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Biogeosciences Discussions

Interactive comment on "Planktic foraminiferal shell thinning in the Arabian Sea due to anthropogenic ocean acidification?" *by* H. de Moel et al.

Anonymous Referee #1

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Review of ‘Planktic foraminiferal shell thinning in the Arabian Sea due to anthropogenic ocean acidification?’ by H. de Moel et al.

This study presents some new and interesting evidence for the possible effects of ocean acidification on foraminiferal calcification. In particular the finding that younger shells within the sedimentary mixed layer are on average lighter and thinner than older shells within the same horizon suggests that ongoing ocean acidification is affecting calcification in these organisms. The authors’ use of 14C dating of thin versus thick shells is very simple and correspondingly convincing. I would hope similar investigations elsewhere will follow their lead and reproduce (or not) their findings. Although

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there are obvious caveats in a study based in an area with such strong seasonality I think these results are certainly worthy of publication.

The authors discuss some important caveats related to seasonal up-welling at the site and suggest that this could explain the observed relationships between shell weight and stable isotope composition. However their 14C evidence seems to demand at least some contribution from an acidification effect (of course this depends critically on their assertion that the lighter shells tend to represent up-welling conditions – can they absolutely sure?). It would be interesting to know whether deeper samples (in a sediment core) also contain bi-modal populations of thin and thick (light and heavy) shells as a result of seasonality. In this regard I am in agreement with Reviewer 2 that a similar (14C) analysis of deeper sediment, free of post-industrial-age foraminifera, would add considerable strength to the study.

The authors describe the size distribution for the thin and thick walled shells used for 14C dating (p1815, line 12) but it would be interesting to see this result plotted in a figure as I believe this could make a significant difference to the main conclusion. Also would it be possible to see photomicrographs of the ‘thin’ and ‘thick’ types (showing the translucent nature of thin-walled shells)? I think I have some idea of what these look like but if the authors are correct and these really do represent the effects of ongoing ocean acidification I’m sure that readers will want to know what this effect actually looks like!

It seems the authors’ biggest problem is the lack of agreement between their core-top results and contemporary tow and trap studies. In fact there is quite good agreement between their core-top thick shells and the average trap results. Could this suggest that the thick shells are more representative of contemporary conditions? In which case what are the thin shells telling us?

Additional comments

In table 2 it is not clear what ‘# of samples’ actually refers to. Is it

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number of individual shells per analysis or number of analyses. I presume it has to be the latter given the value of 1 for the core-top shell weights…?

In figure 2 why not plot the weights for the different size fractions. Seeing the trend replicated for two different size classes would make the figure more informative and the finding more convincing.

On page 1819 (line 16) the authors compare their estimated influence of [CO3=] on shell weight with the dissolution study of Broecker and Clark – I do not see why this is relevant – they are not describing the effects of deep water [CO3=].

The mixing depth inferred for core 905B seems rather large (especially for such a high sed rate setting). It may be useful if the authors plotted the Pb profile in support of their modelling.

Interactive comment on Biogeosciences Discuss., 6, 1811, 2009.