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Interactive comment on "A geographical and seasonal comparison of nitrogen uptake by phytoplankton in the Southern Ocean" *by* R. Philibert et al.

Anonymous Referee #2

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This paper by Philibert et al., focuses on controls on N uptake in the Southern Ocean using in-situ methods. The authors use measurements of 15N marked nitrate and ammonium performed in both summer and winter to estimate the seasonal cycle of nitrate and ammonium uptake. For obvious reasons, the Southern Ocean is a challenging area to sample in wintertime; this dataset is therefore valuable in order to better understand the mechanisms that control N uptake and its seasonal variation. Measurements are simple but the manuscript finds its strength is the statistical analyses performed in order to assess to which extent environmental N uptake. While I am not an expert in the "15N technique", my feeling is that the methods employed to derive estimates N uptake rate are well developed and sound. Also, the statistics used are appropriate. The

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authors infer that the both day length and the ammonium concentration explain most of the variability observed in N uptake. Although the influence of important factors like Fe concentration could not be tested, the authors fully acknowledge this omission and discuss it in the manuscript. The data are well presented and the article is well written. I have no major concerns with this manuscript and only technical corrections should be addressed before publication. These are listed below:

Specific comments - The first section of the introduction would benefit of a more thorough referencing on HNLC regions, and factors limiting primary production in the Southern Ocean. Also, the authors could have done a better job in explaining why having winter N uptake data may ease our understanding of winter production in the Southern Ocean. - The authors measured N uptake at 55% light level according to the method section. However, they often refer to a 50% light level in the text, tables and figures. Please correct - P1835,L4: Please provide equations or provide more details on how specific and absolute N rate were calculated. -P1835, L22: Please add “RDA” after “redundancy analysis”. -P1836, L20: The mixed layer depth increased not decreased - P1836, L22: The “biological activity” cannot be inferred from a Chl-a concentration only. Is the decrease in mean Chl-a concentration due to the “dilution” induced by the deepening of the MLD or by an actual decrease in photosynthesis rate? - 3.2.1: Why are the winter N uptake rate not shown in a figure like Figure 3? - P1840, L8: Please provide a list of all the environmental variables you test - P1840,L20. Could an eddy from the SAF, “escaping” northward, be responsible of the rather sub-Antarctic characteristic of 15-N-2? - P1840,L26: Please specify whether of wide angle represent a good or bad correlation for non specialist. - P1848, L13. How were the C:N ratio measured. The method section makes no mention of POC:PON measurements. -P1849,L13: Please provide reference -P1850,L13: Lower case at silicic -P1851,L5: Silicic acid is a product of BSi recycling not a subtract being recycled. Please rephrase. Was an accumulation of BSi in the upper 300m present in the PFZ and south of the PFZ? - P1855, L6: Please remove “j” after “Southern Ocean” - Figure 1: Were the fronts located at the same positions around Marion Island? - Figure 3: The figure would be clearer if the

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x axis for Nitrate uptake (a, c, e) were plotted on the same scale (0-0.8). Ditto for the Ammonium uptake rate (b, d, f), (0-12)

Interactive comment on Ocean Sci. Discuss., 11, 1829, 2014.