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Discussions
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Interactive comment on "Enhancement of photosynthetic carbon assimilation efficiency of phytoplankton assemblage in the future coastal ocean" *by* J.-H. Kim et al.

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We would like to thank to Dr. G. Hallegraeff and his valuable comment. Find the detail responses to comments in below.

Comment 1) The results that light utilisation efficiency was accelerated under high CO2 (regardless of temperature increase) are intriguing but its broader applicability cannot be fully interpreted from the limited phytoplankton species information provided. ... Available data on phytoplankton species composition need to be included in the results, and not just mentioned as an afterthought!.

Response 1) We agree that the shift of phytoplankton species composition is an im-

portant topic among the biological responses towards climate changes. The results on species composition will be mentioned in our revised manuscript (part of discussion) simply because we consider that G. Hallegraeff's (also other reviewers') comments are important for improving the manuscript. Specifically, composition of Skeletonema costatum, Chaetoceros spp., and Eucampia zodiacus were largely affected by future climate conditions in the diatom group (published in Kim et al. 2010, ES&T, added graph in below, Fig. 1.). In addition, Gyrodinium spp., Akashiwo sanguinea, and Nematodinium armatum responded differently amongst the dinoflagellate group (unpublished data). The results of major species composition and taxonomic group were also published in the series paper (Kim et al. 2010, ES&T). The dominant group of autotroph was especially diatom during the overall experiment periods and dinoflagellate increased a little at the post-bloom period (see supplementary materials, Fig. S3). Thus we regard that the contribution of dinoflagellate to photosynthesis was very low. Also, we could not recognize which species influenced the change of chl a fluorescence and gross photosynthesis even though species composition results were inserted. Chl a fluorescence (quantum yield) and photosynthesis responded differently among the species and treatment. Consequently, we do not know which species affect physiological changes of phytoplankton assemblages. We will mention this limitation in the discussion session.

Comment 2) No wonder therefore that the observed photophysiological changes were different from other similar published work on the (?nutrient deficient) Equatorial Pacific, or East and South China Sea.

Response 2) Our study is largely differed from other physiological researches. Research on Equatorial Pacific phytoplankton community did not focus on the photosynthetic activity. Study on South China Sea showed photosynthesis results, but photosynthetic performance and experimental conditions largely differed in our study. In addition, this study originally estimates energetic balance of autotrophic phytoplankton from the photosynthesis to biomass growth or primary production of phytoplankton.

However, other studies did not focus on the energetic balance.

Reference

Kim, J.-M., Lee, K., Yang, E.J., Shin, K., Noh, J.H., Park, K.T., Hyun, B., Jeong, H.-J., Kim, J-.H., Kim, K.Y., Kim, M., Kim, H.-C., Jang, P.G., and Jang, M.C.: Enhanced production of oceanic dimethylsulfide resulting from CO2-induced grazing activity in a high CO2 world, Environ. Sci. Technol., 44(21), 8140-8143, 2010.

Figure 1. Abundance of diatom during the study period (b) Skeletomema costatum (c) Chaetoceros spp., (d) Eucampia zodiacus. The green, blue, and red symbols and lines represent the control, acidification, and greenhouse conditions, respectively. (Source: Kim et al. 2010, ES&T)

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/10/C1803/2013/bgd-10-C1803-2013-supplement.pdf

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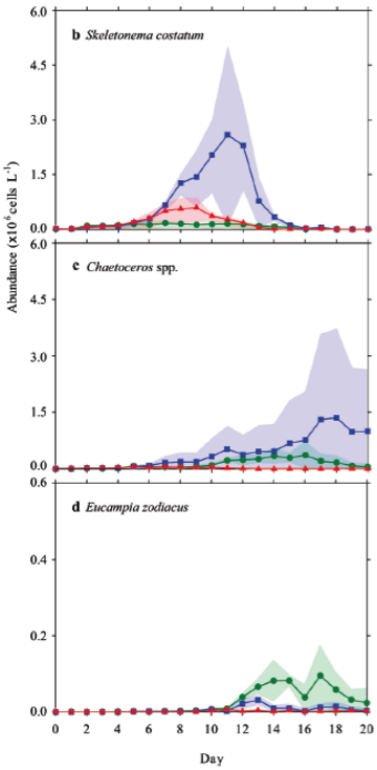
Interactive comment on Biogeosciences Discuss., 10, 4611, 2013.



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