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Interactive comment on “Dissolved greenhouse gases (nitrous oxide and methane) associated with the natural iron-fertilized Kerguelen region (KEOPS 2 cruise) in the Southern Ocean” by L. Farías et al.

Anonymous Referee #1

Received and published: 1 October 2014

Overall: The paper entitled "Dissolved greenhouse gases (nitrous oxide and methane) associated with the natural iron-fertilized Kerguelen region (KEOPS 2 cruise) in the Southern Ocean" deals with the role of mesoscale structures for methane production and subsequent sea-air gas exchange. The topic of this paper is of main interest especially concerning the origin, pathways and fate of GHG in natural Fe fertilized regions. The data are from good quality. However, it is apparent the paper is written in a great hurry. The results chapter is confusing. The description of the oceanographic conditions is not consistent with what is shown in figure 2. The legend of Figure 2

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is incomplete. Figure 3 and 4 are obviously inverted. But also when I assume that Figure 3 is in reality number 4 and vice versa, I am not able to find in the figures what has been written in the text (line 8/p12542; TChla ...peaked in the southern most stations (TNS08, -09 and A3- these stations are shown in Fig 3b and not in Fig. 4b but a peak is also not available in Fig. 3b). The discussion chapter gives a good description of the state of the art in this the region but more in the sense of a second introduction. However that part of the discussion which is really based on the data given at this paper cannot be related as the discrepancies between the message concerning the GHG, nutrient and chlorophyll distribution written in the text and the distribution really shown at the figures are considerable. I recommend major revisions.

Details: Abstract: There are some repetitions and some points could be formulated more clearly, especially in the second part (from line 15 to the end) Introduction: a short information what the message of this paper is should be given at the end of the introduction Results Acronyms should be written out on the beginning of this chapter; KPR – what does it mean? SAMW and AASW are probably water masses but which ones? This should be explained when mentioned the first time, not just later in the text Page 12539/line 25 is written: Figure 2a and 2b shows. ...there is a mismatch between what is written in the text, in the legend and what is really seen in a, b c and d (while c and d is not mentioned in the legend) Page 12540/line 5 is written: ...marked the presence of a mesoscale structure around 49°S, where the most southernmost stations (Tn10 and A3) are located. . . However, both stations are located south of 50°S, while around 49° station 5 and 7 are shown (Fig 1), so obviously station 10 and A3 are not located in the mesoscale structure? The text continues with...There intense...This sentences does not fit into the results chapter but rather in the discussion chapter. Page 12540/line 9/10 is written: There was a tongue of fresher and colder water... (Fig 2a and b) yes, the figure shows a colder lens of water (TNS 05-TNS07) (Fig 2a) but a lens of fresher water is not shown at these stations (Fig.2b). Page 12540/line 14: Figure 2c and d is not mentioned in the legend of figure 2. In addition in the text it reads TWE but the figure is labelled TEW 3.2. Biogeochemical variables In

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the legend of Figure 3 is written: ..along the zonal transect between 69° and 75°E but the figures show the stations TNS01-TNS10 and A3. These stations are located at the N-S transect (see figure 1) - what is right and what is wrong? Page12541/line 6-10 describes the W-E transect however this description fits obviously to the N-S transect? Page12541/line 8 ...elevated NO₃ concentration –elevated to what? And the sentences continue...typical conditions...than :consumption ...was observed at 73.5E°, however in Figure3 the transect runs from 69-75E° and a depletion is shown at the first station i.e. 69°, same situation for PO₄, Where are the stations located at the NPF and SPF? Where is the pronounced increase in Tchla shown? Figure 3b shows homogeneous chlorophyll a concentration of around 1 from station 2 to 10 As the figures do not show what is written in the text, the conclusions about the distribution of the component relative to the water masses cannot be related. Discussion P12546/line 20-25 describes the methane distribution and is referred to Figure 3f and 4f but these figures show the nitrate concentration. P12548/line 14 N₂O is not shown in Fig. 3e P12551/line1-25: in this study no DMSP/DMS data are shown therefore a discussion of a potential relationship is speculative. This chapter should be strictly shortened.

Figures All figures: the numbers on the x and y axes are too small Fig 1: the transect is called TWE while the station name in figure 2 and figure 4 (on top of each plot) is called TEW Figure 2 the legend doesn't describe exactly what is shown in the figure; i.e. there is a c and d figure which is not described in the legend Fig 3 and 4 the legend doesn't fit the profiles which are shown Figure 6 symbols between CH₄ and N₂O cannot be distinguished and should be changed

Interactive comment on Biogeosciences Discuss., 11, 12531, 2014.

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