

## ***Interactive comment on “Dissolved Fe across the Weddell Sea and Drake Passage: impact of DFe on nutrients uptake in the Weddell Sea” by M. B. Klunder et al.***

**Anonymous Referee #1**

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The manuscript of Klunder et al. la presents dissolved iron (DFe) measurements in the whole water-column along two transects in the Southern Ocean: one across the Drake Passage and a East-West transect in the Weddell Sea. In addition, nutrient uptake is calculated using differences in nutrient distribution between this and previous studies. Nutrient uptake and uptake ratios are discussed in the light of iron availability and its impact on plankton communities. Given the fact that iron availability is one of the main factors controlling productivity and nutrient uptake in open waters of the Southern Ocean, and that there are few DFe data available, result presented here are of great interest. The manuscript needs, however, to undergo a serious check by authors and co-authors before publication. The discussion on nutrient uptake in the Weddell Sea

C2947

is verbose and often too speculative, arguments are hard to follow also due to poor English (see comments below). Figure numbers in the text do not correspond to the corresponding numbers in the figure panels, panels a and b not indicated in figures. Figure quality and presentation could also be improved: numbers on isolines are too small and the color scale is given twice in most figures (not necessary) and numbers are also very small (see further comments below). As mentioned before, the English needs to be improved, I have made some suggestions for the introduction but the discussion (in particular section 4.2.1) also needs shortening and proof reading by a native speaker.

Additional comments:

Figures: Weddell Sea iron is presented from west to east while POC export, integrated DFe and Chla fluorescence from east to west.

p. 7449, lines 7-9: I am not sure I understand the argument here: POC export should be a better proxy for past biological activity than Chla fluorescence. If POC export was higher so should be DFe uptake irrespective of Chla fluorescence values found during the cruise.

p. 7450, lines 26-28: I do not understand the sentence at all. . .

p. 7451, lines 16-29 and p. 7452, lines 1-2: Discussion difficult to follow and very speculative. Couldn't the high N uptake relative to Si be simply due to previous input of iron? What are the actual nutrient concentrations in this area? Can't the lower salinities constrain how nutrients concentrations (through freshwater dilution) should be in the area?

p. 7452, lines 3: “Diatoms are the most abundant phytoplankton species in the Weddell Sea”: I wonder where the authors found this information. As an iron limited region the Weddell Sea planktonic system is most probably dominated by nanophytoplankton and the microbial loop. Also most of the paragraph is unecessary (up to line 13) and

C2948

the following sentence can be modified as: "Figure 8 d shows ...at DFe > 0.1 nM consistent with previous observation showing low N:P and N:Si uptake in iron limited systems (Marchetti and Cassar, 2009. ...)."

p. 7452, lines 23-29: I fail to see how the "remaining nutrients" can explain the ratios of removal. Please explain the reasoning here.

p. 7453, lines 14-29 and p. 7454: I do not understand the point of comparing diatoms average size of Eastern Weddell Sea and Greenwich Meridian. Station 191 has also low N/P removal (at least when looking at fig 2A) than st. 187? Also I am not sure that average size of diatom community is very useful as size during uptake events might be different than the situation observed during the study. Further, since diatom species assemblage composition might be more important than some "average" size, and since the authors do not provide information on community composition in the area of study, I find all the arguments very speculative in my opinion not too helpful when trying to understand the impact of DFe on nutrient dynamics in the region.

Some improvement suggestions for the text:

p. 7436, lines 4-12: this paragraph can be shortened to: "It is now well established that phytoplankton growth in the High-Nutrients Low Chlorophyll (HNLC) Southern Ocean is primarily limited by low Fe concentrations (De Baar et al., 1990; Buma et al., 1991; De Baar et al., 1995, 1999, Smetacel et al., 2012). Several studies have reported dissolved Fe (DFe) values in the upper waters of the Weddell Sea (Sanudo-Wilhelmy et al. 2002; Lannuzel et al., 2008; Lin, 2011), but there have been few studies on dissolve Fe at depth in this area (De Jong et al., 2012)."

p. 7436, lines 13-20: "North of the Antarctic Peninsula, the eastward flowing Antarctic Circumpolar Current (ACC) is forced through the narrow (800 km) Drake Passage, resulting in strong velocities (Sokolov and Rintoul, 2007). The distribution of DFe in the region around the Antarctic Peninsula has been relatively well studied in recent years (Sanudo-Wilhelmy et al., 2002; Lin et al., 2011). Thus far, no measurements of DFe

C2949

over the whole water column of the Drake Passage were available.

p. 7438 line 14: "Although the outflow of WSDW is arguably...".

p. 7438 line 20: "Pacific Ocean, carrying properties of hydrothermal origin...".

Make sure all sentences are in the same tense (for example some results are presented in past and some in present tense).

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C2950