

## ***Interactive comment on “Nitrogen cycling in the Southern Ocean Kerguelen Plateau area: evidence for significant surface nitrification from nitrate isotopic compositions” by F. Dehairs et al.***

### **Anonymous Referee #1**

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This paper reports nitrate isotopic measurements from the Kerguelen plateau region in the southern ocean during springtime. They used these data together with independently measured rates of nitrate uptake to calculate the relative importance of nitrification and nitrate upwelling as nitrate supplies for phytoplankton production. It is a nice paper—pretty clear and straight forward. I had a few relatively minor comments for the authors' consideration.

p. 13909, lines 20-25: It would be helpful if all of the features described here were included in Figure 1.

p. 13910, lines 3-8: It would be clearer if these water masses were identified on the

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T/S plot.

p. 13910, line 14: Figure 1b doesn't show chlorophyll. However, it would be nice to see this as a panel in Figure 1.

Figure 1a: I assume that the shading shows bathymetry. It would be helpful to have a color scale bar.

p. 13914, section 3.2: This section was rather brief and does not describe the N-S section. If there is no utility in showing the N-S section, they should leave it out. As a side note, it would be helpful to see the sections outlined either on figure 1 (although it might make that panel too cluttered), or in a sub plot in the section figures, making them 6-panel composites instead of 5 panel composites.

p. 13923, line 24: 'isotopic fluxes' may be better here than 'isotope effects' which have a specific definition related to isotopic fractionation.

Equation 1: Based on their description of the model, I tried to set it up and got a different result. Either they've made an error in calculation or in description of the model, and I think it would be helpful to see more of the derivation here in order to evaluate given that the cited paper is in prep. One possible misunderstanding is how  $f$  and  $y$  are defined. If  $f$  is actually the fraction of ammonium uptake relative to the remineralization flux, and  $y$  is actually the fraction of nitrite uptake relative to ammonia oxidation, then I think we get the same result.

p. 13924: It looks like they changed the  $f$  term from equation 1 to an 'x' in the later equation. I think they should stick to the same terms in both equations. Since they use  $f$  in the Rayleigh term, they should probably stick with 'x' in both equations to denote the ammonia uptake fraction.

p. 13925: The estimated rates of nitrification at the Plateau are 12-22 mmol/m<sup>2</sup>/d over the 100 m euphotic zone, which corresponds to 0.12-0.22 mmol/m<sup>3</sup>/d or 0.12-0.22  $\mu$ mol/L/day or 120-220 nmol/L/day. These rates seem high. Are they feasible? How do

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these rates compare to other reported euphotic zone nitrification rates?

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Interactive comment on Biogeosciences Discuss., 11, 13905, 2014.

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