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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Technical note: Analytical sensitivity analysis and uncertainty estimation of a two-component hydrograph separation method which uses conductivity as a tracer" *by* Weifei Yang et al.

Anonymous Referee #3

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General comments

The paper by Yang et al. presents a methodology to compute the uncertainty in the estimation of the long-term baseflow index (BFI) from streamflow and conductance timeseries in rivers. The paper develops equations on the sensitivity of the BFI that, to my knowledge, are new. However, I find that the overall significance of the paper is rather limited. In particular:

1) The authors mention in the title the "two-component hydrograph separation". This

is a rather broad and active field of research but the authors narrow their focus on one single index (the BFI, which expresses the long-term ratio between baseflow and streamflow) and they compute it with a very specific methodology.

2) The methodology for the hydrograph separation (equation 1) is based on several assumptions (not mentioned in the manuscript) that are typically not met in the field. One of these is the fact that the parameters of equation (1) are supposed to be fixed during an event (or for an entire timeseries, as done by the authors). Finding a methodology to relax those assumptions is, in my view, more useful than evaluating the sensitivity of the present methodology to small measurement errors.

In other words, I feel that the authors improve the uncertainty evaluation of an index that, as currently defined, has major constraints and limited reliability.

Specific comments

Variable names are rather confusing to a hydrologic community, as Q is conventionally used for streamflow. I invite the authors to adopt a notation based on the papers they refer to (e.g. Miller et al. 2014, Genereux 1998).

Besides English grammar errors, the language needs to be improved as the text is often difficult to understand. I invite the authors to revise the use of the term "specific": it seems that they use "specific" to say computed/available. (e.g. specific discharge appears to be just an available timeseries of discharge). Similarly, the use of "specific values" at page 3 Line 17 and "specific" conductivity values (the correct form is specific conductance or electrical conductivity)

Section 2.2. What is, ultimately, the purpose of this section? Is it to show that the sensitivity of BFI on streamflow and conductance measurements is low (and so it can be removed from subsequent equations like eq 20)?. If so, please make it clearer. What sounds interesting to me is that BFI sensitivity only depends on the integral of the (little) errors on Q and y. But once this is clear from the formula (eq. 15 and 16),

then there is no need to show Figures 1 and 2 as the result is implicit from the definition of random errors on Q and y. Instead of the current Figures 1 and 2, why not showing an example of the methodology applied to a case study time series? It would make it easier to understand the usefulness of the approach.

Section 3.1: Please make explicit assumptions on the requirement to apply the error propagation formula (eq 17). For example, "tiny" errors means that errors on Q and y should be small random errors related to the analytic uncertainty of the instrument, i.e. no systematic error.

Page 1
Line 22: rather than "can effectively identify" use "aims to identify"
Line 25: "is considered the most effective separation method". By which standards?

Page 2
Line 1: I guess this is limited to the particular conditions at which Stewart et al (2007) applied the method. But this is not enough to generalize.
Line 30: here and after I guess it should be equation (A1) rather than Appendix A1

Page 4
Line 2: unclear what is meant by "random analysis errors". Please define what you mean by "tiny errors in Qck and yk".
Line 2-5: This statement is unjustified. Please either formulate it as a hypothesis (e.g., if the errors follow a normal distribution. . .) or remove it.
Lines 6-7: "The uncertainty of [. . .] is. . .": please avoid these unjustified general statements. Instrument precision depends on the particular instrument at hand and streamflow precision depends on a very large number of factors. You can simply reformulate the sentence stating that you assumed errors of 5Lines 11-18 is particularly unclear
Line 17: which "average error (

Page 5
Line 13-17: what is the rationale behind the choice of these particular types of uncer-

tainty (W terms)?

Page 7
Line 4-5: "During the rainstorm [. . .] the streamflow is almost entirely from the rainfall runoff": this is a serious misinterpretation of hydrological processes. It is well known since at least 15 years that in most catchments the event-water is not a major component of streamflow (and very often it only accounts for a few percent of total flow). See e.g. the commentary by Kirchner (2003) on Hydrological Processes (https://doi.org/10.1002/hyp.5108).

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