

**Manuscript bg-2011-324 submitted to Biogeosciences Discussion**

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**Response to Dr. Achterberg's comments**

*We thank Dr. Achterberg for his comments and provide our responses below (in italics).*

General comments

The relationships between supply of Fe, pools of Fe in surface waters and the Fe requirements by phytoplankton and their internal Fe pools are very hard to determine. The measurement of the pool of Fe in phytoplankton, and the Fe:C and Fe:P ratios provides a very useful approach to addressing this challenge. This research issue is important in the assessment of the iron status of phytoplankton and the CO<sub>2</sub> uptake by phytoplankton as a result of natural or artificial Fe additions.

The submitted paper compares and contrasts three different approaches to determine Fe:C and Fe:P quotas in phytoplankton communities sampled during the onset and demise of a diatom bloom in an Eddy off New Zealand. The dynamic environmental conditions did not make the comparison study easier, but did provide for interesting natural induced changes to the Fe pools and Fe quota. The quality of the data is high, and the data interpretation is thorough. This is a well written and important manuscript. The research community will benefit greatly from this thorough intercomparison exercise. It provides clear explanations on the advantages and drawbacks on the various approaches, which will aid modellers with their parameterisations. The paper does refer on a number of occasions to FeCycle II manuscripts which are in preparation. I understand the timing challenges of publishing research from an interdisciplinary study, and think that this manuscript can be published before the other work. However, the authors will need to be careful in their phrasing when referring to the papers in preparation (see below). I therefore recommend publication of the manuscript following minor corrections.

*Response: Regarding other unpublished FeCycle II-related manuscripts cited as "(2011)", in accordance with the journal's editorial style we are unable to include them in-text as "in prep." or "submitted". Presented with the option of either excluding the references or conforming to the journal's style, we feel that these supporting manuscripts should remain in the text as-is. Alternatively, we could refer to these manuscripts as works of "unpublished data".*

Specific comments

P 9385 L 25: deionised water unit: mΩ cm<sup>-1</sup>

*Response: The unit for deionized water will be changed to MΩ cm<sup>-1</sup> (mega-ohm per cm).*

P 9393 L 25: higher concentrations

*Response: This will be edited.*

P 9395 L 3: were.....those....

*Response: This will be edited.*

P 9400. Line 6-7: provide units

*Response: Units (mmol Fe:mol P) will be provided.*

P 9401. Line 16. It is awkward here to state that Boyd et al (2011) report..... This paper is not accessible as it is in prep.

*Response: We agree that it is awkward to reference “in prep.” and “submitted” manuscripts within the text as “2011”. This is, however, the journal’s style of citing these types of references. Also, see our response to the General comments above.*

P 9402 The sampling for DFe was occasionally undertaken at different times to the sampling of cells. What would the effect be of this on <sup>55</sup>Fe uptake measurements.

*Response: We will add text in Discussion section 4.2 to bring attention to the discrepancy in time of sampling for DFe and time of sampling of cells, including its potential effect.*

P 9402. Line 6: uptake ratio

*Response: This will be added.*

P 9410. Line 11: There are approaches available to obtain a very high specific activity for <sup>55</sup>Fe (e.g. see Zubkov et al., 2007 DSR II). This will then allow the addition of near-negligible <sup>55</sup>Fe additions (low pM level).

*Response: We agree that low-level radioisotopic tracer additions of Fe would be beneficial to uptake experiments. We will add this idea and associated reference to section 4.2.*

P9411. The very last sentence of the paper does not leave the observational or modelling community with a clear guidance. A better clarity in this sentence is required.

*Response: We will add relevant text and attempt to clarify the existing points of guidance in the Recommendations section.*