

## ***Interactive comment on “ENSO flavors in a tree-ring $\delta^{18}\text{O}$ record of *Tectona grandis* from Indonesia” by K. Schollaen et al.***

**K. Schollaen et al.**

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We would like to thank the editor and the reviewer for their constructive comments on our manuscript. We have revised the manuscript, and we believe that all issues raised by the reviewers have been addressed. Please find detailed answers to reviewers' comments below.

Anonymous Referee #1

General Comments: This manuscript addresses a relevant scientific question which falls in the scope of CP. None of the concepts, ideas, tools or data can be considered novel, but this research presents the first application of the type of data to the question posed. The conclusions present important information about the El Niño variants.

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Some of the methods are not specified and a few assumptions may be questionable. I believe the results support the interpretations and conclusions. I believe the experiments and calculations are reproducible. Proper credit is given to related work with clear indications about the origin of research done in this study. The title is adequate as it is. The abstract is very concise and complete. The presentation of the research is easy to follow and clear. There are a few cases where the English is either imprecise or incorrect. The mathematics is adequate. All parts of the paper should be kept as they are. The references are adequate. No supplemental material was provided with this manuscript

Specific Comments: Lines 12-13 p 3969. I am undecided about the use of alpha-cellulose versus resin-extracted wood, not so much because of possible exchange of carbonyl oxygen in some hemi-celluloses, but because of the potential for interannual changes in the proportions of lignin, alpha-cellulose and hemi-cellulose, all of which are recognized to have different  $\delta^{18}\text{O}$  values. If the proportions do change interannually, then the climate/ isotope signal will probably be dampened, though I can imagine scenarios where the signal would actually be spuriously enhanced.

Re: Indeed,  $\alpha$ -cellulose, hemicelluloses and lignin show different isotope values and changes in relative proportions may dampen or enhance the climate signal. However, we assume that the isotopic differences and annually changing relative contributions of these structural components are not large enough to evoke changes in the statistical climate-isotope relationships that void the reconstruction skills. Resin extraction procedures were applied because we were much more aware of a large variety of potential additional wood extractives such as fats, waxes, alkaloids, proteins, phenolics, simple sugars, pectins, gums, resins, terpenes, starches, glycosides, saponins and essential oils. These substances can represent as much as 20% (wood dry weight) for tropical trees (e.g. Pettersen 1984). They do have a much higher variability in isotopic signatures and their relative proportions are much more affected by particular non-climatic environmental incidents such as fire, microbial or insect attacks. Pettersen,

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R.C., 1984. The chemical composition of wood. In: Rowell, R.M. (Ed.), *The Chemistry of Solid Wood* American Chemical Society, pp. 57–126 (Washington DC).

Line 25 p 3973 to line 3 p 3974. It's also possible for the use of stored starch to significantly modify a  $\delta^{18}O$  signal, smoothing the interannual pattern. Did you assess the  $\delta^{18}O$  time series for autocorrelation prior to your analyses?

Re: Indeed, we tested the  $\delta^{18}O_{TR}$  time series for autocorrelation prior to the analyses and no significant AC1 was detected.

Lines 13-15 p 3974 Can you be certain land use change was not a factor in the drop in correlation mentioned here?

Re: This study site is a very old forest and for the last few decades, a protected area. In former times only selected timber were taken from this forest for the construction of palaces and mosques.

Technical Comments

Lines 12-13 p 3966. What does "highest" mean in this context? Is it the longest amount of time represented, the strength of the convection (e.g. punching through the tropopause), or something else. I realize that the meaning is explained in D'Arrigo et al., 2006, but the word "highest" is imprecise. Line 15 p 3966. Perhaps you mean "essential to 'the functioning of' the global climate system", or something similar.

Re: We have updated this paragraph and its references to better convey the importance of the warm pool. (page 1 L29ff.)

Line 16 p3967. change "in" to "about" Re: Corrected.

Line 2 p 3969. change "is" to "has been" Re: Corrected.

Lines 12-13 p 3969. Schollaen et al. (2013) makes it clear that resin-extracted wood, not alpha cellulose, or holo-cellulose was used in this analysis. In that paper you cite studies showing that further extraction is apparently not necessary, but you need to

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note in this study that "resin-extracted wood" was used, so the reader can decide.

Re: For clarification we added a new sentence: The  $\delta^{18}O_{TR}$  record is built from resin-extracted wood of 7 teak (*Tectona grandis*) trees, collected from the Donoloyo Cagar Alam (site DNLY in D'Arrigo et al., 2006) shown as green lines in Fig. 2.

Line 13 p 3969. I think this should be "in Schollaen et al. (2013)", not "in (Schollaen et al., 2013)", unless CP has different rules.

Re: This has been changed.

Lines 18-19 p 3970. It's not clear from the wording of this sentence if you used the same transform as Ren and Jin (2011), and just extended the transformation back to 1900, or modified the transform in some way. The text in the figure caption for figure 2 is clear about how you used the Ren and Jin (2011) calculation. Reword this sentence to provide the same specific information.

Re: This section has been re-phrased to clarify the calculations.

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Interactive comment on *Clim. Past Discuss.*, 10, 3965, 2014.

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