Dear Co-Editor-in-Chief Monica Turner,

Thank you for your correspondence regarding our manuscript entitled  
“*Land-use legacies and climate change as a double challenge to oak forest resilience: mismatches of geographical and ecological rear edges*” (ECO-19-0444.R2).

We appreciate the helpful comments from the two reviewers and the subject-matter editor. We also thank the opportunity to address their suggestions. We have carefully taken their comments into consideration in preparing the revised version of our manuscript.

Below, please find our detailed point-by-point responses (indicated with “R”) to the reviewer comments and suggestions. We have numbered each comment and reply for easy reference and have indicated the line(s) (“L”) where the changes have been made in the manuscript.

Whether you need anything further clarification, please do not hesitate to ask. We keep looking forward to receiving news.

Sincerely,

Antonio J. Pérez-Luque and co-authors.

Reviewer: 1  
  
#1. L60-L75 (and throughout): I think referring to severe droughts as “natural” is not a good approach as severe droughts, especially in the last few decades have been intensified by human-caused climate change. Additionally, the way this paragraph is worded the authors make it sound like climate is a natural drivers, which historically it was, but human-caused climate change has severely altered climate. The idea that climate change is a challenge to these forests is a main point of the paper so why would the authors refer to changing climates as “natural”. Perhaps the authors could make the distinction at the beginning of the paragraph between the human-caused climate change and human-caused land-use change. And make a distinction that natural variation in climate exerts pressures on these forests but recent acceleration of climate change is now having a much bigger influence than historical climate variation.

R1. Thanks for this suggestion. We agree with reviewer that it’s important to make a distinction between natural and human-caused climate change. We have included this distinction in the text and rewrite some parts of the paragraph to accommodate this point. See L60-74*.*

#2. L110 – reviewed historical…

R2. Done. We fixed the error. See L113.

#3. L111 – impacted tree-growth over time

R3. Done. We changed it. See 114.

#4. L316 – Consider changing to Resilience, resistance and recovery to drought… You are really talking about all three here, not just resilience

R4. We have include both terms in the subsection’ title. See L316.   
  
#5. 388 – and

R1. Done. We fixed the word typo. See L385.

#6. It seems that the paragraph from 458-484 and 486-500 could be both shortened and combined into one “Conclusions” section.  
R6. Done. We have combined and shortened those paragraph into a new “Conclusions” section. See L457-491

Reviewer: 2

#7. L73 ‘Thus’ is unnecessary

R7. We removed it.   
  
#8. L91- 92 This sentence is difficult to follow; “Remote sensing can also be used to analyze the impact of drought on ecosystems at the stand level (e.g. Zhang and others 2013)” may be clearer  
R8. Thanks for the suggestions. We rewrote the sentence according your suggestion. See L89-97.

#9. L107-108 Should the main hypothesis be interpreted as that there will be low resilience to drought at the most marginal populations but that this vulnerability will decrease quickly along an elevation gradient? As the ‘small-scale’ gradient has not been introduced yet, it is slightly difficult to interpret this main hypothesis. Perhaps rephrase to “Our main hypothesis is that range edge stands will show low resilience to extreme droughts, but that the vulnerability to drought will be ameliorated quickly across a fine-scale topographic gradient.   
R9. Done. We rewrote the sentence according to your suggestion. See L108-110.

#10. L111 Change to ‘through time”

R10. We changed it. Please see response to comment #3 of the Reviewer #1  
  
#11. L115 -118 This final sentence seems unnecessary.

R11. As suggested, we have removed it.   
  
#12. L130 ‘Marked variability’ in aridity? Or something else?

R12. The marked variability here refers to rainfall. We have clarified in the text. See L129.  
  
#13. L287, 288 Change ‘time’ to ‘temporal”

R13. Done. See L287,288.

#14. L294-297 Split this into two sentences

R13. Done. See L294-297.

#15. L321 – May be more clear to say the metrics co-varied between those ‘two drought events’ as opposed to those ‘two year’

R15. We changed it. See L321.

#16. L332 – 335 I am not following these couple of sentences concerning 1995. Was this another severe drought event? How did this event influence GC in the different sites?

R16. Yes, it was. The year 1995 was the worst drought event in our study area in the last decades (see Table S3). It provoked a great reduction in tree radial growth (Figure S2a) (see L301-L303). We did not find release events at the southern sites (Figure 4b) during this drought event. However for the northern site (SJ) we observed a release event (GC > 50% occurring in more than 50% of trees sampled) during the period 1995-2000 (L312-313). As we discuss in the discussion section this release might be related to natural drought-induced mortality after 1995 drought event (see 451-456).

#17. L363-366 This sentence feels like it belongs in the introduction as opposed to the discussion.

R17. We appreciate this suggestion. We have moved it into the introduction section. See L91-94.  
  
#18. L408-412 I don’t think you can disentangle the potential impacts of local adaption vs. land-use for the drought resilience at the range edge with this study. It may be better to state that in addition to the potential role of local adaptation, your results suggest that land-use also has a role in drought resilience and the determination of the range edge.   
R18. Thanks for this valuable comment. We have rewritten the sentence to accommodate the suggestion. Please, see L405-408.

#19. L461 – What stabilizing mechanisms are you referring to?

R19. We included some example in the text. See L465-467. You also could find a complete review at Lloret and others 2012.

References used

Lloret F, Escudero A, Iriondo JM, Martínez‐Vilalta J, Valladares F. 2012. Extreme climatic events and vegetation: the role of stabilizing processes. Global Change Biology 18:797–805.