

Interactive comment on “Validation of carbon isotope fractionation in algal lipids as a PCO₂ proxy using a natural CO₂ seep (Shikine Island, Japan)” by Caitlyn R. Witkowski et al.

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We thank the reviewer for their additional comments, which we hope we address in the following response.

I have two comments that warrant further clarification by the authors: Regarding combustion of filters: The authors should provide literature evidence for their statement that the target compounds would be completely degraded after 3h at 300C. I have a hard time believing especially that phytol would combust to completion under these conditions (which are not too different from the GC conditions used by the authors).

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We thank the reviewer for bringing this to our attention. Upon further investigation, we have found that the standard procedure used in our lab (and thus used in this study) was 450C for 4 h. Our apologies for the confusion.

Regarding literature pCO₂ values: After perusal of Agostini et al. (2015, 2018) and Harvey et al. (2018) it is still not clear to me how the authors derived at the presented pCO₂ values. The pCO₂ data presented in the former studies show high variability both temporally and spatially, which should not be disregarded in the present study.

The PCO₂ data presented in the former studies were calculated using the carbonate chemistry system analysis program CO2SYS using the measured values for pHNBS, temperature, salinity, and total alkalinity (TA) values. There is indeed high variability both temporally and spatially. On Page 3, Line 11-12, we include the standard deviations (Control PCO₂ 309 ± 46 µatm, Mid PCO₂ ca. 460 ± 40 µatm, and High PCO₂ 769 ± 225 µatm). In Figure 5, these standard deviations are included as horizontal error bars where the “Actual PCO₂” values measured at the site lie on the x-axis.

Based on the reviewer’s comment, we recognize the need to emphasize and discuss this measured high variability at the sites. This variability could have major impacts on the reconstructed values, as these algae are exposed to different levels of PCO₂ even within the same site.

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