

Interactive comment on “Nutrient regimes control phytoplankton ecophysiology in the South Atlantic” by T. J. Browning et al.

Anonymous Referee #1

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The paper describes Frrf results of phytoplankton communities over an environmental gradient from the South Atlantic gyre to the ACC, with particular emphasis on regions around the SSTC. The Frrf results are supplemented by pigment concentrations to assess phytoplankton biomass and define groups of phytoplankton based on pigment composition and flow cytometer data to enumerate cyanobacteria. This makes for a nice dataset that is discussed with respect to effects of phytoplankton community composition, light availability, and nutrient availability, with the focus on NO₃ and Fe. The main conclusions are that to the south of the SSTC the phytoplankton are limited by Fe availability, whereas to the north of the SSTC phytoplankton communities are in a steady state controlled by macronutrient availability with Fe-replete conditions. In my opinion, these findings are not particularly new, but the paper is a nice description of which factors are likely to influence Frrf data in what regions and highlights some

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important nuances, the most important of which is that there is a spatial correlation between Fv/Fm and Fe : nitrate ratios, rather than just Fe concentrations. My main criticism is the descriptive nature of the paper and the lack of statistical evidence backing the conclusions. Most importantly, the analysis to back the spatial relations mentioned above is missing. Doing some proper statistical analysis of the correlations will improve the paper, which is now solely descriptive, and may also help to come to some clearer conclusions.

In the discussion, the authors do a good job of integrating effects of nutrient limitation and light effects on the Fv/Fm of the different phytoplankton communities dominated by cyanobacteria vs haptophytes and chlorophytes. They show that the community composition is unlikely to explain the spatial Fv/Fm patterns, and claim that the light levels are too. However, I would like to see this claim backed up by data. The light climate in the upper mixed layer is determined by the in situ irradiance, MLD, and attenuation determined mainly by the phytoplankton biomass. None of these factors is discussed, and neither is the difference in NPQ strategies between cyanobacteria and Eukaryote nano- and picoplankton. With a dark acclimation time of 30 min, there may still be some NPQ active.

Some minor comments:

What was the shading of bottle incubations? Please add a % in addition to the statement "simulate the light field at 5 m water depth."

The estimates of HPLC derived Chl a are quite a bit lower than those of ocean color. In general, the Chl a concentrations for this region seem rather low for January, could you please comment?

P11894, line 26: please show an analysis of "a general trend of inverse co-variability with Fv/Fm"