

## ***Interactive comment on “Oxygen isotope exchange between water and carbon dioxide in soils is controlled by pH, nitrate availability and microbial biomass through links to carbonic anhydrase activity” by Sam P. Jones et al.***

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Sam Jones and co-authors,

I have read your work with great interest. The exchange of oxygen isotopes between CO<sub>2</sub> and soil water is an important process for  $\delta^{18}\text{O}$ , and this work contributes to a better understanding of that exchange. However, this exchange is also of great importance for the budget of  $\Delta^{17}\text{O}$  in CO<sub>2</sub>, a different tracer for GPP.

C1

$\Delta^{17}\text{O}$  in CO<sub>2</sub> was first proposed as a tracer of GPP by Hoag et al. (2005). More recently, laboratory studies confirmed the effect of photosynthesis on  $\Delta^{17}\text{O}$  in CO<sub>2</sub> (Adnew et al., 2020), and we simulated large-scale variations of  $\Delta^{17}\text{O}$  in atmospheric CO<sub>2</sub> (Koren et al., 2019). We struggled with representing the soil exchange in that model, and for follow-up studies we can possibly improve our representation of soil exchange using Eq. 6 from your manuscript.

I think you can reach a greater audience if you also explicitly address the  $\Delta^{17}\text{O}$  community in your work.

Some other suggestions/questions:

- In the first line and last line of the abstract I would replace " $\delta^{18}\text{O}$ " with " $\delta^{18}\text{O}$  and  $\Delta^{17}\text{O}$ ".
- Sec 2. Are you sure that the sampling and transporting of soil samples does not affect the CA or microbes in the sample?
- There are two sections with number 2.1.
- L139: "Tillburg". This should be the lovely city "Tilburg".
- L147: Why did you choose to report on the VPDB<sub>g</sub> scale, instead of e.g. VSMOW?
- L210: The units provided in the text do not agree with Eq. 1.
- L423: I would briefly mention  $\Delta^{17}\text{O}$  here.
- Caption Fig. 1: The authors mention twice: "dissolved organic carbon (DIC)". Should this be DIC or DOC?

C2

References:

Adnew et al. (2020). Leaf-scale quantification of the effect of photosynthetic gas exchange on  $\Delta^{17}\text{O}$  of atmospheric  $\text{CO}_2$ . *Biogeosciences*. <https://doi.org/10.5194/bg-17-3903-2020>

Hoag et al. (2005). Triple oxygen isotope composition of tropospheric carbon dioxide as a tracer of terrestrial gross carbon fluxes. *Geophysical Research Letters*. <https://doi.org/10.1029/2004GL021011>

Koren et al. (2019). Global 3-D Simulations of the Triple Oxygen Isotope Signature  $\Delta^{17}\text{O}$  in Atmospheric  $\text{CO}_2$ . *Journal of Geophysical Research: Atmospheres*. <https://doi.org/10.1029/2019JD030387>

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