

Interactive comment on “Interannual variability of pteropod shell weights in the high-CO₂ Southern Ocean” by D. Roberts et al.

Anonymous Referee #2

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Ocean acidification is a pressing issue in marine science, and as noted by the authors of this paper, in situ observations of calcification in marine organisms are limited. The sediment trap data set analysed here provides an opportunity to investigate the affects of changing carbonate chemistry on pteropods in the Southern Ocean. Based on a decline in mean shell weight for *Limacina helicina antarctica* forma antarctica between 1997 and 2006 the authors of this paper suggest a reduction in calcification over this time period. However, the validity of this suggestion is questionable given the limitations in the data set, and the potential influence of biological variability. The interannual trend in *Limacina helicina antarctica* forma antarctica shell weights was based on only 97 specimens spread over 5 sample seasons, with only 3, 11 an 1 specimens collected in 1999/2000, 2000/01 and 2005/06 respectively. The trendline appears to be heavily

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skewed by a large flux of large specimens (> 24 micro grams) in January 1998. The mean weight of *Limacina helicina antarctica forma antarctica* in this study is ~ 15 micro grams per individual. Can such a large change in size be attributed to a change in calcification rates? This is doubtful given the small change in mixed layer carbonate concentration observed between 1995 and 2001. There are numerous other possible causes for these anomalous shell weights. *Limacina helicina antarctica forma antarctica* is a predominantly Antarctic form and is at the edge of its range in the study area. This may manifest as interannual variability in their growth and survivorship. In this study, the sub-Antarctic form *rangi*, for which a substantially larger sample size was available, showed no trend in shell weight over the study period. This is particularly relevant given the authors observations that *rangi* appeared to be more susceptible to dissolution below the aragonite saturation horizon. Pteropod sedimentation rates are extremely seasonal (e.g. Ross Sea sediment trap data, Collier et al. 2000). This seasonality is linked to their life cycle, including a post spawning die off of adult specimens. The population size structure is as a consequence quite variable over the year. In addition, their distribution can be extremely patchy. The supplementary material shows that the timing of pteropod collection in the sediment traps varied between years and this may have contributed significantly to the observed temporal shell weight distribution. To remove the possible influences on shell weight of e.g. time of year, pteropod patchiness, growth variability, it may be more instructive to determine whether size specific (width) shell weights have decreased over the observation period. The data presented here are not sufficient to warrant the suggestion that changing calcification rates may have affected pteropods in sub-Antarctic surface waters over the last decade.

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