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Biogeosciences Discussions

Interactive comment on "Ocean-related global change alters lipid biomarker production in common marine phytoplankton" *by* Rong Bi et al.

Anonymous Referee #1

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General Comments

The authors of this paper investigate experimentally the effects of changes in multiple environmental parameters on the production of phytoplanktonic biomarkers including, PUFAs, sterols, and alkenones in 3 individual species of diatom, cryptophyte, and haptyophyte. These parameters included different temperatures, molar ratios of N:P, and pCO2 concentrations.

This manuscript provides valuable insights for the impacts of lipid remodeling on food web dynamics and biogeochemical cycling, particularly in sterol production. The discussion however is lacking in the specific potential effects of increased FA production and alkenoates on modern biogeochemical dynamics and could be expanded on.

The authors have a sound experimental design to investigate the effects of multiple environmental drivers however much of the discussion focuses on the impacts of individual variables on the production of each respective biomarker. Greater exploration of the potentially compounding effects of multiple environmental drivers may increase the impact of the manuscript. The interpretations from the PCA (Fig. 3) are hardly mentioned in the discussion and would be worth expanding on as well.

Greater connection to the interpretation of these the sterols in sediments could be provided by the authors as well. How might these results specifically influence the interpretation of biomarker analysis in the reconstruction of phytoplankton productivity and community composition?

Specific Comments How comparable are carbon or cell normalized concentrations when sterols are often interpreted as biomarkers for productivity and normalized to dry sediment weight? Would this affect paleo interpretations of community structure or productivity?

In Fig.3, is pCO2 contributing to the distribution of fatty acids in P. triconutum?

How does the DIC and pH compare amongst cultures? Are they consistent across the temperature and nutrient trials?

The prediction of an overall decrease in carbon-normalized contents of sterols and PUFA is based on future open ocean or coastal conditions? The authors suggest that the open ocean may experience more thermal stratification and thus depleted nutrients while the coastal ocean may receive more external inputs of nutrients.

Technical Corrections Missing clear information on the preparation of the fatty acids and their measurement. Please provide details of methodology including quantification. Are only polyunsaturated fatty acids identified and measured or total fatty acids? Please clarify or include citation to previous work in methods section.

What N:P was used for the pCO2 experiments, 24:1? Please clarify.

Consider switching the order of sections 4.2 and 4.3.

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