

## ***Interactive comment on “Catchment classification: empirical analysis of hydrologic similarity based on catchment function in the eastern USA” by K. Sawicz et al.***

**Anonymous Referee #2**

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The paper analyses the important hydrological topic of catchment classification based on limited available data. It is well structured and well written, methods are well described, as well. Results of clustering streamflow characteristics are well linked to clusters based on catchment characteristics, enabling the analysis of control variables. Presentation of results as well as discussion is detailed and reveals the potential of the selected methods. The only significant deficit of the paper is citation and referencing. The authors are asked to carefully check the citations and the list of references! A huge amount of mistakes was found. A useful addendum would be to mention successful applications of cluster analysis in different fields of hydrology, as mentioned below in

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the specific comments.

Specific comments

- P4497, L6: Gupta et al., 2008, is not in the list of references
- P4498, L10: Black (1990 or 1997)?
- P4498, L27: Merz and Blöschl (2009) is not in the references; do you mean 2004/2005?
- P4500, L1: Broxton et al. (2009) is not in the references
- P4500, L4ff (or P4506, L6ff): Before focusing on the specific value of this study I suggest to add a few words on the usefulness of cluster analysis in general in hydrological classification. A few studies could be cited having applied cluster analyses to identify similarity in different parts of hydrological research: Catchment classification (e.g., Ramachandra Rao and Srinivas, 2006), flow regime (e.g., Moliere et al., 2009), water quality (e.g., Panda et al., 2006; McNeil et al., 2005), climate (e.g., Raju and Kumar, 2007), hydrological behaviour of HRUs (e.g., Bormann et al., 1999), soil textural grouping (e.g., Bormann, 2010).
- P4500, L17: Carillo et al. (2011) is not in the references
- P4500, L23-25: Please explain cover type and eco-regions for those readers who do not know this classification.
- P4505, L23: Brutsaert and Nieber (1977) is not in the references
- P4506, L18ff: Please explain why you decided to use this kind of cluster analysis. What is the advantage compared to others?
- P4506, L24: Do you mean Webb et al. (2007)?
- P4507, L1: did you also standardise the variables? Not standardising may put different weights on the different signatures?!

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- P4507, L13/16: ARI or ARO?
- P4507, L22-24: repetition (correlation with other signatures): please delete.
- P4513, L3-6: It can be expected that including catchments from different climatic zones in one analysis will result in climate variables dominating catchment classification
- P4513, L19-20: see also Bormann (2010) and Bormann et al. (1999)
- P4513, L25: IBF?
- P4516, L6: 11 or 9 clusters?
- P4516, L9: do those landscape characteristics change slowly in space? Or are they distributed in a zonal way?
- P4516, L17-24: why do you predominantly focus on tracers as alternative? Hydrological modelling could serve as an at least similarly useful tool.
- P4516, L25: for site models, see Bormann (2010) with respect to modelling experiments on soil texture characteristics, and Bormann et al. (1999) modelling experiments based on HRU (systematic combinations of soil, land use and topographic characteristics)

#### References

- P4517, L10: Abrahams (1984) is not cited in the text, delete from references
- P4517, L12: Andrews (1972) is not cited in the text, delete from references
- P4517, L22: Beighley et al. (2005) is not cited in the text, delete from references
- P4517, L24: Berne et al. (2005) is not cited in the text, delete from references
- P4518, L1: Beven and Kirkby (1979) is not cited in the text, delete from references
- P4518, L4: Blöschl and Sivapalan (1995) is not cited in the text, delete from references

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- P4518, L8: Bras (1990) is not cited in the text, delete from references
- P4518, L10: Breiman et al. (1984) is not cited in the text, delete from references
- P4518, L18: Clapp and Hornberger (1978) is not cited in the text, delete from references
- P4518, L20: Clark and Pregibon (1992) is not cited in the text, delete from references
- P4518, L23: Clausen and Biggs (2000) is not cited in the text, delete from references
- P4519, L2: Falkenmark et al. (2004) is not cited in the text, delete from references
- P4519, L4: Figueiredo and Jain (2002) is not cited in the text, delete from references
- P4519, L6: Fu et al. (2007) is not cited in the text, delete from references
- P4519, L9: Gelman et al. (2003) is not cited in the text, delete from references
- P4519, L11: Gordon et al. (2004) is not cited in the text, delete from references
- P4519, L15: Gould (1989) is not cited in the text, delete from references
- P4519, L17: Gower and Ross (1969) is not cited in the text, delete from references
- P4519, L26: Hannah et al. (2005) is not cited in the text, delete from references
- P4519, L28: Harman et al. (2009) is not cited in the text, delete from references
- P4519, L33: Horton (1945) is not cited in the text, delete from references
- P4520, L13: King (1969) is not cited in the text, delete from references
- P4520, L14: Kirchner (2009) is not cited in the text, delete from references
- P4520, L17: Krasovskaia (1998) is not cited in the text, delete from references
- P4520, L19: Krasovskaia (1999) is not cited in the text, delete from references

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- P4520, L25: Lagacherie et al (1997) is not cited in the text, delete from references
- P4520, L28: Langbein (1947) is not cited in the text, delete from references
- P4520, L33: Lyne and Hollick (1979) is not cited in the text, delete from references
- P4521, L18: Merz and Blöschl (2005) is not cited in the text, delete from references
- P4521, L32: O'Sullivan and Unwin (2003) is not cited in the text, delete from references
- P4522, L8-15: Oudin et al. (2008) is mentioned twice in the list of references
- P4522, L22: Pike (1964) is not cited in the text, delete from references
- P4522, L30: Richards (1990) is not cited in the text, delete from references
- P4522, L32: Richter et al. (1996) is not cited in the text, delete from references
- P4523, L15: Sanz and del Jalon (2005) is not cited in the text, delete from references
- P4523, L17: Sawicz (2009) is not cited in the text, delete from references
- P4523, L24: Schumm (1956) is not cited in the text, delete from references
- P4523, L26: Schwartz et al. (2006) is not cited in the text, delete from references
- P4524, L1: Strahler (1924) is not cited in the text, delete from references
- P4524, L3-5: Stutz and Cheeseman (1994): two different years are mentioned in the reference (1994, 1995); is this correct?
- P4524, L11: Van Haveren (1986) is not cited in the text, delete from references
- P4525, L3: Weiskel et al. (2007) is not cited in the text, delete from references
- P4525, L16, Woods (2003) is not cited in the text, delete from references

Literature

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- Bormann, H., 2010. Towards a hydrologically motivated soil texture classification. *Geoderma* 157, 142-153.
- Bormann, H., Diekkrüger, B., Renschler, C., 1999. Regionalization concept for hydrological modelling on different scales using a physically based model: results and evaluation. *Phys. Chem. Earth B*. 24 (7), 799–804.
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- Moliere, D.R., Lowry, J.B.C., Humphrey, C.L., 2009. Classifying the flow regime of data-limited streams in the wet–dry tropical region of Australia. *J. Hydrol.* 367 (1–2), 1–13.
- Panda, U.C., Sundaray, S.K., Rath, P., Nayak, B.B., Bhatta, D., 2006. Application of factor and cluster analysis for characterization of river and estuarine water systems – a case study: Mahanadi River (India). *J. Hydrol.* 331, 434–445.
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- Ramachandra Rao, A., Srinivas, V.V., 2006. Regionalization of watersheds by hybrid cluster analysis. *J. Hydrol.* 318, 37–56.

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