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Hydrology and Earth System Sciences
Discussions

Interactive comment on "Speculations on the application of foliar ^{13}C discrimination to reveal groundwater dependency of vegetation, provide estimates of root depth and rates of groundwater use" *by* Rizwana Rumman et al.

Rizwana Rumman et al.

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Response to anonymous referee 2:

We are pleased to see that referee 2 considers the paper to be well written and organized. We also thank the referee for saying that the study to be of high importance. We have followed the referee's advice to check rigorously for typos and the placement of commas. In reply to the referee's comments we note:

a) We have added a map in the Supplementary material and this indicates the site lo-

cation and the location of the basin as a whole within the Northern Territory of Australia and Australia as a whole.

b) We have added the word "basin" at the end of the sentence.

c) We disagree with changing the word attributes to traits. It isn't the traits per se that is surprising, it is the values those traits have, that is surprising. The value of the trait is an attribute, not a trait. The trait is, for example, SLA. The attribute is "large" or "small values" of this trait.

d) We have inserted the hyphen in deep-rooted.

e) We have modified the wording of line 30 on p3; and DTGW has been defined here too.

f) We have indicated the distance from the Met station to all study sites (line 27).

g) We have indicated GW depth in the eastern region.

h) No, it is four plots, each with a different DTGW, as stated in the methods in several places.

i) We have reworded p6 line 4 to show that the distances refer to the depth-to-groundwater.

j) We have added text to explain how bore water was collected on p6.

k) The method to extract water is amply described by the phrase "cryogenic vacuum distillation" and the citations to the key references of Ingraham and Shadel (1992) and West al., 2006). We have added some text to refer to the key features, namely imposition of a vacuum and subsequent freezing of water vapour with liquid nitrogen.

l) We have inserted the word "powder" in line 5 of P7.

m) Yes, three leaf samples per tree were measured, independently.

n) We have defined the meaning of the two deltas in equations one and two on p7.

o) Lines 12 – 16 on p8 explain in detail how segmented regressions were undertaken.

p) The abbreviation DTGW has been defined prior to its use on p8.

q) Lines 3 – 12 of p9 does not refer to data sampled along the Allunga Creek. The data presented in this paragraph were from the Corymbia savanna and riparian plots. We have added the words "sampled in the Corymbia savanna and Mulga plots" at the start of the paragraph to make this clearer.

r) We have deleted the word "either" as requested.

s) We have corrected the ANOVA value as requested.

t) We have added the pre-dawn water potential and sapwood density values as suggested, on p9.

u) The possibility of Rubisco limitation for these Acacias is extensively discussed in Nolan et al (2017; Functional Plant Biology 44, 1087 – 1097) and this is not an explanation.

v) Figure numbers are cited as requested.

w) We have amended the citation of Rumman 2017 to Rumman et al 2017 as this is now the published version (Global Change Biology 24, 1186 – 1200). The full species list is available there. It is far too large a list to cite in the HESS Ms.

x) We have rewritten the paragraph mentioned by the referee and hope this is now clearer to the reader. A map of the Ti Tree is now included in the Supplementary material.

z) We have chosen not to add the daily rainfall data to the cumulative sum plot as it makes the plot too "busy". Moving the plots closed together in Fig 1 makes the axes labels become less distinct.

aa) The range of y values in Fig 2 was chosen to optimize the clarity of the plots and

we have chosen to leaves these as they are.

ab) Symbol and font sizes have been reduced in the lower two panels if Fig 3. DTGW has been defined in the legend.

ac) Given the fact that HESS is published on-line, and therefore space is not a critical issue, we have chosen to leave the panels spaced as they are for clarity and ease of reading in Fig 4. We understand the referee would prefer to see DTGW as continuous data, we feel that by the time the reader has got to this figure they will be comfortable with seeing the plots as categorical. We have added "depth-to-groundwater" in the figure legend as requested.

ad) As discussed in section 4.1 of the Discussion, the topographic gradient is very small close to Allungra Creek. Consequently depth-to-groundwater as a function of distance from the Creek shows little variation. What changes with distance from the creek is the amount of recharge of the soil profile following flood events. It was not possible to measure depth-to-groundwater here because there are no bores installed. As we discuss in the Ms, the change in Δ13C as a function of distance from the creek is a function of access to additional water arising from bank recharge following flooding, not access to groundwater.

ae) We have inserted "depth-to-groundwater" in the fig legend and increased the font size and data point size in Fig 6. We have added the R2 and the st.dev of the regression below the breakpoint into the figure legend. We think a key point to note is that the segmented regression, when applied to two independent data sets (13ΔC data (Fig. 3) and LVD data (Fig. 6)) yield very similar relationships with very similar breakpoints (as discussed in the MS) and this adds confidence to the speculations made about what these breakpoints represent ecophysiologically.

af) We have redrawn Fig 7 and made the font and data points larger.

ag) It is not possible to plot the 95 % CI on Fig 8 and still retain clarity. Consequently we have quoted the 95% CI in the legend so that readers can have that value to-hand. We have indicted in the legend what the arrows mean.

Please also note the supplement to this comment:
https://www.hydrol-earth-syst-sci-discuss.net/hess-2017-540/hess-2017-540-AC2-supplement.pdf

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