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Discussions

Interactive comment on "Synergistic effects of iron and temperature on Antarctic plankton assemblages" *by* J. M. Rose et al.

Anonymous Referee #1

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The paper by Rose et al. addresses an important and timely scientific question-synergistic effects of Fe and temperature on Antarctic phytoplankton and microzooplankton assemblages. The title is somewhat misleading in that only <200 micron plankton are included; mesozooplankton are not included. Top-down effects of mesozooplankton grazing/predation on the <200 micron fraction could alter the magnitude of effects of both Fe and temperature in the plankton community. The paper does present an interesting and potentially important phenomenon that deserves further exploration and documentation. The data set is probably unique and is rich in that it contains in addition to data on phytoplankton abundance and composition, measurements of photosynthetic parameters , indicators of phytoplankton physiological state (Fv/Fm) and changes in the stoicihometry of particulate matter. The significantly lower abundance of microzooplankton in the high Fe and high Fe and high temperature treatments rela-

tive to the control and high temperature treatments is striking and unexpected. It would be interesting to see more detailed data on how the microzooplankton communities differed in the treatments. An MDS plot of relative similarities among microzooplankton assemblages is given which indicates that the final microzooplankton assemblages in both treatments with high Fe were fairly similar but quite different from the initial assemblages or the other treatments. However it would help to know how they were different. Did they differ in cell size, feeding type etc? Was the biomass of microzooplankton different? The experimental design was clearly presented and methods appropriate and adequately described. Appropriate statistical analyses were employed. In general the interpretations and conclusions are appropriate and supported by the data. However, the conclusion that the negative impact on microzooplankton abundance was "most likely a secondary response to changes in phytoplankton community composition" appears hasty. There are data that trace element ion activities and ratios can directly affect the growth of heterotrophic protists from physiological experiments with temperate zone cultures. Some studies suggest that heterotrophic and mixotrophic protists require 2 or 3X more iron than autotrophic protists (cited in Twining et al. 2008, J. Eukaryot. Microbiol. 55). Thus it seems possible that high Fe could favor larger microzooplankton. Top down control by larger microzooplankton could result in a decrease in smaller microzooplankton and heterotrophic flagellates, reducing over-all microzooplankton numerical abundance. This type of top-down control would be favored by the lack of mesozooplankton predation on large microzooplankton within the experimental incubations. It seems unlikely that changes in phytoplankton composition alone are responsible for the decrease in microzooplankton numbers since abundance of nanophytoplankton increased in all the treatments.

Over-all the paper is well written and the results clearly presented. It is an interesting data set . It clearly shows that interactive effects of temperature and Fe should considered in predicting climate change effects on lower trophic levels in the plankton.

Interactive comment on Biogeosciences Discuss., 6, 5849, 2009.