

Reply to RC3: 'Comment on gchron-2023-7', Matt O'Regan, 29 Jun 2023

All reviewer text is in red. Author replies in black.

This is a very nicely written paper presenting 92 new radiocarbon dates on pre-bomb mollusks collected from around Greenland (with the exception of its northern Arctic Ocean margin). In addition to the utility of these new dates for constraining regional reservoir corrections, I think the manuscript is timely in presenting a nice practical discussion (and examples) on the need to update reservoir corrections when using the new Marine20 calibration curve.

The comparisons of dR with water depth and sea ice coverage are interesting in highlighting patterns, although somewhat inconclusive in identifying a cause/explanation for the variability. I do not think this limits the scientific contribution made by the paper, and certainly sets the stage for future work needed to understand this variability. I believe this would require a considerable amount of work, and could potentially start with moving away from water depth and looking at the variability in Temperature-Salinity space to see if ages cluster in specific water masses. However, I do not think this is a necessary addition to this work, which very well suited for publication in *Geochronology* in its current form.

Thank you very much for these comments and suggestions. The idea of mapping out the results over water masses is very interesting and, as you suggest, definitely worth looking into for follow-up studies.

I do feel one aspect the paper is missing is a discussion on the limited, but rather informative data on Holocene dR values from the central Arctic Ocean. Specifically the inferred differences between the age of Pacific and Atlantic waters that are found in the interior Arctic, and should be impacting the age of surface waters(?) in northern Baffin Bay. For example, West et al (2022), *Geochemistry, Geophysics, Geosystems* (doi: 10.1029/2021GC010187) used tephra from the Aniakchak eruption circa 3.6 ka in two cores from the Chukchi Sea - one at 50 m depth (Pacific water) and one at 120 m depth (likely Atlantic water) - to show that the dR (using Marine 20) for benthic foraminifera and mollusks at these sites was about 330 years for Pacific waters and 205 years for Atlantic waters. These seem to be somewhat consistent with the larger dR values in sections 3 and 4 from Northern Baffin Bay. It would be nice to see some discussion about the influence of Arctic outflow and the water masses involved on the dR values in Northern Baffin Bay. Currently these are described simply as 'outflow' from the Arctic, which could easily be expanded to detail the role and age of Pacific and Atlantic waters in this outflow.

This is an excellent point, and we will make sure to include this in a revised version of the manuscript.

Overall, I feel this is a great contribution that will provide significant support to future paleoceanographic work around Greenland.