Biogeosciences Discuss., 12, C625–C627, 2015
www.biogeosciences-discuss.net/12/C625/2015/

Biogeosciences Discussions
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Interactive comment on "The biogeochemical structuring role of horizontal stirring: Lagrangian perspectives on iron delivery downstream of the Kerguelen plateau" *by* F. d'Ovidio et al.

Anonymous Referee #2

Received and published: 15 March 2015

General comments -

This manuscript is a very nice piece of work in which the authors use Lagrangian methods to understand the bloom dynamics in a region of the southern ocean. After showing that direct application of standard Eulerian and Lagrangian tools does not give much insight into the chlorophyll distributions, they compute iron pathways and convincingly show that this novel Lagrangian approach helps to understand the location and shape of the bloom. The authors use a powerful combination of on-site, remote, and computational data, including satellite data, Eulerian and Lagrangian diagnosis and modelling, drifter data from several origins, etc., and explain how the blending of all this knowledge was used during their research campaign KEOPS2.

Probably the most far-reaching result, applicable well beyond the particular geographical and temporal context of the paper, is the possibility to predict location and shape of plankton blooms well before occurring, and based only on physical transport dynamics, which preconditions the bloom.

Despite the generally positive impression on the main message and results of the work, I have also to say that I find important deficiencies (in fact, too many) in its presentation. There are many points that lack clarity and need revision. They are detailed below, in 'Specific comments'.

But above all there is a major deficiency which is the lack of a map with the bathymetry of the area, detailing the position of the Kerguelen and Heard plateaux, indicating where is the shelfbreak so many times cited in the text, and sketching, if possible, the most persistent currents. Without this, all the descriptions in the paper become really difficult to follow.

Specific comments -

- In section 3.1 there are comments on the distribution of eddy kinetic energy. But Figure 2a shows total kinetic energy. Is this correct?

- In the paragraph before Eq. A2 figure 8a is mentioned as providing a 'map of tau'. But figure 8a is a line plot showing DFe vs tau instead.

- Table 1 is very unclear. In the text there is mention only to a Chl threshold of 0.53 mgLˆ-1 , and to an age threshold of 3 months (90 days) chosen for the predicted bloom to have the same extent as the observed one. In the table there is another set of thresholds (age=29 and Chl=1) which is unexplained. Is the age threshold also chosen to give the same extent to the predicted bloom? this would explain why there is a single column labelled 'extent' instead of two columns, one for the observed and another for the modelled with the age. Also, the 'overlap' in the min extent cannot be larger than the extent itself, and the % of overlap does not correspond to the previous numbers. I

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suspect 10ˆ5 should be substituted by 10ˆ4 in the min overlap in kmˆ2.

- It would be good to indicate in Fig. 2 if the images correspond also to 11 November 2011.

- The caption n Fig. 4 refers to 'displacements'. But it seems that what is plotted are the latitude and longitude of origin of the water masses, as in Fig. 5b (by the way, in this and in other plots, the labelling is too small to be read, and the units are missing).

- For a better comparison, it would be good to have Figs. 3 and 5 with the same aspect ratio.

- The caption of Fig. 8 needs additional details.

- In addition to the above, there are numerous typos that the authors should correct by careful reading of the manuscript. Here is a list of some of the misspelled words and expressions, to help the authors to search for them: of of, altrimetry, that very drifter, characteristcs, integtrated, ...

Interactive comment on Biogeosciences Discuss., 12, 779, 2015.