

Comment on gchron-2022-25

Anonymous Referee #3

Referee comment on "Amino acid racemization in *Neogloboquadrina pachyderma* and *Cibicidoides wuellerstorfi* from the Arctic Ocean and its implications for age models" by Gabriel West et al., *Geochronology Discuss.*,
<https://doi.org/10.5194/gchron-2022-25-RC3>, 2022

Review of "Amino acid racemization in *Neogloboquadrina pachyderma* and *Cibicidoides wuellerstorfi* from the Arctic Ocean and its implications for age models» by West et al. for *Geochronology*

This paper presents new amino acid data from a series of sediment cores from the Arctic Ocean and the Nordic Seas. The new data include analyses of the planktonic species *N. pachyderma* and the benthic species *C. wuellerstorfi* and it is focused on the racemization reaction of Aspartic and Glutamic acid. The results are discussed in the context of the challenges in establishing robust chronologies for Arctic Ocean deep sea sediments. The paper is well written and has a sound scientific approach and should definitely be published. However, after reading the paper I think the authors should be a little bit stronger on their conclusion regarding the implications of their findings. To me it seems clear that the results suggest that either the established chronology is too young or the bottom waters have been warmer.

In the revision of the paper I would like the authors to consider expanding with the following:

1. It is fine that the aa data generally support the correlation of cores based on density. However, merging all data on the depth scale of the ACEX core may introduce more scatter and uncertainty than needed.
2. Present all Arctic Ocean cores with the basis for correlation also on depth scales.
3. Expand the section with some hard data on the basis for the ACEX established chronology and expand the discussion of the aa results relative to the other methods used.
4. A review/figure/profile depicting the present main water masses in the Arctic Ocean may be useful. Perhaps some references to modelling work concerning possible temperature conditions in the Arctic ocean during the glacial stages may be useful-

Minor suggestions on text

30 ... bottom water temperatures may have been similar.

33models. Also a better understanding of temperature histories at the investigated sites and other possible environmental factors that may influence rasemisation rates in the central Arctic ocean, is needed.

64 Bottom water of Atlantic and Pacific sites are presently generally a few degrees warmer than the Nordic Seas and Arctic ocean.

100influence of Atlantic surface water, and...

110 ...cores have been developed....

141 ..with 21(?) samples...

172 Where the reversal confirmed for both species at the same level?

214 Considering what we know about past and present hydrography the samples from the Nordic Seas most likely have been exposed to the same water masses through time. Also the datapoints you have, seems not allow for establishing different pathways at the two sites. Suggest you make one polynomial fit but keep the coloring of points.

249 This is surprising taken into account that the temperatures potentially have been lower than the "global" ocean.

Fig. 2

Suggest that the density data is plotted on individual core depths with correlation to ACEX indicated with lines.

Fig. 5

It would have been nice to see the data for each core plotted on core depth in a separate figure..

Please also note the supplement to this comment:

<https://gchron.copernicus.org/preprints/gchron-2022-25/gchron-2022-25-RC3-supplement.pdf>