

Interactive comment on “Hydrological recurrence as a measure for large river basin classification and process understanding” by R. Fernandez and T. Sayama

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After reading the discussion paper by Fernandez & Sayama I shared much of the same concerns as pointed out by reviewer#1. After reading the response by Fernandez I still think the authors need to better explain the link/difference of recurrence and seasonality aspects of the water balance. In the current explanation to show that seasonality does not equal recurrence, they ignore some of the key aspects of seasonality in the hydrological cycle.

By using the seasonality index as defined by Walsh and Lawler (1981) they ignore dur-

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ing which season of the year the precipitation is falling. Recent work by Petersen et al (2012) has shown how important the timing of precipitation compared to potential evaporation is for the seasonal streamflow regime. Similarly Berghuijs et al (2014) expose that the timing of precipitation compared to potential evaporation (and/or temperature) is also important for the seasonality of the other components of the water balance. By just using the seasonality of P this aspect is completely ignored. To exemplify that the definition by Walsh and Lawler (1981) is not very insightful to properly argue that recurrence is not just determined by seasonality I give 2 examples that are not covered by the current analysis, but in my opinion are very important to better understand if recurrence is fundamentally different from seasonality:

- If the monthly values of P and T/PET are in phase (when it's warm, there is most rain), precipitation can be very seasonal but discharge and storage can be rather constant over the year. With similar seasonality values of P, but now out of phase with T/PET (when it's cold, there is most rain) there is a very distinct seasonal pattern in storage and discharge. - In a cold region P can be relatively constant over the year, but discharge and storage are dominated by storage and melting of snow leading to very distinct seasonality. For a similar P regime with temperatures during winter generally above the freezing point this distinct seasonality is not occurring.

For details about both examples see the classification made by Berghuijs et al. (2014)

I think the authors should consider taking a more holistic view on seasonality and thereby consider the timing of P compared to T&PET to convince readers that recurrence is not just a surrogate of seasonality.

An additional suggestion: Potentially the catchment's aridity (P/PET) is a factor the authors can further explore to get a better understanding of recurrence.

References

Berghuijs, W. R., M. Sivapalan, R. A. Woods, and H. H. G. Savenije (2014), Patterns of

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