a lot of discussion, which is provided by the authors, and this discussion would be easier to follow when it is separated from the results. Finally, I would advice the authors to have another look at their conclusion and move discussion points from the conclusions to the discussion section.

Regarding the references used in this paper. In the introduction the authors state that their aim is to assess the performance of methods to predict runoff developed during the PUB decade. If this is the aim, the amount of references regarding studies in the PUB decade is really limited. I think that the introduction should at least contain several examples of the two regionalisation methods. In addition, a lot of people worked with signatures and regionalisation before, adding some of these reference would make the introduction stronger.

Finally, there are a lot of small things in the paper which are not completely clear or consequent. Among them the the calibration and exact regionalisation procedure. For example which catchments are used as donor catchments for which catchments

and are multiple catchments used as donor catchment? How is determined which catchments could function well as donor catchments for a specific catchment? The authors also note that the used objective function during calibration can influence the results. Can they also comment in which way and to which extent this can influence the final results?

To conclude, I think the concept of the paper is good and important; however, I think it requires quite some rewriting before it is publishable.

Minor suggestions/questions:

- p450, l5: What is a consistent data set?

- p450, l26: Add some references with examples.

- p451, l5: Add a reference with an example of cross-validation.

- p451, l15: Are the yearly and seasonal runoff not more dependent on rainfall than on actual catchment behaviour?

- p451, l23: The total hydrograph does not seem to be a useful signature too me, because it is too complex. However, in the following of the paper it turns out that again a specific element from the hydrograph is used (the integral scale), it is maybe better to describe earlier in the paper that actually this signature is used.

- p451, l26: This sentence does not seem to be correct.

- p452, l20: (of 213 catchments in Austria) instead of (Austria)

- p452, l21: Why are these two methods selected?

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- p452, l23: How well *can* we predict

- p455, l14: Add a reference for comparative hydrology.

- p455, l17: Add a reference for the richness of signatures across the world.

- p455, l24: Add a reference for both methods.

- p456, l5: I think it should be physically based instead of physics-based.

- p456, l10: Why is the HBV model selected as rainfall-runoff model?

- p456, l16: This sentence does not seem to be correct.

- p456, l19: site*s*

- p456, l24-27: This sentence does not seem to be correct.

- p457, l4: How many stations for precipitation and evaporation observations are used?

- p457, l3/l23: Did the authors first predict the runoff and afterwards calculate the signatures?

- p458, l4: How many stations for precipitation and evaporation observations are used?

- p458, l23: Table 2 is mentioned earlier in the text than Table 1, it is maybe better to change the numbering of the tables.

- p458, l22: These seem to be results, instead of a description of the methods.

- p460, l15: This criterion is not clear for me, maybe add a reference.

- p461, Are these performance measures used before, if yes, maybe add a reference.

- p462, l10: How well *can* we predict

- p462, l17: How many rainfall stations are used and where are they located?

- p464, l5: Did the authors perform a visual inspection or did they weighted the performance measures?

- p464, l10: Add reference or formula.

- p464, l16: This sentence does not seem to be correct.

- p464, l16: Catchment size is probably more clear than catchment area.

- p465, l7: The authors list a number of arguments why the performance is better for larger catchments. Could it be that larger catchments are more comparable due to averaging and mixing of different processes and that therefore, regionalisations give better results?

- p468, l9: Add a reference.

- p469, l12: One of the reasons the Top-Kriging method works better is, according to the authors, because of the stream gauge density. Why are not the same (amount of) gauges used for both methods?

- p469, l16: So, if I understand it right, Top-Kriging is most suitable to use when a lot of data is available for the surrounding areas, how does this relate to PUB?

- p470, l3: regionalisation instead of regionalation.

- p481-484: Although papers are published in color, they are often printed in black and white by readers. Therefore, I would change one of the squares in a circle or diamond, to prevent the use of different colors.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 449, 2013.

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