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Comment on nhess-2020-427

Anonymous Referee #2

Referee comment on "Assessing local impacts of the 1700 CE Cascadia earthquake and tsunami using tree-ring growth histories: a case study in South Beach, Oregon, USA" by Robert P. Dziak et al., Nat. Hazards Earth Syst. Sci. Discuss., <https://doi.org/10.5194/nhess-2020-427-RC2>, 2021

This paper presents an analysis of tree-growth and tsunami model from South Beach Oregon, where an old growth forest persists near the shoreline, after the 1700 megathrust earthquake. The study shows that the trees that survived the 1700 earthquake and associated tsunami exhibit growth suppression and anatomical signs of stress during and after the event. There are comprehensive descriptions of prior work and each component of the study, however it can read as repetitive and disjointed in places. To avoid the current ample redundancy this paper may benefit from a more classic breakdown of "methods" and "results" then discussion (with subsections for tree analysis and tsunami modeling). As written, with the results and methods combined, the purpose of analyses and what they suggest can be hard to follow.

As my expertise is not in tsunami modeling, I limited my review primarily to the tree ring analysis.

The manuscript would benefit from more context of the climate/ecology before, during, and several years after the event. The authors mention the importance of climate and ecology in suppressing ring growth – what do reconstructions from the NADA say about drought? Can the upland/lake trees be used to reconstruct any climate parameter that may explain the potential growth release or suppression? Also, as there are only about 40 years before the 1700 event, what is the likelihood of seeing these suppression events in older trees? Are these trees potentially the youngest trees in 1700 with a better potential

for survival than their older neighbors?

The authors utilize the presence of traumatic resin ducts and other wood anatomical features as signals of inundation. As presented, it is not clear if these are quantitative or qualitative measurements? If they are quantitative, it would help if there were symbols (stars etc.) on the time series figures (figure 4 & 5a) to mark years with significant numbers of TRD etc. It would be helpful if the authors performed a superposed epoch analysis (or growth release/suppression detection) rather than just showing the raw ring indices shown in Figure 4b. A SEA comparison of inland vs survivor coastal trees might also help highlight any differences. I found myself looking for quantitative measurements and uncertainties for these analyses.

I feel that the manuscript is missing a figure or analysis on the amount of ring suppression or presence of ring trauma with amount of inundation as modeled. This would make the connection between the tsunami model and the tree-ring analysis stronger. Do we see more wood anatomy indicators or ring suppression with deeper inundation?

As written, this paper seems to support a full rip M9 rather than multiple events (e.g. Melgar 2021). It would be great in the discussion to discuss the potential for multiple events, or utilize this site to evaluate the potential for an event prior to or after 1700. Especially as growth suppression is seen prior to 1700, *could* one argue that this site is evidence for an earlier or later event?

Below are some smaller comments about structure:

Line 9: Although the study does discuss some of the spatial components of disturbance

history, it doesn't read as the principal emphasis/analysis of the tree-ring work. I would suggest changing to "We present an investigation of the disturbance history..."

Line 10: I would suggest "changes" rather than effects?

Line 22: erroneous floating period?

Line 29: add "growth" before suppression

Line 30: for non-dendrochronologists what is a "growth-event"?

Line 32: "Here we present a spatial analysis of the disturbance..."

Line 43: replace "it seems" with "it is plausible".

Line 43: add in here "in the form of traumatic resin ducts, ring width suppression etc." after "might be recorded in ring widths"

Line 57: "Occurred **in** the Cascadia Subduction Zone"

Line 63: as these dates aren't exact, maybe add an ~ in front of the dates

Line 67: change "should" to "would"

Line 94-95: rogue paragraph space?

Line 111: "it" refers to the digital-elevation and bathymetric grids? The inundation model?

Line 170: I would define reaction wood the first time it is mentioned

Line 200: define "water-logging" or possibly show an image of the traumatic resin canals and water logging as seen with a microwood anatomy image

Line 203: Where any statistical analyses done to quantitatively look at the ring growth suppression? SEA or growth release analyses?

Line 245: How were the stand-wide releases detected? Or in this case, not detected

Line 261: It would be good to list what altitude these sites are at, as up mountain climate sensitivity of trees is often stronger

Line 266: Only the 50-yr splines were used on the control chronology? Not the NEGEX? It was slightly unclear to me why NEGEX was dropped and why 50 yr spline was used.

Line 269: "trees from OR lakes" or "the lake's trees"

Line 270: Again, how was the growth anomaly detected?

Figure 4 a: are these detrended ring width?

Figure 5 b. All these lakes are not mentioned in the manuscript – it is not clear why they are all labeled.