

## ***Interactive comment on “Responses of woody species to spatial and temporal ground water changes in coastal sand dune systems” by C. Máguas et al.***

### **Anonymous Referee #2**

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Maguas et al investigated the ground water use of 5 different dune plants in western Portugal. Specifically, the authors were interested to test 1) how ground water use varied among the 5 different species, 2) how ground water use varied between the rainy and the wet season and in response to changing ground water depth and 3) how differences in ground water use and changes in ground water depth affect the physiology (pre-dawn water potential, foliar  $\delta^{13}C$ ) of the 5 plant species. Unfortunately, I have several concerns about the scope, data analysis and the presentation of this research:

1) The authors need to do a better job of presenting the overall scope of their research.

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As it stands, this is a case study for sand dune vegetation but the general relevance of the observed mechanisms is unclear. 2) The important hypothesis 1 was never tested. I.e. there is no statement in the manuscript explaining if and how the 5 plant species differ in ground water use. 3) A two-pool model was used to calculate the % ground water used by plants. The model used d18O of ground water as one end-member and d18O of precipitation as the other end-member. Using precipitation as one end-member of the model and not surface soil water might introduce substantial uncertainty to the estimates of % ground water used by plants. This is because the isotope composition of precipitation water could differ substantially from soil water (soil water can become evaporatively enriched). I fear that these uncertainties challenge the presented results. The authors acknowledge these uncertainties, yet data on surface soil water would be critically important to evaluate the accuracy of the estimated % ground water use. 4) A central question of this study is how plants respond to changes in the ground water table. However, ground water depth is not presented numerically. Fig. 4, which shows the spatial and seasonal variation in ground water depth with color imaging, is nice but not very useful. I would recommend to show numeric values for ground water depth and to include these values into the analysis. E.g. does the % ground water use of plants depend on ground water depth and changes therein? 5) Some results are greatly overstated. E. g. p.8 line 13-15. The authors state a clear seasonal difference in the observed source water used by the plant community. I cannot find this difference anywhere. Tab 1 shows that only 2 out of the 5 species show significant seasonal differences. E. g. p. 8 line 30 cont. I do not see where the authors demonstrate that a lower GW table leads to increased vulnerability to drought. 6) I have trouble understanding the definition and analysis of the “microsites”. When I read the paper I had the impression that the authors established 5 sites that varied in ground water depth and used this as a gradient to test their hypothesis. In this context, I do not understand the purpose of discussing patterns at the individual sites in terms of “microsite” comparisons.

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