Hydrology and Earth System Sciences Discussions

Interactive comment on "Technical Note: Analytical sensitivity analysis of a two parameter recursive digital baseflow separation filter" *by* K. Eckhardt

Anonymous Referee #1

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In this paper, the author performs a sensitivity analysis for a two-parameter digital baseflow filter. Analytical expressions for the sensivity indices are derived, and applied to a number of catchments. The conclusion is that the results are more sensitive to the recession constant than to the BFImax parameter.

I have checked all the derivations, and have not found an error, so the paper is technically sound.

I have no fundamental objections to seeing the paper published, but there is one item that needs to be discussed, in my opinion. There already exists a two-parameter filter,

the Boughton (1993) filter. This filter is described in Furey and Gutpa (2001) and Huyck et al. (2005), both in WRR. First, I would like to see a couple of sentences describing the advantage of the Eckhardt filter as compared to the Boughton one. The reason why I am asking is the following: Furey and Gupta derived analytical expressions for the two parameters in the Boughton filter. Huyck et al actually used the Boussinesq equation to derive a similar filter, with three parameters, also with analytical expressions for the parameters. The fact that these physically-based filters exist, with parameters for which analytical expressions exist (and which thus do not need to be estimated or calibrated), is an important fact in this paper: this paper performs a sensitivity analysis under the assumption that the parameters (or at least the BFImax parameter) for the filter need estimation. I would argue that the advantage of this filter as compared to the other ones is that it is much easier to apply (the parameters are much easier to estimate), but in my opinion this needs to be discussed.

One minor remark: on page 9475 a couple of times the author writes in the plurar (we insert, we have here ...). There is only one author, so this should be corrected.

But overall, I think that this paper performs an interesting study and should be published, if the remarks made above are taken into account.

References:

Boughton, W. C. (1993), A hydrograph-based model for estimating the water yield of ungauged catchments, paper presented at Hydrology and Water Resources Symposium, Inst. of Eng., Aust., Newcastle, N. S. W., Australia.

Furey, P. R., and V. K. Gupta (2001), A physically based filter for separating base flow from streamflow time series, Water Resour. Res., 37(11), 2709– 2722.

Huyck, A. A. O., V. R. N. Pauwels, and N. E. C. Verhoest (2005), A base flow separation algorithm based on the linearized Boussinesq equation for complex hillslopes, Water Resour. Res., 41, W08415, doi:10.1029/2004WR003789.