

Interactive comment on “Stable isotopes reveal evaporation dynamics at the soil-plant-atmosphere interface of the critical zone” by Matthias Sprenger et al.

Anonymous Referee #2

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General comments

The authors studied the influence of vegetation on water fluxes in the upper soil compartment of the Scottish Highlands by means of stable water isotopes. Soil samples were taken eleven times over the course of a year and analyzed for their isotopic composition using the direct equilibration method. The authors nicely visualized their results. However, they should consider cutting down the number of figures. I think the paper length should also be reduced by at least five pages, which would help focus on the most important points. There are many repetitions, which unnecessarily blow up the manuscript. What did the authors really expect to find? I think there could also be a more compelling title that illustrates immediately to the potential reader what exactly

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the paper is about. The title should focus more on the actual findings as the manuscript does not present atmospheric data or detailed data on vegetation (e.g. rooting depth and density) anyway. The authors pose three research questions. In my opinion, these questions could be more precise. In particular, the third research question cannot really be answered by the results – especially not the atmospheric component. With regard to the soil samplings, I would not consider the sampling strategy as high frequent, especially against the background of portable laser spectrometers which can indeed measure water isotopic composition in-situ with high frequency. The authors describe the soil texture of the upper 20 cm as mainly loamy sand. A table, which compiles all soil properties, would be helpful at this point. Soil properties have been shown to affect the extraction method's isotope results. Do the authors have data on the soil mineralogy (clay mineral composition)? The applied direct equilibration has several downsides: It is less precise for more clayey soils and soils with low water content; storage time is also an issue as it can lead to evaporative water loss through the bag (How long were the bags stored prior to analysis in the present study?) Furthermore, soil organic matter content has been proven to have an effect on gained isotope results. The authors should consider these aspects when discussing their data. In sum, I think this paper will make a good addition to the soil water isotope literature, although it does not contain much novel or surprising findings. However, the authors did a great job in data analyses and presentation.

Specific comments

P 1 L 13: $\delta^{18}\text{O}$

P 3 L 1: Thus,...

P 4 L 14-29: Described in too much detail; consider compiling important soil data in a Table

P 5 L 3-8: Far too detailed

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P 5 L 24: Not necessary to state model and serial number of the isotope analyzer

P 6 L 7: Not necessary to reference the python module; please change throughout the manuscript

P 8 L 4 –P9 L3: This whole section is again too long. Please condense

P 9 L 6: Different font used

P 11 Fig. 2: for a) I would suggest to plot the rainfall amount data inversely (top-down) and either change the scale of the axis or the size of the blue star so that they are not cut off; for b) consider including moving averages through the soil data (e.g., moving average for the top and subsoil); describe the color code of the soil data (light brown dots stand for. . .)

P 13 Fig. 4: This figure does not add much information; consider deleting this figure. Does the average precipitation input signal represent a 1-yr mean?

P 16 chp. 3.2.2.: Include this section in results section 3.1 as it does not add too much new information

P 20 chp. 3.2.4 Delete this section. There are no sig. differences in isotopic signatures when considering the aspect.

P 20 L n134 ff: Repetition; consider deleting

P 21 L 167-68: bypass flow, really; not so much differences over depth here

P 22 L 175 : Is throughfall data available for these sites to underline this statement?

P 24 L 260: Add Gaj et al. (2017b)

P 24 L 265: This is not a new finding and not really surprising.

P 24 L 269: The authors compare their study with results by Geris et al. (2015a) quite frequently. Is the vegetation cover comparable in both studies?

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P 24 L 277: Debatable that the authors state to see highly dynamic isotope signals.

P 25 L 290: What exactly is the angle in your case?

P 25 L 293: gamma: . . .are mainly due to . . .

P 26 L 318: In my opinion, the present study does not really unravel interactions occurring in the soil-plant-atmosphere continuum but adds to process understanding of water fluxes through the soil compartment.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., doi:10.5194/hess-2017-87, 2017.

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