Dear authors,

I would like to thank you for the effort put into addressing my comments. The discussion is the best way to clarify the ideas and realize possible misunderstandings or drawbacks. Our discussion can be perhaps useful also to journal readers.

1. I understood that you did not do hydrograph separation with stable isotopes. It is not necessary to to rewrite lines 165-172. The reader can obtain a more detailed information from your response to my comments.
2. The key assumption of your approach is the exponential relationship between EC and young water fraction. Could you try to justify it also in some other way than just mathematically (l. 176-190)?
3. I have downloaded and checked the discharge and EC data for your catchments. Some thoughts are given below (you do not need to respond to them). Although I am still not convinced about the use of EC, the manuscript describes the proposed approach clearly.
4. You may think about using the list of symbols, because there are many symbols from earlier works and some other symbols used in your study. Such a list might be helpful to someone who is not so familiar with all the literature and would like to use your method.
5. It is clear that "old water" in your study is related to the young water fraction (the metric calculated from seasonal isotope variability); i. e. "old water"=1-young water fraction. However, this term is the same as the "old water" from the isotopic hydrograph separation conducted by a mixing formula. To avoid the confusion, it may be useful to explain, e.g. in the List of symbols that your "old water" is different.
6. Despite my comments on the manuscript, if the editor and other reviewer(s) decide that the manuscript can be published, I will not have a problem to accept such a decision.
7. I agree that you acknowledged many uncertainties related to the use of the method. What I mind is this:
   A. We (the hydrological community) know for decades that determination of the input (tracer concentration of the water entering the system, e.g. a catchment) is uncertain. The composition of water infiltrating into the soil that eventually appears in the output (e.g. in catchment runoff) is almost always unknown. We acknowledge this uncertainty and use tracer content in precipitation, because that is what we can (more easily) measure and in sometimes adjust it using different approaches.
   B. We know that tracer variability in the input varies both temporally and spatially. The range of temporal variability differs in different years. We acknowledge this uncertainty and approximate the input concentration by the sine curve having the same amplitude over different years. Spatial variability in larger catchments is often neglected.
   C. Several approaches are used to estimate the sine curve's amplitude (limiting or accepting the outliers) for weighted or unweighted data. Study periods are sometimes shorter than several years. All this brings the uncertainty which we acknowledge and determine the amplitude.
   D. From the amplitudes we calculate the metric (an exact number) characterizing studied system. For many years it was the mean residence/transit time. After the inspiring work by Kirchner (2016) we prefer to use the metric called young water fraction.
   E. Young water fraction (an exact number) is defined as "the fraction of runoff with transit times of less than roughly 0.2 years" (Kirchner, 2016). It represents an average over the study period. It

seems obvious that when the discharge in a study catchment increases, the young water fraction should likely be greater than in the low flow periods when the streamflow is supplied by water that probably stayed in the catchment longer (we do not know how much longer than 2-3 months, but part of that water may be in the catchment not much longer 2-3 moths, i. e. 4, 5, 6?).

F. We introduce a new metric called discharge sensitivity of the young water fraction and assume the exponential relationship between the young water fraction and a virtual young water fraction for discharge equal to zero.
G. It is fascinating and potentially very useful to know how big is the young water fraction on every day, hour, etc. We continue with the development of methodology and calculate daily young water fractions using another, non-conservative tracer (EC) and two-component hydrograph separation. We estimate the unknown tracer concentrations for the two end members though calibration. We assume that there is exponential relationship between the tracer and young water fraction and optimize the daily values so that their average is the same as the young water fraction obtained from seasonal variations of stable isotopes. We acknowledge possible uncertainties.
H. Having the daily young water fractions, we can investigate their relationships with meteorological drivers, and so on and so forth. …..
I. A to H indicate that we are adding uncertainties with every step in the development of our methodology. Please note I am saying "adding" not "accumulating", because I do not know if the uncertainty increases in the described chain of methodology development.
J. We are acknowledging the uncertainty, but continuing to develop the methodology and adding other uncertainties. The result is that since the 1970'/1980' we moved from a simple method providing a rough, but useful characteristic (especially in groundwater hydrology, because it matters if possible pollutant enters an aquifer with mean transit time 6 or 26 months for example) to a complex methodology involving many acknowledged uncertainties providing "exact" numbers for the short time steps.
K. I am not sure how much can the obtained numbers be trusted and whether we are obtaining a substantially new knowledge about the subject of our study, e. g. catchment hydrological cycle (in addition to the information on tracer dynamics). Benetin et al (2022) noted: "In the light of the complexity of the theoretical apparatus underlying time-variant TTDs …, one might wonder if this effort is actually worthwhile and all this complexity is really needed for practical purposes. Our claim is that, while time-variance might not be needed a priori to characterize transport processes in a catchment, it directly affects tracers and solute signals in stream water and plant water. Therefore, acknowledging and incorporating this time variance may be necessary to capture and explain both high-frequency and long-term tracer dynamics."

I have downloaded the discharge and EC data from your catchments and period October 1st, 2010-November 30th, 2015 which is approximately your study period according to Table 1.

1. I agree with you that discharge increase almost always corresponds to EC decrease and vice versa.
2. A few thoughts on the optimized EC values of the endmembers: The low flow periods in the study catchments are never very long (even in winter). Yet, the difference between the

optimized EC of the old water fraction in ERL (501 µS.cm^{-1}) and the minimum EC values measured in the stream in period October 2010-November 2015 (334.3 µS.cm^{-1}) is quite high. Even the absolute EC minimum in ERL (439.5 µS.cm^{-1}) between January 1978 and February 2023 (daily data) that was measured on 23rd January 1990, i.e. outside of your study period, was quite different from the optimized value. I am therefore not sure if the optimized EC values are correct. The young water fraction was maybe not very big in January 1990 at catchment discharge of about 0.3 l.s^{-1}. I would assume that streamflow EC would be closer to that of the groundwater, i.e. the measurements over long periods could identify this end member. Similarly, the optimized EC values of the young water fractions seem to be a little higher than data on Central European precipitation suggest (Monteith et al., 2023), but it can be argued that the young water fraction contains some soil water with higher EC.

3. According to coefficient of determination, Q explains about 50% of daily EC variability in your catchments. It would be great if part of the variability could be explained by young water fraction. However, how can it be confirmed or rejected if daily young water fractions were estimated on the basis of EC?

References:

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Monteiths, D. T., Henrys, P. A., Hruška, J., de Witt, H. A., Krám, P., Moldan, F., Posch, M., Räike, A., Stoddard, J. L., Shilland, E. M., Pereira, G. M., Evans, Ch., D. 2023. Long-term rise in riverine dissolved organic carbon concentration is predicted by electrolyte solubility theory. Sci. Adv. 9 (3), eade3491. DOI: 10.1126/sciadv.ade3491