

## Comment on cp-2021-34

Anonymous Referee #2

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Referee comment on "The triple oxygen isotope composition of phytoliths, a new proxy of atmospheric relative humidity: controls of soil water isotope composition, temperature, CO<sub>2</sub> concentration and relative humidity" by Clément Outrequin et al., Clim. Past Discuss., <https://doi.org/10.5194/cp-2021-34-RC2>, 2021

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The triple oxygen isotope composition of phytoliths, a new proxy of atmospheric relative humidity: controls of soil water isotope composition, temperature, CO<sub>2</sub> concentration and relative humidity

Clément Outrequin et al.

This study combines new and previously published phytolith triple oxygen isotope data to develop a new proxy to determine paleo-RH. The approach and chamber studies are interesting and thorough, and the utility of 17O-excess as a proxy for paleo-RH will be of great interest to many in the paleoclimate/paleohydrology communities. The writing is generally clear and is well supported by the existing literature. Occasionally some of the writing syntax could be cleaned up. With some revisions, this will be a welcome contribution to the growing 17O literature.

- I think a more nuanced discussion about the role and variability of vapor 17O-excess is warranted. There is very little published vapor 17O-excess data, so I don't think it is yet quite reasonable (as in line 62) to expect that vapor 17O-excess will vary little from place to place. In thinking about this, it might be useful to draw comparisons between observations of vapor d-excess and expectations of vapor 17O-excess. This study is limited to the tropics, but are there other regions with a limited range of vapor 17O-excess where a similar paleo-RH proxy might be worth exploring?
- Is the  $\delta^{17}\text{O}$  (or  $\delta^{17}\text{O}$ , note the difference between the apostrophe and the prime notation and please be consistent throughout the manuscript) defined in Equation 3 necessary? This may be confusing for beginning readers because some recent triple oxygen isotope studies (e.g., Aron et al., 2021, Sharp et al., 2018, the 2021 RiMG book) have used the  $\delta^{17}\text{O}$  notation rather than 17O-excess. If possible, I think it would be good to avoid the  $\delta^{17}\text{O}$  symbol in this instance to minimize confusion.
- Section 3.2, paragraph 1: Did the authors account for potential memory effects in the vapor measurements when switching between ports on the manifolds? Were any

measurements dropped or ignored just after switching to vapor measurements from a new chamber? Previous vapor isotope studies have shown that memory effects on vapor  $d^{18}O$  and  $d$ -excess need to be accounted for when a this type of manifold setup is used (e.g., Simonin et al., 2013). I imagine that the sensitivity of  $17O$ -excess to mixing makes this consideration important in this case as well.

- Figure 1 provides a very useful schematic to understand the experimental setup. However, I have a few questions about the isotopic values reported. First, if evaporation is prevented from the soil, why are the soil  $d^{18}O$  and soil  $17O$ -excess values not identical (within analytical precision) to those of the irrigation water? Second, why is the  $17O$ -excess of the final vapor (-6 per meg) so low? Is this a product of vapor mixing within the chamber? I encourage the authors to add  $d$ -excess data when possible (I assume this is accessible from the Picarro measurements) to explore the hydrologic processes that are going on in the chambers.

#### References:

Aron, P. G., Levin, N. E., Beverly, E. J., Huth, T. E., Passey, B. H., Pelletier, E. M., et al. (2021). Triple oxygen isotopes in the water cycle. *Chemical Geology*, 565, 120026. <https://doi.org/10.1016/j.chemgeo.2020.120026>

Sharp, Z. D., Wostbrock, J. A. G., & Pack, A. (2018). Mass-dependent triple oxygen isotope variations in terrestrial materials. *Geochemical Perspectives Letters*, 7, 27–31. <https://doi.org/10.7185/geochemlet.1815>

Simonin, K. A., Roddy, A. B., Link, P., Apodaca, R., Tu, K. P., Hu, J., et al. (2013). Isotopic composition of transpiration and rates of change in leaf water isotopologue storage in response to environmental variables. *Plant, Cell and Environment*, 36(12), 2190–2206. <https://doi.org/10.1111/pce.12129>