In *ShellChron 0.2.8: A new tool for constructing chronologies in accretionary carbonate archives from stable oxygen isotope profiles*, de Winter presents a model for temporally aligning sclerochronologic data. The approach expands on the growth rate model of Judd et al. (2018), with three notable improvements: (1) a sliding window approach that allows for more continuous age transformation of multi-year records, (2) a modular code design that increases usability and flexibility of application (e.g., user-specified proxy-to-temperature transfer function), and (3) propagation of error and uncertainty.

In premise, the approach offers an innovative solution to a complex problem and promises to elegantly addresses the key limitations of previous growth models. However, after reading the manuscript several times and going through the supplement, I am still left with several questions about the practical application of the approach, including but not limited to:

(1) **Attenuated amplitude of the modelled isotope data**: Why do the modelled curves seem to consistently underestimate the known isotopic range (e.g., **Fig 3**)? The manuscript explains that each window is designed to include at least one full year of growth (L238), meaning that at least one (if not both) seasonal extremes should be included in any given window. Additionally, the stated benefit of fitting a (linearized) sinusoid to the data in the window (in the depth domain) prior to iterating the temperature and growth rate functions is to set realistic starting parameters and bounds (L267-272). Given this, it seems the modelled isotope curve of each window should accurately capture the seasonal range of values.

    This point is illustrated in **Fig. S1**, which shows the known and weighted mean modelled isotope curves for the Texel high resolution scenario (**Fig. S1A**) and the residuals (**Fig. S1B**). Consistent with **Fig. 3**, the residuals are normally distributed and center at 0‰; however, they exhibit a non-random distribution, paralleling the seasonal signal – a direct result of systematically underestimating seasonal extremes. This is important as it not only detracts from the potential climatological and biological insights from the temperature and growth rate functions, it also leads to spurious intra-annual temporal alignment of the data.

(2) **Number of growing days**: In looking through the supplement for the Texel high resolution scenario, more than 35% of the windows predict that the duration of growth captured by the isotope data in each window is less than 7 days (as per '*Day_of_year_raw.csv*'). Again, if each window spans at least one year and realistic bounds have been set for the temperature and growth rate functions, then why is growth condensed into such a short duration?

(3) **Shape of the modelled isotope curves in the depth and time domains**: Why do some modelled isotope curves exhibit high frequency variability (e.g., Window 3 of the Texel high resolution scenario; **Fig. S2**)? My understanding is that the modelled curves derive from the sinusoidal temperature function and the skewed sinusoidal growth rate function, both of which exhibit monotonic increases or decreases between their peaks and troughs. Are these wiggles a function of the weighting? If so, why is it not consistent across all windows? Also, as alluded to above, many of the windowed curves exhibit long flat lines at their start and/or end, indicating that the temperature and growth rate function bounds might be impeding a better fit.

I suspect there might be an error in the Case 1 and Texel examples, as some of the concerns addressed above don't appear in the Coral, Oyster, and/or Speleothem examples. (Could the upper amplitude bound accidentally been set at $T_{amp}/2$ in these examples?) However, it is difficult to (a) ensure that I fully understand the methodology and (b) evaluate the fidelity and applicability of the approach while these questions linger.

Other general comments

- The manuscript would benefit from a detailed guided example. It is difficult to clearly and concisely convey complex mathematical model. Rather than presenting the Case 1 and Texel examples (which ultimately don't add much insight that can't be gleaned from the real-world examples), I would suggest creating a shorter (<5 yearlong) virtual dataset and stepping the reader through 2 or 3 window examples, showing the temperature and growth rate functions for each window and comparing those to the known values.

- It would be useful to address how the moving window approach is impacted by changes to the number of samples per year change and/or interannual extension rate. In practice, it can sometimes be difficult to sample at a constant rate and/or samples are sometimes lost or too small to run. How would the moving window approach adapt to an example where the first year had 15 samples and the second had only 8? Similarly, how are the results impacted if there is a large change to the interannual extension rate (as is observed in some low latitude bivalves)?
- Can you please clarify whether the period of the window (in the time domain) is defined during the linearized sinusoidal fit or if it is fixed at 365 days?

Line-by-line comments

L22: This notation is not defined until L70; I'd suggest rephrasing to 'oxygen isotope records'

L39: Change 'time' to 'temporal'

L54: Delete 'of'

L54: Change 'greenhouse warming' to 'anthropogenic warming' or something of the like – we're still a far way off from a true ice-free greenhouse climate

L58: Change 'by' to 'at'

L71: Change 'by' to 'at'

L73: 'one being dominant over the other' – I'm not sure I completely agree; it can be quite difficult to disentangle these signals with, for example, low latitude, shallow bivalves and corals that are subject to seasonal precipitation; perhaps revise to 'with one generally being dominant over the other'

L91: Change 'causes them to rely on' to 'require'

L109: Define SCE-UA (Shuffled Complex Evolution model developed at the University of Arizona)

L112: Sample trajectories are referred to as "depths" in the text of the manuscript but "lengths" in the figures (I'd suggest opting for "sample distance", as that term is more widely applicable ("depth" is an odd term in reference to bivalves)

L138: Rephrase 'the question which'

L138 – 154: The original foraminifera references should be Spero et al. (1997) and Zeebe (1999). However, I'd contend that these studies do not suggest that foraminifera are precipitated out of equilibrium with their environment, but rather that additional environmental variables pertaining to the carbonate system (e.g., pH) contribute to oxygen isotope value of carbonate. This discussion is important (!) but highly nuanced, and I'm not sure this is the appropriate platform to address it. I'd suggest removing this section or moving it to the supplement; the important part of this paragraph as it pertains to the work presented in the paper is that ShellChron permits the user to define their desired transfer function.

