

Hydrol. Earth Syst. Sci. Discuss., referee comment RC2  
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## Review 2

Anonymous Referee #2

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Referee comment on "Implications of variations in stream specific conductivity for estimating baseflow using chemical mass balance and calibrated hydrograph techniques" by Ian Cartwright, Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2021-454-RC2>, 2021

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If I understand this piece of science correctly, it is a valuable criticism of the CMB method during baseflow estimation. This might be (very) interesting for the community as many studies before criticize (pure) hydrograph separation for its missing physical justification, i.e. call for tracer or isotope supported baseflow estimates. Here, the study argues that CMB calculations during specific flow periods might not be applicable to the entire flow series to gain a (valuable) baseflow estimate. I guess the paper could be even stronger if more detailed information was given how a valuable CMB/SC method should look like (i.e., what kind of flow periods should at least be considered to reduce bias in baseflow estimation, see below).

I am not sure if the presented bias in baseflow estimation during high SC periods can be transferred 1:1 to other regions than Australia. Or in other words, are the found deficiencies of the presented methods also an issue in more humid catchments, i.e., other regions of the world where typical ranges of SC might be very different to those measured in this study?

A further concern in this perspective is the selection of catchments that are used to justify the outcomes of the study. I am not sure if the reference to the Supplement is enough to understand the characteristics of the study catchments (as there is also no map or other topographic or hydrogeological information on this catchments). At this point I ask myself how much regional distinctions are in the study and what about the transferability of the results (see above). To judge this, the reader might need more details on the catchments what from my point of view can be easily done by transferring information from supplement to the paper.

The study proposes a multi geochemical analysis in larger rivers to identify many/more sources of water: It would be nice to be more concrete here, e.g., what kind of

geochemical analysis are needed, during which seasons or flow periods and what is meant with larger catchments. I doubt that larger catchments will offer a clearer signal as with increasing catchment area also often human interactions increase and regional groundwater systems will become more important. However, it might be worth to gain an additional review for this interesting study from the isotope/tracer or hydrogeological community.

### **Minor comments**

- Fig. 5: What is the difference between the blue and white points (here circles and squares)?
- Fig.3: A lot of overplotting is going on here. A density scatterplot might help out to see more details of the point clouds.
- Is the filter parameter of 0.93 justified by other studies in the same region or is it just a value from literature? Normally it is recommended to have values between 0.95 and 0.90 and the specific values has a high impact on the actual baseflow estimate.
- In general, the axes labels of most figures are too small.
- The SM method is based on variable N. Is N somewhere reported for the specific catchments? And, is the assumption of N being a function of catchment area really valuable?