Biogeosciences Discussions

Biogeosciences Discuss., author comment AC1
https://doi.org/10.5194/bg-2022-68-AC1, 2022

Reply on RC1

Karen M. Brandenburg et al.

Author comment on "Physiological control on carbon isotope fractionation in marine phytoplankton" by Karen M. Brandenburg et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2022-68-AC1, 2022

Brandenburg et al. synthesize the available data on stable carbon isotope fractionation in phytoplankton to test how this parameter (Ep) is controlled by CO2 and other environmental parameters. This is a very well written and interesting paper and the data collection/analysis/interpretation seem very sound. I have hardly any comments, although I must admit that my knowledge on isotope fractionation is a bit rusted as I haven't followed the literature for a couple of years.

The key message of the paper is almost frustrating, nevertheless important. From my stand-point this paper requires only very minor revisions (but I hope the other Reviewer is more up to date on the topic than I am).

We thank the reviewer for his/her kind words. In terms of proxy applications, the key message of our analysis is indeed discouraging. Below you will find our answers to the reviewer's comments and suggestions.

Minor comments:

Figure 2: I found the unit of the C-demand/C-supply a bit strange. Wouldn't it be easier to keep the unit as for the individual components and put them in brackets i.e. (C-demand unit)/ (C-supply unit)? Just a suggestion to facilitate understanding what this parameter means.

We agree with the reviewer that the units may be clearer, both in the figures and also in the text. Whenever we use POC production/CO2 concentration, we now consistently use POC production/[CO2]. We also made figure legends clearer, by typing the unit between brackets (e.g. ([pg C cell^{-1} d^{-1}] / [µmol kg^{-1}]) like the reviewer suggested.

Line 165: "…prevents diffusion of CO2 but is permeable for HCO3-…" This surprised me. Are is CO2 or HCO3 mixed up, perhaps? Just double-checking.

No they are not mixed up. Cyanobacterial photosynthesis takes place in the carboxysome,

and to allow sufficient build-up of CO_2 around RubisCO ensuring effective carboxylation, the membrane of this compartment is not permeable to CO_2. It is for HCO_3^-, which upon diffusion into the carboxysome is converted to CO_2. See also the references (i.e. Espie and Kimber, 2011).

The supplementary material could be moved to the main text. I don't see a reason to bury it there.

As we would like to keep to main text focused and condensed, we would prefer to keep the supplement as is.

The figures are very well designed and informative.

Thanks!