

Hydrol. Earth Syst. Sci. Discuss., referee comment RC1
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Comment on hess-2020-683

Anonymous Referee #1

Referee comment on "Potential effects of cryogenic extraction biases on plant water source partitioning inferred from xylem water isotope ratios" by Scott T. Allen and James W. Kirchner, Hydrol. Earth Syst. Sci. Discuss.,
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The manuscript underlines existing issues with cryogenic vacuum extraction of plant water for isotope analysis. The authors demonstrate via five case studies how $\delta^2\text{H}$ biases resulting from this extraction method may lead to misleading conclusions when interpreting plant water sources.

The authors heavily rely on results of a study by Chen et al. (2020) without going much into detail about this study. This is often tricky for the reader (since details are not mentioned) and it requires going back and reading the study by Chen et al.

The authors apply a $\delta^2\text{H}$ bias correction to a handful of plant source water studies. But what are the selection criteria of these case studies? The manuscript does not go far beyond the discussion section of the Chen et al. (2020) study. The application of an average bias correction factor determined by Chen et al. to a limited selection of other studies is not enough. Are the tree species from the selected case studies even covered in the study by Chen et al (2020)? Otherwise, I highly question the overall applicability of an average bias correction factor to different tree species (from your case studies) that may react differently during cryogenic vacuum extraction. This would result in the necessity to calculate different bias correction factor for specific plant species. Chen et al. (2020) stress the fact that species-specific differences in the cryogenically obtained $\delta^2\text{H}$ values exist and need to be accounted for (together with data on stem relative water content). Overall, the manuscript is a bit light. It would benefit from 1) case studies that include the tested species of the Chen et al. study 2) selecting more than five case studies to underline the statements and conclusions of the present study and 3) from including recommendations on how to perform bias correction on your own data and which factors to consider for that (species-specific differences, extraction system bias correction, isotope measurement accuracy etc.). The authors further ignore the well-known fact that cryogenic vacuum extraction from certain soil types causes isotope effects that need to be corrected for (such effects may also differ for the selected case studies). I admit that this is difficult when the raw data of the selected case studies is not available but this could be overcome by choosing newer studies where authors might be willing to share their data or where data is already publically available.

Further, it would be interesting to know if a bias correction is necessary and how a potential bias correction would look like for artificial isotope labeling studies. How would results be shifted?

My specific comments can be found in the attached pdf.

References

Chen, Y., Helliker, B. R., Tang, X., Li, F., Zhou, Y. and Song, X.: Stem water cryogenic extraction biases estimation in deuterium isotope composition of plant source water, PNAS, 117(52), 33345–33350, <https://doi.org/10.1073/pnas.2014422117>, 2020.

Please also note the supplement to this comment:

<https://hess.copernicus.org/preprints/hess-2020-683/hess-2020-683-RC1-supplement.pdf>