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**Biogeosciences Discussions**

# *Interactive comment on* "Sargasso Sea phosphorus biogeochemistry: an important role for dissolved organic phosphorus (DOP)" *by* M. W. Lomas et al.

**Anonymous Referee #2**

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The authors present a time series of phosphorus measurements at the Bermuda Atlantic time series, including inorganic and organic phosphorus, particulate phosphorus, both suspended and sinking, and rates of alkaline phosphatase activity. This is a unique and insightful dataset, with the main conclusion being that the exogenous DOP pool supports 30-60% of primary production in the western subtropical Atlantic. The importance of DOP as a substantial P source has been postulated by a number of studies over the past 5 years (and this is recognised by the authors) and thus the conclusions of this study are not new. However, findings from this study support previous modeling output and observations, which have focused primarily on the eastern tropical Atlantic and therefore this study extends the current understanding of phosphorus



dynamics in the North Atlantic to the western subtropical Atlantic.

I have a few questions and comments.

1. Page 10153: The authors estimate that horizontal advection of DOP could supply 43 mmol $m^{-2}$ $y^{-1}$ of DOP, or 32% of the annual phosphorus demand. Are the authors assuming that 100% of the DOP transported into the region of BATS is bioavailable? Other studies that have made similar calculations have divided the DOP pool into labile, semi-labile and refractory with some time scale of utilisation. If the various estimates of DOP supply are to be compared, it is important to know what the assumptions are.

3. There is insufficient detail on the incubation conditions used to determine APA activity. What volume of seawater was used? Were the samples incubated in the light or the dark? Why was a saturating rather than ambient concentration of phosphorus added? Why was a kinetic study not performed? Adding 10uM of phosphorus to a community that is adapted to nM concentrations must have some stimulating effect? Is incubating for a short period of time a way of avoiding measuring the response of a community to high phosphorus?

4. Page 10154: I would like to draw the author's attention to a recently published paper:

Torres-Valdes et al., 2009. Distribution of dissolved organic nutrients and their effect on export production over the Atlantic Ocean. Global Biogeochemical Cycles.

This is a modeling study following on from work by Roussenov et al., 2006, which shows that DOP is responsible for driving up to 70% of the export production in the North Atlantic. This is a useful comparison to this study.

5. 10154: How do the authors know that the changes observed in the phosphorus pools are not due to changes in analytical techniques? As pointed out earlier by the authors, the MAGIC-SRP techniques used to generate recent phosphorus data was not used by Case in the earlier studies.

6. Do the authors think it is important to know which organisms are responsible for

producing APA and thus accessing the DOP pool?

Interactive comment on Biogeosciences Discuss., 6, 10137, 2009.