Hydrol. Earth Syst. Sci. Discuss., 10, C3199–C3203, 2013
www.hydrol-earth-syst-sci-discuss.net/10/C3199/2013/

Hydrology and Earth System Sciences
Discussions

Interactive comment on "Technical Note: Characterizing hydrologic change through catchment classification" *by* K. A. Sawicz et al.

Simon Seibert (Referee)

simon.seibert@kit.edu

Received and published: 17 July 2013

The authors developed a signature based classification scheme for catchments using clustering and decision tree techniques and applied it to a subset of the MOPEX dataset. By repeating their classification procedure over different decades the authors studied temporal and spatial similarity and dissimilarity between groups of catchments over time. The paper is well structured and well-written and the idea is worth publishing. Nevertheless, I suggest to revise a number of points:

Main points

6603L14: Please comment why you selected the provided signatures

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

6604: Q90 is in [mm], Q10 has been normalized and does not have a unit. Please explain why.

6604: I expect that some of the provided signatures are correlated (e.g. Q90 and IBF?). Please provide information on the correlation between the signatures

6605L10: “A CART analysis (. . .) was performed using all six signatures to predict the class assignment generated from the AutoClass cluster result”. This sentence sounds like you are applying the CART analysis to understand and reconstruct the behavior of your clustering algorithm. Please explain in more detail why you applied the clustering and the CART analysis here.

6609: Your discussion on the potential impact of both climate and land use change on hydrologic signatures (line 8 to end) is very brief, in some cases speculative and it even contains a few inaccuracies. For instance I disagree with your general statement in Line 14 "logging can increase the amount of water stored in the soil". Logging (if you mean deforestation?) will increase mineralization in the soil, thereby decrease the soil organic carbon content and in turn may also lead to a reduction of water that can be stored in a soil. To my knowledge, the most significant impact of deforestation is the increase in water yield (Bosch and Hewlett 1982, Brown et al. 2013), which has not been mentioned in the text at all. I also disagree with the general statement you make in line 19: "increasing agricultural activity likely increases evapotranspiration". This depends on the type of the previous form of land use. If it was uncultivated land which was turned into (maybe irrigated?) cropland than it is true, but if it was a forest your statement might be wrong. There is a plethora of studies available which address the impact of changes in cover on water yield, ET and soil moisture dynamics. Since, such information is critical to understand the impact of both, climate and land use change on hydrologic signatures I suggest rewriting and re-structuring the entire section. Please try to make clear which change in land use is likely to have which consequence and please also provide information on the direction of change of your signature value wherever possible.

HESSD

10, C3199–C3203, 2013

You argue that changes to climate characteristics seem to explain most of the observed class change transitions but you do not provide information on (decadal-)changes of climate characteristics. Please provide data (e.g. time series plots of (decadal) mean annual precipitation, length of winter period, intra-annual seasonality of precipitation for selected locations) or literature. Both would help to follow your argumentation.

6615L21: I missed some conclusions regarding the value of the applied signatures. Please comment on that.

6616L23: If climate was found to be a primary control shouldn't we also ask and look for signatures which capture changes in climate and land use and include them in our classification attempts?

Minor points

6602L9: Please explain why you assume that "a decade is both required and sufficient" and provide examples on the variation of signature values within the selected decades.

6602L19: You excluded catchments that were heavily impacted by human activity. Please briefly comment what do you mean by "heavily", how you quantified "impacted" and what exactly was visually inspected.

6603L3: the cross reference to table 1 does not make any sense here

6603L14: Sawicz et al. 2011 is not on the reference list

6604L3: "This signature is a proxy for flow seasonality. . .". RSD sounds more like a proxy for the length of the winter period than for the flow seasonality. Please clarify.

6608L8: You often refer to states and distinct geographical regions like the Appalachians. Someone who is not familiar with the geography of the US will have trouble to follow your argumentation. Maybe you could add some of the regions you mention in

HESSD

10, C3199–C3203, 2013

the text to figure 1.

6610L6: Table 1 is not very insightful, since the overall variation between the periods is almost negligible for most of the signatures. A nice way to emphasize the existence of spatio-temporal variations would be to draw maps which show the absolute percentage of change in the signature values over time relative to the baseline period.

6610L6 to end: Very detailed. You could limit the discussion to variables which showed variance and summarize overall patterns (trends/ no trend) at the end of the paragraph.

Many abbreviations/ subscripted characters (e.g. SFDC vs. SFDC) are not used in a consistent way. Please correct

Figures and Tables

Fig. 1: 0 Small and energy (. . .) Please explain what you mean with 50/50 blue/green water split

Fig. 3: The caption is imprecise. Essentially it does not show physical and climate characteristics but the signatures you provided to CART and the way they were used to organize information. I suggest modifying the caption as follows "CART decision tree showing the signatures and resulting threshold values used for the classification of catchments in the baseline period".

Fig. 5: The inlay, all marker shapes and colors and the interpretation of changes are almost impossible to read when printed on a regular inkjet printer. Please redraw (maybe enlarge the maps and align them in single a column). In the caption: Please explain what a "key change" is.

Literature Bosch JM, Hewlett JD (1982): A review of catchment experiments to determine the effect of vegetation changes on water yield and evapotranspiration. Journal of Hydrology, 55, 3–23. Brown, AE, Western, AW, McMahon, TA, Zhang, L (2013): Impact of forest cover changes on annual streamflow and flow duration curves. Journal

HESSD

10, C3199–C3203, 2013

of Hydrology, 483 (13), 39-50.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 10, 6599, 2013.