**Hydrology and
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Discussions

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Interactive comment on "Quantifying new water fractions and transit time distributions using ensemble hydrograph separation: theory and benchmark tests" *by* J. Kirchner

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Dear Editor, Dear Author,

in brief my thinking:

a - Finding a way to estimate hydrograph separation or travel time distribution averages through regression is an interesting achievement

b - Doing linear regressions, either with plenty of data or data scarcity, cannot be considered an advanced topic in 2018. Reference to appropriate literature should be enough and could substitute many pages of this paper.

c - Niemi's relation validity is granted always, if properly modified to account for the missing knowledge of the partitions coefficient required. In Rigon et al. 2016 there is a section dedicated to it.

d - The explanation given to account for evapotranspiration is not clear, at least to me. For what I understand, the Author did not introduced a new modelling procedure but tried to simulates the effects of fractionation on the final outcomes by introducing a sinusoidal alteration of the output signal obtained. If I did not understood properly, the Author should make an effort to express things better. If I understood properly, that was not so easy, anyway. I personally have doubts on the procedure he used, but I understand the point of the Author.

e - I think that the technique developed by the Author is worth to be published. However, it accesses a limited number "m", as called in the paper, of instants (less than the number of recorded inputs, much less, for having good statistics). This limitation have effects both on the backward and the forward probabilities estimations. The techniques does not get everything. With respect to the backward probabilities, it is NOT able to get really old water distributions, i.e with expected values of decades years old, unless the time series of appropriate length is available. Regarding to the forward expectations, the techniques does NOT allow to estimate the right partition coefficients if multiple fluxes are present, but only an approximate value for them. In both the cases, long time series in input could be required to get right answers. These facts should be clarified better to the reader and to the potential users of the methods developed.

All the best,

riccardo rigon