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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 Dr J. Ding for reading our manuscript and for his comment. The transformation he suggests is very interesting to illustrate the way streamflow is filtered in the algorithm presented in the manuscript.

The negative inverse square root (NISR) transformation is a useful tool to highlight the behaviour of a quadratic reservoir during recessions. Indeed, if the input of the quadratic reservoir is set to zero – i.e. when the fraction of streamflow $\beta Q(t)$, the input of the reservoir, is negligible compared to the baseflow $R(t)$, the output of the reservoir – the system of equations (1) and (2) – page 6 – becomes:

$$\frac{dV}{dt} = -\frac{V^2}{S\Delta t} \tag{1}$$

$$R(t) = \frac{V^2}{S\Delta t} \tag{2}$$

If we integrate these equations given an initial condition $V(t_0) = V_0$, we get the following NISR-transformed recession curve:

$$\frac{1}{\sqrt{R(t)}} = \frac{\sqrt{S\Delta t}}{V_0} + \frac{t - t_0}{\sqrt{S\Delta t}} \tag{3}$$

This curve is a straight line: therefore, during low-flow periods, we would expect the baseflow curve computed by the filtering algorithm presented in the manuscript to be close to a line segment. Figures 1, 2 and 3 show the three separated hydrographs shown in page 16 of the manuscript, with a NISR transformation applied to measured streamflow and baseflow. In figure 1, baseflow index is low and thus, during low-flow periods, the inflow of the quadratic reservoir is negligible compared to computed baseflow. We can observe that several parts of the transformed baseflow curve are line segments; this happens during low-flow periods. This behaviour can also be observed, to a lesser extent, in figure 2, for instance during the 1996–1997 drought. In figure 3, the condition to get a straight recession curve like in equation 3 are never met, because baseflow index is too high and therefore, the input of the reservoir is never negligible compared to its output. Yet, the NISR transformation points out the behaviour of the separation algorithm during low-flows and the role of updates is clearly visible. It also highlights the smoothing role of the filter.

In a nutshell, we consider the negative inverse square root transformation as a good tool to show the behaviour of the hydrograph separation algorithm on a wide variety of catchments. We would like to thank Dr. J. Ding for his suggestion and we will add comments as a appendix. Obviously, we will acknowledge his contribution in the text.

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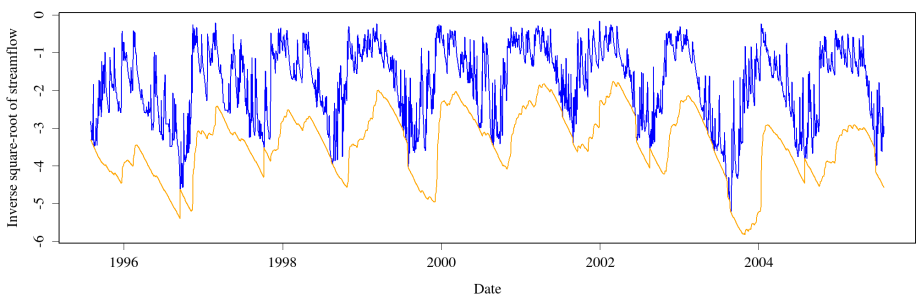

Fig. 1. NISR-transformed separated hydrograph of Vair river in Soulousse-sous-Saint-Élophe

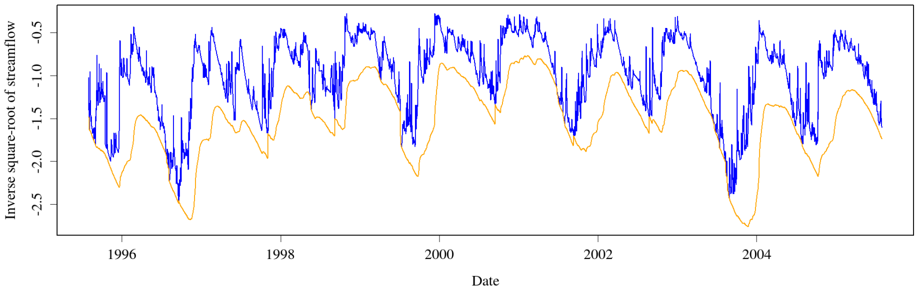

Fig. 2. NISR-transformed separated hydrograph of Virène river in Vire-Normandie

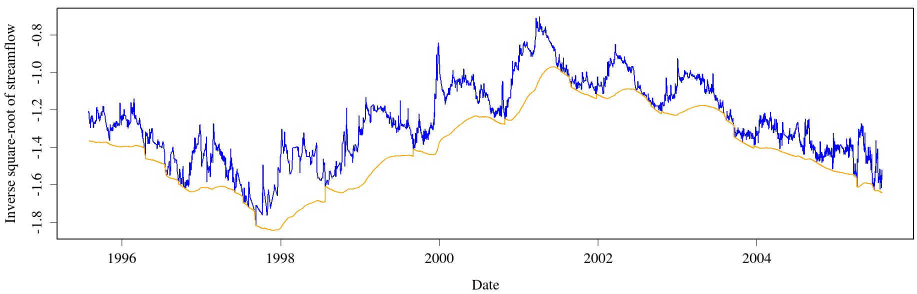

Fig. 3. NISR-transformed separated hydrograph of the Petit Thérain river in Saint-Omer-en-Chaussée