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Climate of the Past Discussions

Interactive comment on "Large spatial variations in coastal ^{14}C reservoir age – a case study from the Baltic Sea" *by* B. C. Lougheed et al.

W. Austin (Referee)

wena@st-andrews.ac.uk

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The CPD manuscript submission by Lougheed and colleagues makes a valuable contribution to our currently rather limited understanding of the spatial variations in coastal 14C reservoir age; as such this is a valuable new dataset and discussion. The Baltic Sea represents an excellent case study for this type of investigation because of the very large measured salinity gradients (<5 to >20) in bottom water; these salinity gradients themselves reflecting the typical mixing process of a large restricted exchange system.

The focus on pre-bomb museum shell collections, while not new in its approach, does represent a significant new dataset and the efforts of the authors to date a single genus (Macoma) wherever possible is a sensible strategy when trying to elucidate spatial

gradients in the 14C reservoir age (i.e. R(t)).

The authors argue for a strong linear relationship between Macoma R(t) and average salinity. They also argue for a statistically significant correlation between δ18Oaragonite and Macoma R(t), suggesting that δ18Oaragonite can be used to estimate Macoma paleo-R(t). I would urge caution at this point, given that they have included shells of Macoma sampled at water depths ranging from 1 to 182 m (Table 1), which not only capture the very large salinity gradients of the Baltic Sea halocline, but presumably also the large temperature gradients (data not reported in Table 1) associated with this strong stratification of the water column. The combined influence of salinity and temperature on equilibrium calculations of δ18O over the adjacent seasonally variable NW European shelf seas are discussed by Austin et al. (2006) and some further consideration of these effects would improve the manuscript. Of course, the salinity gradients in the modern Baltic Sea are large, but the conclusion that δ18Oaragonite can be used to estimate Macoma paleo-R(t) should be treated with extreme caution. My recommendation would be to include bottom temperature (estimates if necessary) in Table 1 and add a further calculation for temperature effects on the incorporation of the δ18O under 'equilibrium' conditions into the shells of Macoma; if the conclusions hold, then the final manuscript will be all the better for it.

The manuscript is generally very well written, clearly structured and well-illustrated. It will have wide readership appeal across a range of disciplines. I recommend publication, subject to some further consideration of the δ18Oaragonite signal in Macoma as a function of both salinity and temperature.

Interactive comment on Clim. Past Discuss., 9, 891, 2013.