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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Beyond binary baseflow separation: delayed flow index as a fresh perspective on streamflow contributions" *by* Michael Stoelzle et al.

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This is an interesting article and essay about an approach that may find its place in practice. It aims to subdivide total (merged) baseflow (slow flow) into its possibly different components. The title, however, appears slightly high-handed. This enhanced application of the smoothed minima method will hardly replace other baseflow separation methods; hence it is not "beyond" but may be "besides". The splitting of flow contributions is a fresh idea, but not a new one. Also, the term "delayed flow" appears problematic. A delay is normally a time shift which cannot really describe the inflow-outflow (retention) processes of reservoirs (aquifer, snow, lakes...). The paper is not easy to read. Many formulations could be straighter forward. Lines 66-77: This section gives the impression that hydraulic processes are not fully understood. Aquifers act as

reservoirs discharging baseflow according to hydraulic head (pressure) and rather not "water that is moving slowly..." (line 70). Skip or rewrite. Also, the many abbreviations (e.g. in chapter4.1) and awkward formulations in chapter 5 make reading difficult. The proposed method is built on the IH-UK smoothed minima method following the philosophy of former respective research work performed in Freiburg at the institute of three of the authors under the denomination Wundt/Kille-Demuth method (Demuth 1989). It is an empirical, statistical approach to only detect and describe the effects of storage in aquifers etc. on streamflow and does not model the hydraulic processes. Baseflow separation methods based on reservoir algorithms are not even mentioned in the present paper though they are the closest to physics and hydraulics. Line 78 and others: Write Hollick instead of Hollwick. Abstract and other places: The authors criticize contemporary "binary" baseflow separation methods "for their arbitrary choice of separation parameters". This is not quite an objective argument. So, like "the DFI is based on characteristic delay curves...", other baseflow separation models are calibrated with observed flow recessions and yield good results. The authors probably used data of a number of the same stations as their colleagues in Bern, Switzerland (Meyer et al.2011), who report: "Three different procedures to separate baseflow are applied in 59 catchments in Switzerland. The results show a good coherence of baseflow with well-known storage processes". Why not have a look? The authors criticize baseflow separation methods because they "merge different delayed components". Reservoir based separation methods were applied for distinguishing and quantifying different contributions, two examples: Schwarze et al. (1989) created a model of parallel linear reservoirs representing different contributing aquifers or storages. Wittenberg (2003) distinguishes with his nonlinear reservoir method groundwater outflow, groundwater evapotranspiration, abstraction.... Is the present method only or particularly suited for regional studies since a linking of flow contributions to catchment characteristics is needed? Line 485: Groundwater recharge does not need saturated soils. Infiltrating water passes the vadose zone via preferential pathways.

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ysis of data from small research basins. Friends in Hydrology, IAHS Publication No. 187, 43-60, 1989. Meyer, R., Schädler, B., Viviroli, D., Weingartner, R. Die Rolle des Basisabflusses bei der Modellierung von Niedrigwasserprozessen in Klimaimpaktstudien. (The role of baseflow in modelling low-flow processes in climate impact studies). HyWa 55,5,244-257, 2011. Peters, E. van Lanen, H.A.J. Separation of base flow from streamflow using groundwater levels – illustrated for the Pang catchment (UK). HProc 5548, 2003. Schwarze, R., Grünewald, U., Becker, A., Fröhlich, W. Computer aided analysis of flow recessions and coupled water balance investigations. Friends in Hydrology, IAHS Publication No. 187, 75-83, 1989. Wittenberg, H. Effects of season and man-made changes on baseïňĆow and ïňĆow recession: case studies. HProc 17, 2113-2123, 2003.

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