Final author response to Anonymous Referee # 2 (RC2)

Referee comments – Author response

General Comments:

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: 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.

The manuscript have been revised for consistent naming and use of hyphenation.

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 is possible to 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.

We checked the citations list and citations within the text and corrected the errors. We apologize for the inconvenience.

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

$$\delta_E = \frac{1}{(1-h)+\Delta\varepsilon}\left(\frac{\delta_S}{\alpha^*_{v-w}} - (h\delta_A) - \Delta\varepsilon + \varepsilon^*\right)$$

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 refered 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):

$$\alpha^+_{w-v} = \frac{1}{\alpha^+_{v-w}}$$

$$\frac{1}{\alpha^+_{v-w}} = \alpha^*_{v-w}$$

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, $\alpha *$ 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 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, Piayda 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

We apologize for the errors in the citation list, they are checked and corrected. The Craig and Gordon formula was written however not in delta notation but isotope ratios following previous publication of the authors. We now cite Dubbert et al., 2013 and Harverd and Cuntz, 2010 to refer to it. In addition we added a sentence on the transformation of R_E to δ_E (page 6 line 7).

Specific Comments:

Abstract

Check hyphenation.

The hyphenation errors have been corrected.

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.

The sentence was changed accordingly.

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"

The term refers to transpiration by plants and was changed accordingly.

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

The sentence was corrected.

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

The sentence was changed accordingly.

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.

The authors are thankful for the appreciation of the referee. The authors agree that working hypotheses will enhance the structure of the manuscript and incorporated the following hypotheses in the introduction, discussion and conclusions:

I. Presence of understory vegetation increases evaptranspirative water loss compared to bare soil, but foster infiltration due to shading.
II. Preferential root water uptake depth of understory plants is unaffected by changes in soil water availability after rain pulses during drought.
III. Tree shading fosters infiltration of event water and reduces evapotranspiration generating favourable soil moisture conditions for understory plants.

Material and Methods

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

The authors do not have access to data about the standard deviation of the long term temperature and precipitation distribution and therefore apologize for the missing information.

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

The sentence was changed accordingly.

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

The sentence was changed accordingly.

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

(WS-CRDS).

The sentence was changed accordingly.

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.

The parenthesis were removed and the equation was split in two.

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 Orlowski 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.

We used a cryogenic system of our own design, which are in long term use in the labs in the PSI and Freiburg. The system is similar to that of Orlowski et al., which we cite now respectively.

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

This was misleading. The 0.05 m refers to the effective path length. We corrected the sentences.

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

The sentence was corrected.

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

The term was changed accordingly.

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

The term was corrected.

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)"

The term was changed accordingly.

Results

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

The sentence was corrected.

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

The term was changed accordingly.

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

The term was removed.

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)).

The sentence was changed accordingly.

Discussion

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

The space was removed.

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

The term was removed.

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

The parenthesis was removed.

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

The citation was corrected.

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, Piayda 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

The term was removed. Regarding the literature no specific action was taken. However, in response to the suggestions of both reviewers, the paragraph was restructured and more literature was added in response to the other specific comments.

Conclusion

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

The term was changed accordingly.

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

The term was changed accordingly.

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.

Unfortunately we do not have data on root water redistribution at our study sites. Hence, the authors removed the aspect of root water redistribution from the discussion in compliance with important comments of referee RC1.