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Discussions

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

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We would like to thank Pr. Renata Romanowicz for reading our manuscript and for her careful and useful review. Here are our answers to the points raised by her remarks.

Optimisation criterion

As it is highlighted in Pr. Romanowicz's comment, the optimisation criterion that we use to calibrate the parameters of the hydrograph separation algorithm – Pearson correla-

tion between baseflow and cumulated effective rainfall – is not univocal enough to be a satisfying correlation criterion. Indeed, it is subject to pseudo-periodical oscillations caused by the annual hydroclimatic cycle; it is visible on figure 3, page 14. We chose to use Pearson correlation since it is quick to compute and easy to interpret; however, a more complex optimization criterion could be developed indeed to get more univocal results.

Linear relationship between flow and recharge

Pr Romanowicz underlined a major hypothesis of the hydrograph separation method presented in the manuscript: the water inflow of the quadratic reservoir is a linear fraction of daily measured streamflow. This is a very crude estimate of aquifer recharge, which is a far more complex process including water flow through banks of the river, soil water balance, vegetation, seasonality, etc. Solving the groundwater transmissivity equation in a theoretical framework of a shallow aquifer connected to a river shows that recharge in anything but a linear fraction of streamflow; and real configurations of river-aquifer interactions are even more intricate.

However, as highlighted by the exchange with Pr. Keith Beven, we do not claim to present a physically-based hydrograph separation method. For such a purpose, we would need an explicit recharge model, that would add more hypotheses and parameters: an elaborate production function in such an imperfect, but objective, algorithm would be as useful as a chocolate teapot. Therefore, the inflow function composed of a fixed linear fraction of daily streamflow can be regarded as a basic estimate of the quantity of water that the catchment remembers.

In the revised version of the article, we will add a clearer explanation about the inflow function of the reservoir.

Equations in pages 6 and 7

We use a different notation for the continuous and the discrete versions of a variable: $X(t)$ for the continuous one and X_t for the discrete one. Integration of the continuous differential equations is made through a Eulerian explicit scheme and equation on page 7, line 15 is intended to explain how continuous variables are made from discrete measurements; in the revised version of the manuscript, we will replace it by a clearer plain-text explanation that will avoid confusion with other variables in the algorithm. We will also add a diagram to explain the integration scheme.

Correlation between parameters

Two parameters need to be calibrated in the algorithm presented in article. We tried to find a simple relationship between catchments' characteristics and parameters, in order to remove one degree of freedom in the optimization process; but we did not manage to find one. Since it is an unsuccessful point, it is not detailed in the manuscript; it is only mentioned at the end of page 17. In the revised version of the manuscript, we will give more details about correlations between parameters.

Algorithm 1 :

Pr. Romanowicz noticed that β is missing at line 6, according to equation 1. It will be corrected in the revised version of manuscript.

Figure 10 :

Pr. Romanowicz noticed an error in the left panel y-axis label: it will be corrected as BFI.

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