Rereview of *ShellChron 0.4.0: A new tool for constructing chronologies in accretionary carbonate archives from stable oxygen isotope profiles* by de Winter

Overall, I am largely satisfied with the revisions made by de Winter to *ShellChron 0.4.0: A new tool for constructing chronologies in accretionary carbonate archives from stable oxygen isotope profiles*. Below I highlight four general comments, as well as some specific editorial comments. Pending minor-to-moderate revisions, I believe this manuscript will be suitable for publication in *Geoscientific Model Development*.

General comments

- **Fidelity of the examples**: My original main concern regarding the attenuation of the seasonal amplitude in the Case 1 and TEXEL examples seems to be resolved in this revision. However, the *Crassostrea gigas* example still shows some odd solutions (attenuation in Year 1 and multiple vertical lines in Year 2 in Figure 7B) not present in any of the other examples, that should be addressed. I'm also still slightly concerned by the systematically season residuals in Case 1 (Figure 6C; which also don't seem to fully match the distribution in Figure 6B). This seems to imply that something (e.g., bounds on the sine parameters, weighting of the windows) may be inducing a nonrandom bias. I encourage the author to explore this a bit more to determine where and why such biases occur, so that future users of the model have a better sense of whether such biases might affect their data.

- **Test 1 Example:** I'm a bit confused by the example – if each window is supposed to span at least one year (L243-245) and the input growth rate of Test 1 was sinusoidal with no growth cessation (Figure 2A), why do the x-axes in Figure 4A,B only span ~250 days? This seems to imply that the model is imposing a growth cessation and condensing growth into 250 days. Is this the case? If so, can you achieve a better fit by changing some of the starting parameters of the model? Please address this is the text. It would also be helpful to also the "known" (i.e., input) temperature and growth rate curves on these panels for comparison.

- **The impact of cumulative offsets**: Can you speculate on why the date offsets in the TEXEL example are not centered at zero? Is this phase shift an artifact of the windowed approach? e.g., If you were to omit the data from Years 1-3 and instead just model Years 4-9, would the results be different and, if so, by how much?

  What I'm getting at here, is that while I fully appreciate the advantages of the window approach and the formation of a single continuous time series, it ends up largely ignoring the only *a priori* age information we have about age (i.e., the placement of year markers or identifiable peaks and troughs in the data, which ultimately provide an annual chronometer). Many seasonal paleoclimate studies now stack temporally resolved data onto a single seasonal cycle, rather than analyzing them in time series, to get a climatological average (e.g., Tierney et al., 2020; Judd et al., 2019). In this sense, the *a priori* identified year markers help to minimize the propagation of uncertainty across the age model (i.e., one spurious year doesn't result in compounding error). A major advantage of the approach presented here is that it generates a continuous record, but I'm interested in understanding if and how this may propagate error across the record. I'm not sure that there's an easy solution here, but I think that the sensitively of the results to cumulative offsets and the range over which the data is modelled (e.g., full dataset vs. only a few select years) should be addressed in the discussion.

Lastly, can you explain how the offset from actual age was computed for the Judd et al. model? Because each year is run individually using this model, the year markers define the starting and ending point of discrete years – so theoretically offsets should never be greater than >1 year (as suggested in Figure 8B), provided that year markers are correctly defined. In this sense and building on what is discussed above, it would perhaps be useful to see the year-to-year offsets rather than (or in addition to) the cumulative offset.

- **Speleothem example**: In my opinion, the speleothem example is neither necessary nor constructive. As the model is currently written, it is not designed for speleothems (L167-170) and the speleothem example only serves to highlight this. In most cases, speleothems violate the assumption of sinusoidal oscillation in $\delta^{18}O$ and thus would likely benefit from a different age modelling approach. The manuscript is already quite long with several examples, and there's no need to add length by explaining why such systems are difficult to model (e.g., L477-496; L588-605).

Specific comments

L217: add comma between "included" and "which"

L358: change "all." to "al."

L444-446: awkward phrasing; consider revising to "The lower sampling resolution later in the record mutes this variability and further illustrates that..."

L468: "real" feels colloquial and nonscientific; I'd recommend changing "real" to "known", both in the text and the figures (e.g., "the "known" age of the samples in these natural carbonates is not truly known.")

L476: remove "very" (such descriptors are unquantifiable)

L671: change "eliminate" to "minimize"

Figure 2: change the blue bar to reflect the window used in the Figure 4 example.

Figure 7: for consistency with Figure 6, I suggest keeping the isotope residuals histogram in the upper left corner and the date residuals histogram in the lower right corner

New references cited

Judd, Emily J., Linda C. Ivany, Robert M. DeConto, Anna Ruth W. Halberstadt, Nicole M. Miklus, Christopher K. Junium, and Benjamin T. Uveges (2019) "Seasonally resolved proxy data from the Antarctic Peninsula support a heterogeneous middle Eocene Southern Ocean." *Paleoceanography and Paleoclimatology* 34(5).

Tierney, Jessica E., Christopher J. Poulsen, Isabel P. Montañez, Tripti Bhattacharya, Ran Feng, Heather L. Ford, Bärbel Hönisch et al. (2020). "Past climates inform our future." *Science* 370(6517).