**Hydrology and
Earth System
Sciences
Discussions**

Interactive
Comment

Interactive comment on "The role of catchment classification in rainfall-runoff modeling" *by* Y. He et al.

Y. He et al.

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The authors wish to express sincere gratitude to Prof. Wagner for his very valuable comments.

We agree that the manuscript in its current form can benefit from improvements to its structure, logic and style of reporting although there are many good bits. We will endeavour to make the manuscript coherent and succinct by taking out irrelevant texts and linking the sections with schematics, figures or tables.

The authors address the "specific comments" as follows:

W: Using the word arbitrary in the abstract to describe non-natural schemes suggests

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a process that is not guided or not informed, which I do not think is the case. Is there not a better word than arbitrary?

- The word "arbitrary" is misleading. The objective of the statistical catchment classification (SCC) is to classify the catchments based on the hydrologic functions or behaviours. I will replace it with "interpretive", to indicate the SCC category interprets hydrologic functions or behaviours with multivariate data using statistical methods.

W: The discussion of function of an object in section could be related to the discussion of catchment function in Black (1996) and Wagener et al. (2007). it might provide another connecting element.

- Not sure which section the comment referred to, but the discussion of functions has been well covered in Black (1996) and Wagener et al. (2007). This paper doesn't intend to focus on the discussion of watershed or catchment functions but presents it as one of the basis for hydrologic similarity.

W: There is some repetition in the text. For example the content of section 2.2.1 had been discussed earlier.

- Regionalization was discussed in Section 2.1.4, 2.1.5, 2.2.1 and 3.1.2, but there was no repetition because the same word "regionalization" has different meanings in the context of geography, hydrology and even statistical hydrology, which was explained towards the end of Section 2.1.5. To make the structure clearer, the Section 2.2.1 will be removed and discussion of regionalization in different contexts will be pointed out in the beginning of the text.

W: It would be good to include hydrologic landscape units as defined by Winter (2001, JAWRA) and ecoregions in the discussion here.

- A good point, will be taken into consideration in the revised manuscript.

W: The review is missing some discussion of the idea of signature regionalization (e.g. Yadav et al., 2007, Advances in Water Resources, Bulygina et al., 2009, HESS, 2010,

WRR; etc.) as model constraints and of kriging approaches to flow regionalization (e.g. Laaha or Archfield). The idea of classification (connected to RR modeling) is especially strong in the first approach. If we would know a priori how a catchment behaves hydrologically then we can use this information to constrain any hydrologic model! Hence a functional classification could achieve this.

- The idea of signature regionalization will be added to the Section 3.

W: There are some spelling mistakes that need to be corrected.

- Will check spelling and correct typos.

W: Why does catchment structural similarity include wavelet analysis? Isn't this rather functional or behavioural similarity?

- Wavelet analysis listed in 2.2.2 Catchment structural similarity will be moved to Section 3.

W: Section three has a reference to Bardossy lecture notes, which I think needs adjustment since these are not available for others to review.

- This is correct. Will rephrase it.

W: See Wagener and Wheater (2006, JoH) for another discussion of the problem of lack of identifiability of parameters as well as of model structural uncertainty for regionalization.

- will take this into consideration in the revision.

W: The periodic table of elements paragraph does not really add anything. I suggest deleting it and just mention it as an example in a sentence elsewhere.

- The point made in Section 2.1.4 is "Unlike the top-down hierarchical classification system in biology, the periodic 5 table is based on the recurring trends of the properties of the elements." It could be a useful idea in formulating certain hydrologic similarity

and classification systems.

W: No review is going to be complete. I refrained from making a long list of papers that I think should also be included since it is not really the point. These days due to the larger number of papers out there it is impossible to include them all. I expect a review to provide some nice connections or larger scale picture that I did not previously have. Here is where the paper falls short. How about some conceptual figure that provides a structure for the discussion? Maybe even in the form of a decision/classification tree that 'classifies' the types of classification approaches and suggests when to use what? It would also be good to discuss what the different approaches can ultimately achieve and how they might have to be combined.

- very good suggestion of using some conceptual figure that provides a structure for the discussion. It is also useful to discuss what the different approaches can ultimately achieve and how they might have to be combined.

W: The discussion of individual papers by others could be shortened (section 3.2) and the generic aspects of the paper could be enhanced. It might also be good to have another quick look through most recent papers and see where they could fit in. Not to include more discussion of other papers, but to show the large increase in PUB literature (for example).

- Section 3.2 acknowledged a large number of regional studies have been published but discussed in details 6 papers which are considered as representative regional studies. But it may be better to summarise papers in a table according to the methodology, regions and models used.

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