

Interactive comment on “Modelling tree-ring cellulose $\delta^{18}\text{O}$ variations of two temperature-sensitive tree species from North and South America” by Aliénor Lavergne et al.

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We are happy that the reviewer really liked and enjoyed our study. We are responding to his comments and suggestions as Author Comment (AC).

Comments: I have only a few main comments that I believe can help, and a handful of minor ones. For Section 2.4. Estimation of parameters, I believe this is one of the more important elements of the study. It is my opinion here because in some cases, a range of unknowns need to be assumed or tested in a hierarchical way where observations are sparse. It might be good to mention other studies to the readers that have grappled with this issue in this section. For example, a range of unknown

C1

parameters for a Southern Hemisphere species with dendroclimatic potential was recently examined using a mechanistic model that augmented Barbour, Roden, Farquhar and Ehleringer (BRFE04). The ranges of some unknown parameters were tested simultaneously against a mean $\delta^{18}\text{O}$ chronology while others were empirically derived (Lorrey et al., 2016). The code for the model described in that paper can be found here: https://github.com/nicolasfauchereau/model_isotope

AC: We have added in the text the link to the code of MAIDENiso model: <https://doi.org/10.6084/m9.figshare.5446435.v1> (L134-135).

I can appreciate that some elements of MI will be different from other mechanistic models that have come before, so my pointing to the aforementioned resource is not to state it is better (or to get it cited), but rather suggesting that a myriad of modelling approaches can be helpful for distilling and probing important issues for isotope dendroclimatology.

AC: We thank Reviewer#2 for this suggestion. We have mentioned in the revised manuscript other studies that have used this approach: e.g. Danis et al., 2012; Lorrey et al., 2016 (see L266-268).

It would also be really nice if a diagram that shows how the MI model was constructed (the main componentry and inputs, for example) could be included either in the main paper or the supplement.

AC: Different publications have already detailed the construction of the MAIDENmodel (among the most recent one, Danis et al., 2012 and Gennaretti et al. 2017b). We have cited these papers in the text as references (L126 and L128-129).

Minor comments. 118-120. Reword this please as: The chronologies that were built for each species were significantly correlated between stands (Figure 1). This supported the construction of a combined isotope chronology for both the northeastern Canada and western Argentina sites.

C2

AC: We changed this part as proposed by Reviewer#2 (L119-122).

124. please provide reference for MAIDENiso again here. If you can please provide links to the code for this model, it would be appreciated.

AC: We have added the references on MAIDENiso model mentioned above (L126 and L128-129).

162. can you please cite any IAEA studies where the closest measurements would be, or have a look at whether anything useful can be gleaned from the data under pinning the online isotopes in precipitation calculator

AC: To our knowledge, no IAEA studies have been developed in the regions of our study. In Argentina, only studies further north (30°S; Rozanski et al. 1995) and further south (47°-48°S; Stern and Blisniuk, 2002) have been done to understand the variability of $\delta^{18}\text{O}$. We are referring to the IAEA dataset in the text (L171-172) and we discussed the studies that have been done further north and further south in the Discussion section (L371-376).

164. First. Not Firstly. Prettification of words by adding 'ly' is not correct grammar.

AC: We have changed it as proposed by Reviewer#2 (L174).

175. As above with secondly. Second.

AC: We have changed it as proposed by Reviewer#2 (L185).

180. can you please spell out the acronym for LMDZ5A, and also fully spell out National Centers for Environmental Protection (NCEP), as well as fully refer to the 20th Century Reanalysis (20CR)

AC: LMDZ5A is the acronym of 'Laboratoire de Météorologie Dynamique Zoom'. We have spelled out all the acronyms in the text as proposed by Reviewer#2 (L190-192).

202. I see 20CRv2c mentioned here; it should be fine, but please explain why this

C3

reanalysis dataset is chosen over something like NCEP1 or ERA-Interim.

AC: We have used the 20CRv2c dataset to extract daily minimum-maximum temperatures and precipitation amount because it is one of the few reanalysis products covering entirely the 20th century. Furthermore, NCEP1 has been replaced by 20CRv2c and ERA-Interim starts in 1979. We add this explanation in the text (L218-219).

250. Lorrey et al. (2016) evaluated the outcomes of iterative changes to unknown parameters for a $\delta^{18}\text{O}$ model output in a similar way for NZ kauri (mentioned above). This appears to be a standard way to evaluate how well a mechanistic model does for $\delta^{18}\text{O}$ TR, in a simple way. I would just mention here a range of studies that may have undertaken a similar approach to show it is an acceptable method for evaluation.

AC: As suggested by Reviewer#2, we have added other studies that have undertaken a similar approach (L266-268).

318. Leaf water enrichment (are underscores needed?)

AC: We have deleted the underscores (L280, L287 and L341).

324. Last sentence. Can you please expand on this statement just a little bit more, for clarity?

AC: As suggested as well by Reviewer#1, we have deleted this last sentence, which was not clear (L352).

348. '...agreement with previous work (Rozanski et al)'

AC: We changed it as proposed by Reviewer#2 (L373).

356. Reword to start "In contrast, in northeastern Canada...".

AC: We changed it as proposed by Reviewer#2 (L391).

362. Reword to start "Of interest, the..."

AC: We changed this sentence as proposed by Reviewer#1 (L397-399).

C4

374. Rerword to say “Although isotope-enabled atmospheric global models can reproduce the mean annual precipitation isotopic values and seasonality for many areas (Risi et al)...”

AC: We changed the sentence as proposed by Reviewer#2 (L410-412).

385. Also mention here that the IAEA datasets that had a good deal of chemistry run on them in the 1970-80s may have been compromised by pan evaporation and therefore enrichment. Have to treat many of those extant (older) data sources very carefully.

AC: We have incorporated this explanation as well in the text (L421-436).

471. Firstly. As above.

AC: We changed it as proposed by Reviewer#2 (L521).

473. Secondly. As above.

AC: We changed it as proposed by Reviewer#2 (L523).

475. Last instead of Finally.

AC: We changed it as proposed by Reviewer#2 (L525).

References. Some errors with author names (Farquhar was one) please check this carefully.

AC: As already mentioned in the response to Reviewer#1, we have corrected all the errors detected in the Reference list.

Interactive comment on Clim. Past Discuss., <https://doi.org/10.5194/cp-2017-93>, 2017.