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Optimal hydrograph separation filter to evaluate transport routines of hydrological models

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Hydrograph separation (HS) using recursive digital filter approaches focuses on trying to distinguish between the rapidly occurring discharge components like surface runoff, and the slowly changing discharge originating from interflow and groundwater. Filter approaches are mathematical procedures, which perform the HS using a set of separation parameters.
The first goal of this study is an attempt to minimize the subjective influence that a user of the filter technique exerts on the results by the choice of such filter parameters. A simple optimal HS (OHS) technique for the estimation of the separation parameters was introduced, relying on measured stream hydrochemistry. The second goal is to use the OHS parameters to develop a benchmark model that can be used as a geochemical model itself, or to test the performance of process based hydro-geochemical models. The benchmark model quantifies the degree of knowledge that the stream flow time series itself contributes to the hydrochemical analysis.
Results of the OHS show that the two HS fractions ("rapid" and "slow") differ according to the geochemical substances which were selected. The OHS parameters were then used to demonstrate how to develop benchmark model for hydro-chemical predictions. Finally, predictions of solute transport from a process-based hydrological model were compared to the proposed benchmark model. Our results indicate that the benchmark model illustrated and quantified the contribution of the modeling procedure better than only using traditional measures like r2 or the Nash-Sutcliffe efficiency.