

Interactive comment on “Quantification of dynamic soil – vegetation feedbacks following an isotopically labelled precipitation pulse” by Arndt Piayda et al.

Anonymous Referee #2

Received and published: 13 January 2017

General comment

This very interesting work deals with an important and hard to assess ecohydrological problem, where once more stable isotopes prove to be useful. The manuscript presents a NICELY WELL done experiment. With very interesting results which suggests that vegetation keeps withdrawing water from the same depths after simulated rain events. Event size showed that short to medium precipitation were not very important under a dry scenario; that vegetation below trees are fierce competitors and that these lead to senescence at the beginning of the drought, and last that Trees also ameliorate the micrometeorological conditions and soil water infiltration rates. This is, in my opinion, the most relevant finding of this study. However, some issues need to be address first:

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The authors made the experiment in a Cork-Oak forested area. However, they refer to it as Cork - Oak, cork-oak and cork oak. Please, select one and be consistent throughout the document. Please, pay attention to the use of hyphenated words.

Citations also need to be checked. For example on material and methods, the authors cite: "(Piayda et al., 2015)". However, later the authors start using parenthesis enclosing the year. I understand it is possible to do it like that, but for example on line 10, just before equation 4 (page 6) the citation is: "(Moreira et al., (1997); Yakir and Sternberg (2000))". However, it should read "(Moreira et al., 1997; Yakir and Sternberg, 2000)". Please, check this throughout the document. Also, pay attention to repeated parenthesis that are not needed.

Equation 2, is referenced to Craig and Gordon (1965). However, that equation does not appear in that document.

Please see attached pdf file

Where dE , stands for isotopic composition of the water vapour coming from the evaporating surface (dS) and dA stands for the atmospheric isotope composition. Also, the fractionation factor α , is referred as α^+ , for condensation; and α^* for evaporation. It is important to note that in this case, and according to nomenclature introduced by Craig and Gordon, (1965), and followed by others (e.g. Gat, 1996; Gibson and Reid, 2010):

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Please note that W and v stand for water and vapour. And that the reactant (i.e. source) is noted in last place. Hence, $w-v$ should read as vapour to water (i.e. condensation). While, $v-w$ should read as water to vapour (i.e. evaporation). Hence, α^* is used for evaporation process. I have checked also Mathieu and Bariac (1996); Dubbert et al. (2014) and couldn't find it either. Please, could you provide the right cite?; If this equation was derived by the authors, then please add include it in the appendix.

Craig H, Gordon L. 1965. Deuterium and oxygen 18 variations in the ocean and

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the marine atmosphere. In *Stable Isotopes in Oceanographic Studies and Paleotemperatures*, Tongiorgi E (ed.).Spoleto; 9–130. which can be downloaded from <http://climate.colorado.edu/research/CG/>

Dubbert M, Playda A, Cuntz M, Werner C. 2014. Oxygen isotope signatures of transpired water vapor – the role of isotopic non-steady-state transpiration of Mediterranean cork-oaks (*Quercus suber* L.) under natural conditions. *New Phytologist* 16: 2014

Gat J. 1996. Oxygen and Hydrogen isotopes in the hydrologic cycle. *Annual Review of Earth and Planetary Sciences* 24: 225–262. DOI: 10.1007/s13398-014-0173-7.2

Gibson J, Reid R. 2010. Stable isotope fingerprint of open-water evaporation losses and effective drainage area fluctuations in a subarctic shield watershed. *Journal of Hydrology* 381 (1–2): 142–150 DOI: 10.1016/j.jhydrol.2009.11.036

Mathieu R, Bariac T. 1996. A numerical model for the simulation of stable isotope profiles in drying soils. *Journal of Geophysical Research* 101 (D7): 12685–12696 DOI: 10.1029/96JD00223 In the reference list, please check all of them. Some of them are in full capital letters; other don't have volume and/or page number

Specific comments:

Abstract:

Check hyphenation.

Line 24 (page 1): consider using “soil evaporation and transpiration were quantified.”; instead of “evapotranspiration were quantified.”. I think it would add the right value to your work, since you actually separate both evapotranspiration components.

Line 26 (page 1): it is not clear to me, who “use water”...soils or vegetation. If it refers to soils, I would change “use” for “evaporates”

Line 30 (page 1): Consider adding a comma after Thus.

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Line 30 (page 1): consider rephrasing "...faster subject" to "...subjected faster"

Introduction:

Please, consider adding the hypothesis already tested in this great work. This will only add more value to your research and again, great work. Material and Methods:

Line 12 (page 3): Please, consider adding the standard deviation in the temperature and precipitation.

Line 28-29 (page 3): Please, consider rephrasing this sentence. "...was measured at 5 cm depth", instead of "...in -5 cm depth was measured".

