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Exploring the limits of conventional hydrograph separation

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The separation of runoff into different components, typically some “event” (or “new”) water as opposed to some “baseflow” (or “old”) water, is a task that has been attracting hydrologists for decades. The ability to separate runoff sources has implications for our understanding of hydrological processes and to predict changes due to e.g. deforestation or urbanization. Although the methodology has notably evolved during the years, the most conventional and widespread application involves a two-component separation achieved through stable isotopes or electrical conductivity measurements. Use of this approach is based on a strong assumption that is difficult to test in the field: the signatures of the two end-members either do not change during the event or their variations can be taken into account. By using extensive numerical tests, this contribution explores the limits of this assumption. Results highlight the importance of considering the time-varying contribution of soil water, which is not event-water nor baseflow, and show that the method can easily lead to incorrect estimates when the above assumption is not met.