

Interactive comment on “Annually resolved $\delta^2\text{H}$ tree-ring chronology of the lignin methoxyl groups from Germany reflects averaged Western European surface air temperature changes” by Tobias Anhäuser et al.

Anonymous Referee #2

Received and published: 19 March 2019

Review of "Annually resolved $\delta^2\text{H}$ tree-ring chronology of the lignin methoxyl groups from Germany reflects averaged Western European surface air temperature changes" by Anhäuser et al., submitted to Climate of the Past

This paper describes a study of lignin $\delta^2\text{H}$ measurements from an Alpine site in Central Europe. Lignin isotope studies complement existing studies based on cellulose, because they it is formed in the xylem and thus less affected by enriched leaf water. The study explores some of the potential influences of the $\delta^2\text{H}_{LM}$ that can lead to variation between individual trees at the same site, and attempts an air temperature

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reconstruction for Western Europe. Comparison to an observed temperature record appears promising (with uncertainties). The study is generally well written. I have several comments that could lead to a more comprehensive discussion of some of the findings. I suggest acceptance of the manuscript subject to minor revisions.

Main comments

1. In the introduction, the deficiencies of cellulose isotope measurements are discussed. It would be very useful to compare your results with any existing isotope record from cellulose in the region.
2. The groundwater influence is now mostly discussed as a hypothetical factor. It seems unlikely that the groundwater stable isotope composition would vary systematically across the sites at a distance of up to 1 km.
3. There are some studies on the isotope composition of runoff, precipitation and water vapour in alpine/subalpine catchments which could enlighten the discussion of the results (Fischer et al. 2017 and references therein, Aemisegger et al., 2014).
4. The soil properties and hydrology could be discussed more explicitly. What is the role of snow melt in the local hydrology? What is the soil type, is there permafrost?
5. The correlation presented in Fig. 7 seems less stable through time than the discussion suggests. The early part is not correlated with the local influences whereas the latter is. Does the same correlation pattern appear for these time slots when you use observed temperature? That way you could reinforce that a climatic signal is picked up, otherwise you would have an indication that the correlation with the isotope measurements is not stable through time.

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6. It would be helpful to show some selected correlations between $\delta^2\text{H}_{LM}$ and $\delta^2\text{H}_{precip}$ that are summarized now in Fig. 6 in detail, such as for the annual mean, spring and summer.
7. I am used to ordering multiple references that go with one sentence be by time, rather than alphabetically.

References

Fischer, B M C, H J I van Meerveld, and J Seibert. 2017. "Spatial Variability in the Isotopic Composition of Rainfall in a Small Headwater Catchment and Its Effect on Hydrograph Separation." *Journal of Hydrology* 547: 755–69. doi:10.1016/j.jhydrol.2017.01.045.

Aemisegger, F, S Pfahl, H Sodemann, I Lehner, S I Seneviratne, and H Wernli. 2014. "Deuterium Excess as a Proxy for Continental Moisture Recycling and Plant Transpiration." *Atmospheric Chemistry and Physics* 14: 4029–54. doi:10.5194/acp-14-4029-2014.

Interactive comment on *Clim. Past Discuss.*, <https://doi.org/10.5194/cp-2019-8>, 2019.

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