Line 1-2 (page 4): please consider rephrasing "Volumetric soil water ..."

Line 14 (page 4): Add WS to CRDS...Picarro is a Wavelength Scanned-Cavity Ring Down Spectrometer (WS-CRDS).

Line 19 (page 4): Please, remove parenthesis enclosing the publication years, since they are not needed. Please consider separating both equations Equation 1.1 and 1.2.. For example.

Line 6 (page 5): Please, add a cite after cryogenic distillation...This will clarify which kind of system did you use...West et al., 2006 and Orłowski et al., 2013 both use cryo-distillation, but the systems are very different. Could you add also information on your water recoveries (if measured), extraction temperature and time it took the whole process of water extraction from soils and leaves. I think this will add robustness to your work.

Line 4 (Page 6): I really don't think that the mesophyll in a leaf measures 5 cm. please check the unit and correct.

Line 10 (page 6): please, remove the parenthesis from the publication years on Moreira et al. and Yakir and Sternberg.

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Line 4 (page 7): please, consider “three-source linear model” instead of “three-source model”.

Line 7 (page 7): please, consider removing the “s” in “depths”

Line 21 (page 7): please, consider rephrasing “(bare: 14.9 °C, veg: 11.3 °C, Fig 1)” to “(14.9° and 11.3° C for bare and vegetated soils, respectively, Fig 1)”

Line 24 (page 7): please, consider adding a comma after “Systematically. . .”.

Line 8 (page 8): please, change “Lowest. . .” for “Depleted. . .”, I think it is more adequate.

Line 11 (page 8): please, consider removing “only”, is not needed.

Line 28 (page 8): please consider removing “here much” and adding after “than”, “that of”.

Please, remember that water evaporates, water is not used by evaporation or soil. (Line 10 (page 9)).

Line 23 (page 9): please check the double space you have before “Different . . .”.

Line 28 (page 9): please remove “was”, not necessary.

Line 17 (page 10): please remove the parenthesis before “Bhark and Small”, is not needed.

Line 6 (page 12): please add “et al” after Orlowski and remove the parenthesis from the year.

Line 8 (page 11): please remove the word “the”. The word is not needed. It would be interesting that you could add more literature to this paragraph.

Craig H, Gordon L. 1965. Deuterium and oxygen 18 variations in the ocean and the marine atmosphere. In Stable Isotopes in Oceanographic Studies and Paleotemperatures, Tongiorgi E (ed.).Spoleto; 9–130.

Dubbert M, Playda A, Cuntz M, Werner C. 2014. Oxygen isotope signatures of transpired water vapor – the role of isotopic non-steady-state transpiration of Mediterranean cork-oaks (*Quercus suber* L .) under natural conditions. *New Phytologist* 16: 2014

Gat J. 1996. Oxygen and Hydrogen isotopes in the hydrologic cycle. *Annual Review of Earth and Planetary Sciences* 24: 225–262. DOI: 10.1007/s13398-014-0173-7.2

Gibson J, Reid R. 2010. Stable isotope fingerprint of open-water evaporation losses and effective drainage area fluctuations in a subarctic shield watershed. *Journal of Hydrology* 381 (1–2): 142–150 DOI: 10.1016/j.jhydrol.2009.11.036

Mathieu R, Bariac T. 1996. A numerical model for the simulation of stable isotope profiles in drying soils. *Journal of Geophysical Research* 101 (D7): 12685–12696 DOI: 10.1029/96JD00223

Line 18 (page 12): please consider changing “Irrespective” by “Regardless”.

Line 22 (page 12): please consider changing “Therefore” by “Hence”.

Line 23 (page 12): Do you have any proof of root water redistribution in your study area...if you have it and are planning to publish it maybe, you could briefly comment.

APENDIX A:

I would enlarge the legend, and would use the same size as the scale. Please, add a multiplication sign or a space in between g and m-2 in the Y-axis unit. As you have already made in the figures.

FIGURES:

On figures 2, 4 and 5: too much iteration in the X-axis “days since event”. I would leave only one and change it for (time (d)) or simply “days”; and in the caption I would mention before that the dashed line is the watering event (on figure 2)

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Why are all axis in italics?, would be better to have them normal?...just a thought.

On figures 4 and 5: I would try to use a different symbol...squares, triangles, and diamonds. I think this will improve the readability of the figures. Please, this last is only a suggestion. However, I think it will improve the readability and impact of, again, such a nice work.

Figures 6 and 7: please, center the Y-axis name.

Please also note the supplement to this comment:

<http://www.biogeosciences-discuss.net/bg-2016-451/bg-2016-451-RC2-supplement.pdf>

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2016-451, 2016.

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