Climate of the Past Discussions

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Comment on cp-2021-142

Anonymous Referee #1

Referee comment on "Sclerochronological evidence of pronounced seasonality from the late Pliocene of the southern North Sea basin and its implications" by Andrew L. A. Johnson et al., Clim. Past Discuss., https://doi.org/10.5194/cp-2021-142-RC1, 2021

The paper "Sclerochronological evidence of pronounced seasonality from the late Pliocene of the southern North Sea Basin, and its implications» by Andrew L. A. Johnson et al., aims at reconstructing the late Pliocene seasonal range of the seafloor and sea surface temperature in the southern North Sea Basin.

This topic is relevant for CP. The manuscript is clear and well-written, it presents new data, and substantial conclusions are reached.

The data used in the paper are primarily based on stable oxygen isotope analysis of growth increments in different bivalve species from formations in Belgium and in the Netherlands.

When using sub-fossil shells for climate reconstructions, there are several issues that need to be addressed when drawing conclusions about the seasonality of water temperature. These are the overall differences in d18O seawater between the Pliocene and today, possible seasonal variations in water d18O, uncertainties depth habitat (above/below the thermocline), aliasing of the d18O signal in relationship to ontogenetic decreases in growth, estimates of the changes in temperature between surface and bottom during the late Pliocene, and possible differences in the thermal niche between the late Pliocene and today.

The authors do a good job addressing the possible implications of these uncertainties on the reconstructed seasonal ranges in temperature. For the present paper, it seems likely that the biggest unknowns are the depth habitat and, for the calculation of absolute sea-surface temperatures, the estimate of summer stratification. However, the authors go through and reason around these uncertainties in detail. The authors also discussed briefly possible shifts in the thermal niche over time, which is an important point.

The interpretation of the 13C signal in the shells is not entirely necessary for the main story. However, given the complex interpretation of other isotopic data and sclerochronological analyses in the paper, I think that many readers will appreciate that the d13C data are also addressed, at least to some extent.

Some graphs (6 and 7) are tiny, and not entirely suitable for the aging eye. The same goes for the tables. Is it possible to present the comparison of temperature ranges (Pliocene vs modern) in a graph?

All in all, this is a nice paper that is an interesting read to many, especially sclerochronologists working on past warm climates.