

Clim. Past Discuss., referee comment RC2
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Comment on cp-2021-171

Anonymous Referee #2

Referee comment on "Do Southern Hemisphere tree rings record past volcanic events? A case study from New Zealand" by Philippa A. Higgins et al., Clim. Past Discuss., <https://doi.org/10.5194/cp-2021-171-RC2>, 2022

General Comments

Higgins et al. show that New Zealand tree rings can indeed record past volcanic events. They effectively address the research questions they set out to answer. They find that the nature of the response to volcanic dimming varies across species, categorizing species as either "fast responders" or "stress tolerant." With this mixed response between species, they find that site-related factors are more important to the displayed volcanic response in tree-ring width. They additionally develop two austral summer temperature reconstructions for New Zealand, which show evidence of cooling from past volcanic events. The response to past volcanic eruptions in these reconstructions shows good agreement with climate model temperature anomalies following volcanic eruptions. The authors competently show that New Zealand tree-ring width is a reliable regional indicator of volcanic climate response. They add further nuance however and underline the importance of species/site selection, which will be very useful for future studies in these regions that wish to optimize sample selection. I believe this publication is fit for publication after minor revisions and will be useful to the research community.

Specific Comments

In general I think you need to be more specific with the use of the term "dimming". I'm assuming you're using this term to refer to the increase in SAOD but this should be clearly stated to avoid confusion. The "dimming" term is used throughout the text as a catch all for the effects that could affect tree-ring width, but add specificity where you can. There also needs to be more discussion on the effect of light availability changes, or dimming, and how it could affect final tree-ring width. Particularly in your discussion of the kauri growth benefit (line 393-394). Line 62-63 is another part of the text with opportunity to add more discussion on effects of radiation changes from volcanic eruptions. Here are some references you could use to expand this discussion:

Robock, A. (2005). Cooling following large volcanic eruptions corrected for the effect of diffuse radiation on tree rings. *Geophysical Research Letters*, 32(6).
<https://doi.org/10.1029/2004gl022116>

Tingley, M. P., Stine, A. R., & Huybers, P. (2014). Temperature reconstructions from tree-ring densities overestimate volcanic cooling. *Geophysical Research Letters*, 41(22), 7838–7845.

Line 109-114 How robust is this event list? Is there a secondary dataset you could use to test? Would you get the same events with the same SAOD thresholds? If there isn't a comparable dataset I'm not too concerned with this, but I think the choice of this dataset over potential others needs to be explained if it can change the final list of events used.

Line 438-439 You need to support the statement that sites with high exposure to prevailing winds are more sensitive to low growing season temperatures, either from the literature or from your own analysis.

Line 444 Similar to the point above, you need to support this statement.

Figure 1 Add a legend for the elevation. This is important context for your conclusions as elevation is an important site characteristic.

Figure 3 Caption "...the number of chronologies are shown in brackets/square brackets." Make it clear which bracket type refers to which chronology. Adding the word "respectively" will work.

Technical

Line 22 proxy --> site/species Using proxy sounds like you are expanding into non tree-ring proxies like coral for example.

Line 46-49 Awkward sentence structure

Line 51-52 tree-ring data

Line 89 proxy --> site/species

Line 114-115 awkward sentence structure

Line 140 specify season

Line 436 add a call to Figure 5

Line 458-460 awkward sentence structure

Line 478 MDX-->MXD typo

Line 482 Add call to Figure 7

Line 508 proxy --> species/site