

Interactive comment on “The influence of iron and light on net community production in the Subantarctic and Polar Frontal Zones” by N. Cassar et al.

Anonymous Referee #2

Received and published: 6 September 2010

This paper presents the results of a comprehensive study of net community production and iron availability in the ocean south of Tasmania across the subtropical, subantarctic and polar fronts in Jan/Feb of 2007. The key point is the intense maximum of NCP just south of the subtropical front and a discussion of the process that causes it. It is rare to have comprehensive results of NCP and dissolved iron measurements together, and I believe this study represents a true advance in the understanding of processes that limit productivity in this part of the world. This is important because the boundaries of the subtropical/subpolar fronts are regions of intense uptake of CO₂ by the ocean.

The paper is pretty well written, and I definitely think it should be published. However,

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I think it could be improved. I would like to try to convince the authors to make some changes that I believe will make it more convincing and a little easier to read. I have two main points and then some less important ones.

(1) It reads as though it is not completely clear in the authors' minds what hypothesis they wish to forward for the enhanced NCP they observe at the front. The reason I say this is the discussion around line 10 of pg 5695, which I think is a critical discussion in the paper. First it is stated that, "Mixing of macronutrient poor/micronutrient rich subtropical waters with macronutrient rich/micronutrient poor subantarctic waters probably enhances primary production at the front." The next sentence states that this may not be what is causing the enhanced NCP in the same area. There are inconsistencies here from previous statements: First, it is stated on pg 5657 that nitrate and phosphate are high through the whole region, but Si is low everywhere. How can these statements support the horizontal nutrient gradient hypothesis, and why do we not get to see the latitudinal nutrient gradients? Second, on pg 5659 it is stated that there is no latitudinal trend in NCP/GPP. So, if GPP is higher because of the nutrient gradients then so is NCP higher because of the nutrient gradients. I think this most important section could be rethought and improved.

(2) My second major point has to do with hiding much of the critical information used for the conclusions in the supplementary material. I believe supplementary material is the place for details that are not critical to the main arguments. In this paper we have to go to the supplementary material to see that GPP is high at the subtropical front and that there is no clear trend in the NCP/GPP ratio, which are critical to the arguments. Real O₂/Ar data are not presented anywhere, nor are horizontal gradients of NO₃, PO₄ and H₄SiO₄. There seems to have been an emphasis on making the paper short at the expense of the presentation. I believe this would be a much better paper if critical information were presented in the main text.

Other less significant but not trivial improvement comments follow:

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(a) Pg. 5651 Introduction. The latitudinal extent of the SAZ and PFZ are never defined. It is important to provide this information because everyone that reads this will not know these terms and the value given for NCP in this zone depends entirely on its definition because of the strong horizontal gradients observed.

(b) A similar comment comes up on pg. 5661 where processes stations P1, P2, and P3 are pulled out of the air. These stations should be described somewhere and put on Figure 1. Also, on Figure 1 it would be very helpful to have one more line of longitude and one more of latitude to give scale to the map for those less obsessed with the Antarctic.

(c) pg. 5654, line 13. I do not think it is DOC production that might cause an error but rather DOC accumulation.

(d) pg. 5657, line 13. "... dominated by non-diatoms..." (?) What is a "non-diatom"? There must be a better way to say this.

(e) pg. 5661, I find the one paragraph discussion under 4.2.1 to be much too glib. I think it should be deleted or the discussion expanded so the reader knows why it is there.

(f) pg. 5664, line 16. Missing an, "in the" pg. 5664, line 20. I think this sentence is confusing. Maybe a restatement of the point in different words would help?

Interactive comment on Biogeosciences Discuss., 7, 5649, 2010.