L162-163: Rephrase 'temperature evolution'

L168: Change 'priory' to 'priori'

L206 (and all other instances): I don't know that 'depth' is the correct word choice; bivalves aren't generally discussed in terms of a depth domain, but instead a sampling 'distance' along a growth axis

L211,212: Change both instances of 'were' to 'are' for consistency of tense throughout the paragraph

L316: delete 'in the'

New references cited

Spero, H.J. et al. (1997). Effect of seawater carbonate concentration on foraminiferal carbon and oxygen isotopes. *Nature*, *390*(6659). https://doi.org/10.1038/37333.

Zeebe, R.E. (1999). An explanation of the effect of seawater carbonate concentration on foraminiferal oxygen isotopes. *Geochim. Cosmochim. Acta,* (63). https://doi.org/10.1016/S0016-7037(99)00091-5.

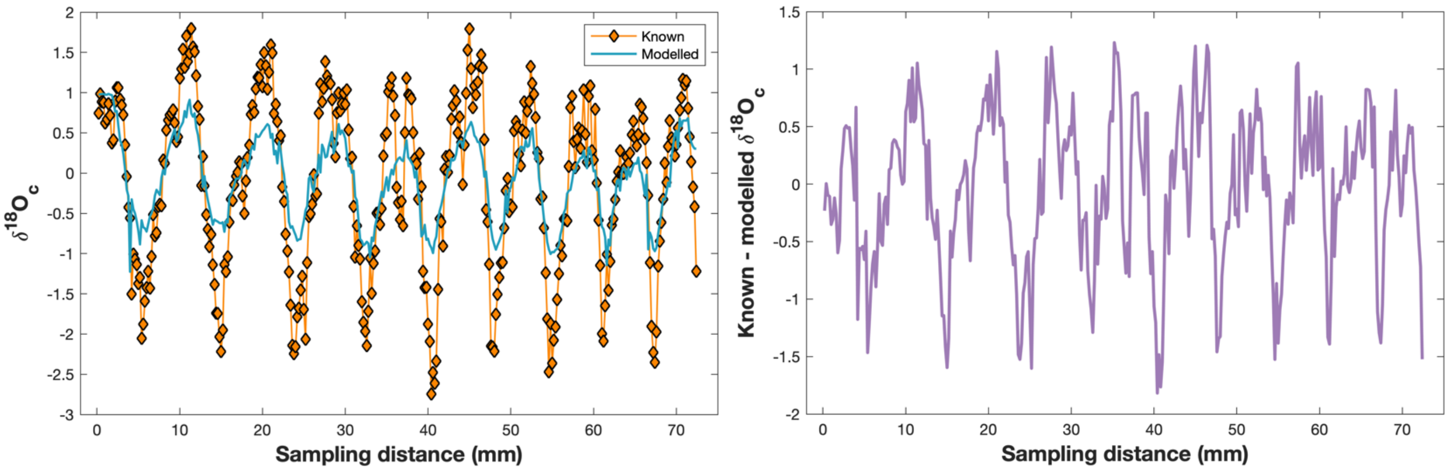

Figure S1: (**A**) Known and modelled isotope profiles from the Texel high resolution example. Known values come directly from the supplemental file '*SI8_Texel_data.xlsx*' and mean weighted modelled values come from the supplemental file '*d18O_model_results.csv*'. The modeled isotope profile consistently underestimates the seasonal extremes. (**B**) Model residuals (known minus modelled values) plotted as a function of sampling distance. Though the residuals are normally distributed around 0, as shown in the histogram of **Fig. 3**, they exhibit a non-random, highly seasonal pattern suggesting that there is a systematic misfit of the data.

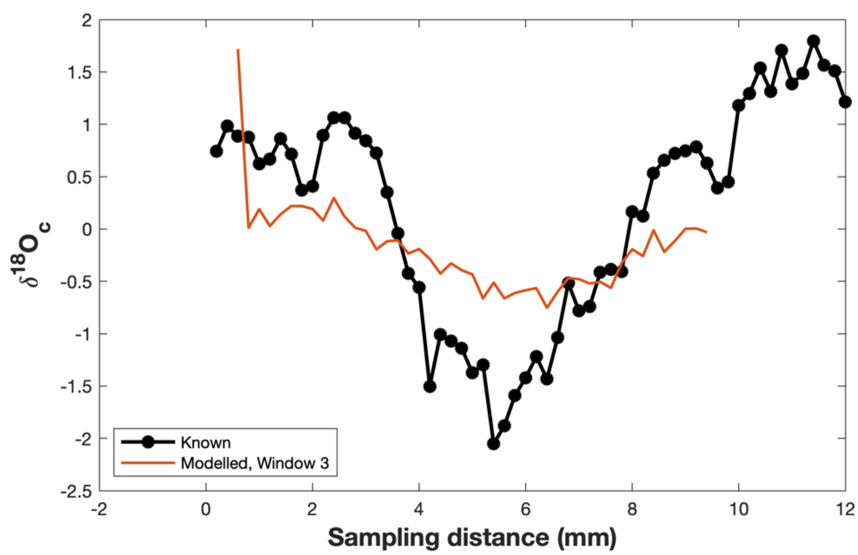

Figure S2: First 12 mm of the Texel example, with the modelled isotope curve from Window 3 of the high resolution scenario overlain. Known values again come directly from the supplemental file '*SI8_Texel_data.xlsx*' and the Window 3 values come from the supplemental file '*modelled_d18O_raw.csv*'. The modelled curve exhibits high frequency variability (i.e., wiggles), inconsistent with a smooth sinusoidal fit.