

Interactive comment on “Isotopic fractionation of carbon during uptake by phytoplankton across the South Atlantic subtropical convergence” by Robyn E. Tuerena et al.

Anonymous Referee #2

Received and published: 28 May 2019

This is an interesting paper looking at the variability in carbon isotope (and fractionation) of particulate organic matter (with CO₂aq) in relation to phytoplankton cell size. The authors sampled subantarctic and subtropical regimes with contrasting environments and community structures to investigate mechanisms for isotopic fractionation in d¹³CPOC resulting from carbon uptake and biological production in the upper ocean. The authors suggest that cell size is an important factor. Using estimates of cell size (via HPLC analyses) and calculated CO₂aq, the authors suggest that smaller cells will respond less to increased CO₂aq than the larger cells south of the SSTC and the wider Southern Ocean.

C1

Query: when looking at investigating future epsilon-p did the authors consider the combined effect of increased CO₂ and increased temperature in the two environments?

General point about Figures, it is very hard to deduce where measurements were taken in the profiles and also which interpolations were used to create the profiles.

Initial thoughts while starting to read the manuscripts were: ‘but what about species composition’? This really only gets dealt with in the discussion. It would be good to see this upfront, including a small discussion about cell size on its own (so possibly discussing culture studies) actually supports what the authors conclude.

Introduction:

Second sentence: missing a bit; anthropogenic CO₂ input to the atmosphere causes enhanced greenhouse gasses, which causes the oceans to warm up. It is not a direct effect.

Methods: A bit strange to see details of where the inorganic carbon isotopes were analysed, but none of the other analyses.

Results: 3.1 first para. In reference to Figure 1, what does MC stand for?

Figure 1 does not show a correlation between various variables, just cross sections.

3.2 Para 3 ‘There is no significant correlation between d¹³CPOC and CO₂aq or d¹³CCO₂ (Fig 2)’ where? Subtropical samples?

Para 4 Statement: Picoplankton were dominant in the subtropical environments. NO. This figure suggests that f_{micro} and f_{nano} are dominant in all environments.

The authors claim there is a significant positive correlation between average community cell radius and d¹³CPOC, with n=30. There are 47 data points in Figure 6a; in Figure 6b 4 are attributed to being coastal sites. What happened to the missing 13 data points?

C2

Page 7: with to first sentence and reference to Figure 5: what is the average error and is the suggested difference supported by statistics?

Discussion: add some references when discussing the used of stable isotopes of organic matter as a primary means for examining food web structure and variability. Plus also to line 32-33 (nitrogen isotopes).

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2019-162>, 2019.