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Biogeosciences Discussions

Interactive comment on "Summer microplankton community structure across the Scotia Sea: implications for biological carbon export" *by* R. E. Korb et al.

Anonymous Referee #2

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The manuscript by Korb et al. illustrates the tight coupling of microplankton community composition and the fluxes of carbon and silica. Linking plankton ecology with elemental cycles could not have been achieved by bulk measurements alone and detailed studies of the plankton community like the one by Korb et al. are therefore highly warranted. The manuscript is generally well written and provided that the recommendations listed below are addressed by the authors this manuscript merits publication in Biogeosciences.

General comments:

The manuscript by Korb et al. presents a detailed analysis of the microplankton community composition in the Scotia Sea during austral summer and distinguishes 5 distinct biogeographic areas based on community structure, nutrient deficits and oceanographic as well as topographic features. Depending on their species composition each microplankton community has a different impact on the carbon and silica cycles respectively. Thus the study of Korb et al. addresses two important aspects: it furthers our understanding of the functioning of polar pelagic ecosystems and examines the role of the productive Southwest Atlantic sector of the Southern Ocean for the global carbon cycle. The authors furthermore raise an important point: ultimately it is the structure of the pelagic food web that determines the quality, magnitude, timing and fade of the vertical carbon flux. This is a generally well written and structured manuscript and my major concerns centre around the relatively shallow winter water layer to calculate nutrient deficits and the use of cell abundances to characterise the different communities.

Specific comments:

Methods:

Page 9787, line 1: The winter water layer was estimated at 60 – 140 m during this study. This seems a pretty shallow estimate since frequent storms and convective mixing maintain deeply mixed surface layers in the Southern Ocean. Mixed layers depths of >60 m are not uncommon in the Southern Ocean and a correct estimation of the winter mixed layer is therefore critical since nutrient deficits are calculated as the difference between winter water and surface water nutrient concentrations. Nutrient deficits might therefore be biased by the relatively shallow winter water layer chosen during this study. Depending on the mixing history some of the nutrients between 60-140 m depth might have well been in contact with the surface layer and utilized prior to the survey spoiling the interpretation of the nutrient deficits.

Results:

Page 9787/9788: What about phytoflagellates other than cryptophytes, e.g. Phaeocys-

tis?

Discussion:

General comment: The authors make their comparisons mainly based on abundances. This overemphasis small and usually abundant species/groups but as the authors acknowledge some rare but large species like Corethron pennatum can have a substantial contribution to total biomass. I would therefore suggest to use biomass estimates for comparison of the different communities and the two cruises in 2003 and 2008.

Page 9793, lines 5-6: The authors speak of two heavily silicified species but mention Fragilariopsis spp. which implies that more than one Fragilariopsis species were involved. Furthermore compared to most Fragilariopsis species I wouldn't consider Corethron pennatum as heavily silicified.

Page 9795, line 3: Were the medium-sized, naked dinoflagellates hetero- or phototroph? Throughout the text the naked dinoflagellates are described as being heterotroph. How was this ascertained (by epifluorescence microscopy)?

Page 9795, line 16-18: Naked dinoflagellates are not obligate heterotrophs. Several species are photo- or at least mixotroph.

Page 9796, line 6-7: Were the Chaetoceros spp. mainly small, weakly silicified Hyalochaete or large, robust Phaeoceros species?

Figures and tables:

Page 9806, Table 2: Have the dinoflagellates during the 2003 cruise been underestimated due to the coarse enumeration? Their contribution seems to be systematically lower than during the 2008 cruise.

Page 9807: Why is no carbon biomass provided for the 2003 cruise?

Page 9812, figure 3: A biomass comparison would be more helpful. Furthermore crytophytes were not counted in 2003 and the comparison therefore misleading.

Technical corrections:

Page 9785, line 23: . . .., taxonomic resolution was coarse,. . .. .

Page 9785, line 26:. . .with similar studies in the Southern Ocean. . ...

Page 9788, line 1: dinoflagellates. . . ...

Page 9788, line 1:..dominated by Fragilariopsis species. . ...

Page 9789, line 13:.. Fragilariopsis kerguelensis. . ... (Although mentioned before the genus name should always be fully spelled in every new paragraph. Applies also to other sections of the manuscript.)

Page 9796, line 8: . . ..Thalassiothrix. . ...

Page 9797, line 6: . . ..Thalassiothrix. . ...

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