

Interactive comment on “Drought reduces tree growing season length but increases nitrogen resorption efficiency in a Mediterranean ecosystem” by Raquel Lobo-do-Vale et al.

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Response to reviewer 2

We thank the reviewer for the positive comments to the paper and suggestions that have improved the manuscript.

This study aimed at untangling the effects of drought on timing, duration and amount of growth, budburst, and nitrogen resorption efficiency. For this, the authors used 2 subsequent years, one of which was a mild drought, the other a strong drought. The authors found significant reductions in timing and duration of phenological param-

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ters like budburst and growth, and found an increased nitrogen resorption in drought stressed trees, mitigating the negative effects of drought on N uptake from the soil. The authors study some important aspects of effects of a changing climate: the phenology of trees. - In the discussion they are however a bit chaotic, and strong explanations on what has been caused by drought and what could be caused by other factors are partly there but not very elaborate.

Answer: Discussion was re-structured and improved.

- I think I understand that only dry/ambient trees were used, and not the wet trees. This has to be more clearly explained though, even if referred to another paper, it would be nice to have a clear explanation in this paper on the exact study sample. Why were the wet trees not used? That could have been a nice interaction: drought years and trees growing with more or less water.

Answer: In the manuscript by Kurz-Besson et al. 2014, we showed a significant effect of the irrigation treatment on tree growth, while no significant effect of rainfall exclusion could be detected throughout the study period between 2003 and 2005, between trees from the DRY (rainfall excluded) and the AMBIENT (control) treatments. Therefore, we considered trees from the DRY and AMBIENT treatment as a single pool belonging to the same statistical population. Also the irrigation treatment only had a significant effect after a single pulse irrigation in late spring applied as a punctual experiment, that we did not consider representative of the rest of the irrigation performed in 2005. This is why we excluded trees from the WET treatment in our manuscript. We added an explanation to the manuscript Page 4 lines 15-21.

- I advice to revise the discussion. It is a bit chaotically structured. Different measured variables come back every time with another focus, but then there is also overlap (trunk growth first occurs in terms of timing and duration (p16, line 25 a.f), then later it comes back again in growth rate but also again duration (p18 line 5 etc).

Answer: Discussion was re-structured.

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- The authors mention the short time frame of their study in the conclusion, but it would be nice to already discuss some of this in the discussion. Because, what could be the effect of time lags of drought on growth? Are there any legacy effect?

Answer: In fact, we can not exclude any legacy effect of previous droughts on tree phenology. However, because we observed a fully recovery on tree physiology shortly after the start autumn rains, as reported in Besson et al. 2014, we believe that the current hydrological year, or short-term environmental conditions, were the major drivers of phenology in the spring.

Some minor comments - Could you indicate significance in figure 2?

Answer: Because figure 2 shows the onset and cessation and, thus, duration of the phenophases, we believe that adding significances to the figure would make it difficult to interpret. Alternatively, we added a table (Table S2) to the supplemental material.

- I feel that figure 4 is unnecessary next to figure 3. If significance would be indicated in -figure 3, all those relations would already be shown there.

Answer: In Fig. 3 we want to show the dynamics of different phenophases over time. In Fig. 4 we want to emphasize the differences in spring growth. So, time scales considered in Fig. 3 and Fig. 4 are different. Pooling data in Fig. 4 allowed the detection of stronger significant differences leading to stronger conclusions for our manuscript.

- P14 line 16, move to discussion

Answer: In fact this information was already in the discussion section, so this sentence was deleted.

Discussion - P16 line 1-7 What was the DDS at budburst in this study? This does not have to be speculated on, the data is there to calculate, right?

Answer: On page 7 lines 27-28: "The degrees-day sum (DDS) until budburst were not significantly different between years ($p > 0.05$, 461 ± 13 and 431 ± 19 °C for the mild

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and dry year, respectively, Fig. S1b).

- P17 line 1-7 Is water the only factor that can cause cessation of growth? In the mild year, I think the cessation was not caused by a low water potential, but by other factors that determine the end of a growing season.

Answer: We can not exclude the possibility of an effect of VPD, that was higher in the mild year. Nevertheless, high VPD's were also registered in some periods during the growing season. We added some comments in the discussion, Page 17 line 13.

- P20 line 9 In my view it has been speculated upon but not shown. We have shown a clear effect of drought in shortening the spring growing season length, mostly by an early cessation of growth, with a correspondent decrease in growth variables, such as shoot elongation and trunk growth.

Please also note the supplement to this comment:

<https://www.biogeosciences-discuss.net/bg-2018-393/bg-2018-393-AC2-supplement.zip>

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2018-393>, 2018.

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