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Hydrology and Earth System Sciences Discussions

Interactive comment on "The olive tree: a paradigm for drought tolerance in Mediterranean climates" *by* A. Sofo et al.

Anonymous Referee #2

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General Comments

This paper presents the results of some interesting experiments that evaluate the methods by which olive trees tolerate droughts. The first set of experiments considers two year old olive plants that were grown in pots under irrigated and drought stressed conditions. The second set of experiments considers plants grown in a semi-arid region over a period of seven years. The central result in my opinion is shown in Figure 2c. This figure demonstrates that a widely-used relationship between transpiration rates and relative saturation of soil applies during a dry-down period, but after that period, the olive trees require about 4 weeks to recover to their full transpiration rates again even when soil water is available. Much of the paper is focused on explaining why this

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behavior is observed.

I approach this paper with a background in hydrology rather than plant physiology, so my comments must mainly focus on that side of the paper. However, my main suggestion would be to make Sections 3.2 and 3.3 more easily understood by a broad audience. I think the results of this paper are quite valuable and should be interesting to researchers in many areas, so it would be appropriate to write the paper in a way that allows a broad audience to benefit. Indeed, the authors have made most of the paper quite readable aside from these two sections. Perhaps the authors can include a little more explanation of their terminology. Also, it would help if the paper described the methods, results, and conclusions in a more thorough and sequential order. In Sections 3.2 and 3.3, it is difficult to determine which statements are based on the experiments and which statements are drawn from the literature. It is also difficult to determine the methods that were used in the experiments to obtain the results.

Overall, however, I believe the paper is quite interesting and warrants publication with some additional clarification.

Specific Comments

Page 2813, line 3 – what is meant by “land surface?” Do the authors mean only topography or something more (soil properties, etc.)?

A more specific statement of the objectives would strengthen the paper. The objectives are currently stated quite broadly, which makes it more difficult to understand the choice of the experimental design, results, and conclusions.

In section 2, more explanation about the experimental design would be valuable. For example, it was not obvious to me why these particular ages of plants were selected or why the second site was studied. Also, I would recommend stating the measurements that were made for each experiment and the method used to make each measurement.

The description of the irrigation and drying schemes for the first experiment is difficult

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to understand in that section. They become clear later in the paper, but the text about this could be clarified a bit in Section 2.1.

In Section 2.2, the modeling results are not fully described. Has the application of the model to this region been described elsewhere in the literature already? If so, a clearer citation is needed to support this section. If not, then a much more thorough explanation of the modeling is needed. For example, the authors do not describe the porosity (which directly affects the distribution in Figure 1) and other parameters in the model or their origins. Whether or not these results are new in this paper, I believe that another layer of detail is needed here to judge the significance of the results that are presented. Alternatively, the authors may wish to consider removing this figure and associated discussion because it does not seem central to the main thrust of the paper.

In Section 2.2, the authors provide soil texture results. Can the hydraulic characteristics be provided as well (porosity, unsaturated hydraulic conductivity, etc.)?

In Section 3, the authors state (page 2817 line 11), “…Eq. (1) should be applied accounting for this reduction in the potential transpiration rate.” Is it correct to consider this reduction in the potential transpiration rate? To me, this approach seems like a redefinition of the term. Also, for clarity, I suggest that the authors directly call Emax the potential transpiration rate because they imply their equivalence here.

The results described on page 2817 (lines 17-21)–are these also from Nuzzo et al. (1997) or based on the experiments? Please include a stronger justification here.

Page 2818-line 1-2. Can the authors provide some brief basis for each of their assumptions?

Technical Corrections

Most of these are grammatical/typing corrections:

2812, line 1 I suggest “Olive trees … are commonly grown” 2812, line 15, I suggest “proline and other osmolytes have key roles” 2812,

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line 22, I suggest “understanding plant-soil interactions” 2812, line 25, I suggest “forcing, producing” 2813, line 2, I suggest “climatic conditions” 2813, line 5, citation? 2813, line 12, In numerous places (like here) the authors say “olive tree.” I suggest “The olive tree” or “An olive tree” 2813, line 14 suggest “Mediterranean area, and “ 2813, line 16, suggest “the olive tree” 2813, line 18, suggest “response” rather than “reply” 2813, line 27, “Olive trees are” 2813, line 27, not sure what is meant by “sparing users of soil water.” 2813, line 29, “the olive tree” 2814, line 1, remove hyphen 2814, line 6 connect the two sentences “…hills (…,2005) because its culture…” 2815, line 1, replace “grew” with “grown”, “vases” with “pots” 2815, line 6, I’m not sure what “integrated” means here 2815, line 7, why was 85% chosen? 2815, line 9, replace “and successively” with “after which” 2815, line 10, is optimal the same as 85% saturation? 2816, line 19, I think the figure citation is incorrect 2817, line 16, “of about 55%” should be “by about” 2818, line 17, “recovering” should be “recovery” 2821, line 4, “The olive tree” 2822, line 24, “the olive tree”

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 4, 2811, 2007.