Hydrol. Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/hess-2019-503-SC2, 2019

Hydrology and Earth System Sciences
Discussions
Open Access
EGU

Interactive comment on "Hydrograph separation: an impartial parametrization for an imperfect method" *by* Antoine Pelletier and Vazken Andréassian

Keith Beven

k.beven@lancaster.ac.uk

Received and published: 21 October 2019

The aim of providing "an unarbitrary, impartial, repeatable parameterization that could be used as a general-purpose study tool over large catchment sets" is commendable but cannot escape the issues that have dogged the numerous methods in the past (in my own review of hydrograph separation in Beven, 1991, the section on choosing a separation method said simply "Don't").

In particular, it is surely poor hydrological practice to make any process interpretation of an arbitrary separation as the authors do here throughout – essentially treating quick-flow and surface flow as equivalent (though accepting that the latter might include some

Printer-friendly version

Discussion paper

interflow). But the differences between the type of separation presented here and the tracer separations between event and pre-event water tell us that this equivalence can be totally wrong (surely Figures 5,6,7 cannot support this equivalence?). Quickflow in many catchments can be made up of a large proportion of pre-event water (with some indication that this proportion might decrease with increasing event magnitude; sequences of events etc). This is a reflection of the differences between velocities and celerities in catchment responses (e.g. Beven, 2012; McDonnell and Beven, 2014).

But, this process interpretation is not actually necessary to the authors aims. They could simply present the method as differentiating between fast and slow responses – effectively as a way of estimating BFI. A consistent and standardised approach for regionalisation purposes could still be useful (e.g. Figure 9). The results would be different from another chosen method (as they show in Figure 11, so sometimes really quite different) but that reflects the arbitrariness of baseflow separation methods that they discuss in the introduction.

It also begs the question, however, of why the dividing line between fast and slow should be chosen in this way – why are there not intermediate responses that might be appropriate in some catchments but which are forced to be split between fast and slow by the method proposed here? This would almost certainly be reflected in insensitivity in the fitting surface plots for some catchments (such as Figure 3 & 4). The DBM methodology of Young (2013 and references therein) could, for example, provide one way of providing a justification for the number of components by identifying the order of the transfer function, but this could well vary for different catchments (including cases where it is not necessary to invoke a slower 2nd order or 3rd order components; the discharge is adequately described by a first order component).

So it seems to me that baseflow separation still remains a rather desperate technique with somewhat arbitrary results depending on whatever storage or filtering function is chosen. Interpretation in terms of any process interpretation should definitely be avoided. As demonstrated in the paper it can certainly provide estimates of a BFI –

but it is not the BFI since it depends on a particular set of assumptions (the quadratic storage in this case) that might not apply everywhere (or actually anywhere).

References

Beven, K.J. (1991), Hydrograph Separation?, Proc.BHS Third National Hydrology Symposium, Institute of Hydrology, Wallingford, 3.1-3.8.

Beven, K.J. (2012) Rainfall-Runoff Modelling: The Primer, Wiley-Blackwell: Chichester

McDonnell, J J and Beven, K J, 2014, DebatesâĂŤThe future of hydrological sciences: A (common) path forward? A call to action aimed at understanding velocities, celerities, and residence time distributions of the headwater hydrograph, Water Resour. Res., 50, doi:10.1002/2013WR015141.

Young, P. C., 2013, Hypothetico-inductive data-based mechanistic modeling of hydrological systems, Water Resour. Res., 49, doi:10.1002/wrcr.20068.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., https://doi.org/10.5194/hess-2019-503, 2019.

Printer-friendly version

Discussion paper