Biogeosciences Discuss., 10, C8395–C8396, 2014
www.biogeosciences-discuss.net/10/C8395/2014/

Biogeosciences Discussions
Open Access

Interactive comment on "Small diversity effects on ocean primary production under environmental change in a diversity-resolving ocean ecosystem model" *by* A. E. F. Prowe et al.

A. E. F. Prowe et al.

fipro@aqua.dtu.dk

Received and published: 2 February 2014

We thank the reviewer for his comments and have added our response in italics after the relevant paragraphs.

Overall, Prowe et al address an interesting aspect by asking whether the response of phytoplankton primary production on global warming is modulated by phytoplankton diversity.

My major concern is that phytoplankton diversity is represented in a way too simplistic manner. Neither spectral light use (e.g. Stomp et al. EcolLett 2007) is not considered, nor algal mixotrophy (e.g. Hartmann et a. PNAS 2012), nor susceptibility to grazing,

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

motility etc. By limiting the niche-space to light and temperature, the model seems to be prone to yield limiting diversity-functioning relationships.

We agree with the reviewer that the representation of phytoplankton diversity in this model must seem very limited compared to diversity in nature. However, the phytoplankton parameterization is representative of most global biogeochemical ocean circulation models currently used for investigating biogeochemical fluxes on large spatial and temporal scales (e.g. Bopp et al. 2013), while adding the diversity aspect. Studies resolving diversity in, for example, algal mixotrophy (Ward et al. 2011, AmNat) or spectral light use (Hickman et al. 2010, MEPS) have not yet been applied to the global scale. The use of a Holling type 3 grazing function in our study does implicitly capture different susceptibility to grazing, if not explicitly via linking to motility characteristics. Such a more explicit predation model is currently developed by F. Prowe and colleagues, but is not yet fully validated for the global scale. We now mention this in the introduction and discussion to clarify the intention of our study.

The authors do acknowledge the shortcomings of their model. Apart from technical problems, it should be kept in mind that our knowledge on phytoplankton trait diversity is quite limited. Taken as a 'proof of concept' rather than an explicit test whether global change effects are modulated by diversity of communities, the study by Prowe et al. may serve as agood starting point for elucidating global change effects. Studies combining the analytical approach undertaken here with experimental manipulation are especially needed to enhance our ability for predicting the effects of global change on ocean primary production.

Interactive comment on Biogeosciences Discuss., 10, 12571, 2013.