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Biogeosciences Discussions

Interactive comment on "The effects of nutrient additions on particulate and dissolved primary production in surface waters of three Mediterranean eddies" *by* A. Lagaria et al.

Anonymous Referee #2

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General Comments: The underlying question, changes in primary production and system metabolism upon nutrient amendment, is a very interesting question and I think it has potentially far-reaching implications (e.g., why some eddies in the open Sargasso Sea are net autotrophic vs. heterotrophic). That said I wonder about the value of the 14C PPd and PPp data. There are the caveats to its interpretation that the authors list but they don't list diel periodicity, filtering artifacts and separating PER from sloppy feeding by grazers (see below) as very important issues when trying to match up PPtot to NCP. In fact, the only meaningful discussion of PPtot is how close it is to NCP. In my opinion the trophic status (oxygen measurements and BCD) is the most compelling part of this data set and the one that should be put forth; the 14C data could easily

be left out without any harm to the value of the manuscript. Then the authors could actually discuss why +P drives eddies B & C to net heterotrophy, while +N has no consistent impact on trophic status. +NP I think it is obvious why it stimulates NCP but still worth discussing. Consistent with this, I find the title to not be representative of the actual work presented. It should, again in my opinion, be something more like "The effects of nutrient additions on trophic status of surface waters within Mediterranean eddies."

My recommendation is to drop the 14C, or at least reduce its presence, focus on presenting and discussing the metabolic balance data, and present additional environmental data so it can be evaluated how relevant these surface samples are to the 'euphotic zone/mixed layer" of the eddy.

Specific comments: 1) P8925, L3 - why only sample at the surface? It seems it could be due to space constraints but surface only data can only be interpreted so far. I think the authors, given that they can't go back and repeat the experiment, need to at least include some CTD profiles to see what the mixed layer depth is, Chla profiles (was 8m the Chla max?), nutrient profiles. This will really help in the interpretation of the metabolic balance data.

2) P8925, L7 – what is the justification for adding those nutrient concentrations and in those ratios, and why is C different from A & B?

3) P8926, L11 – what about diel periodicity of photosynthesis. I recognize the authors want to minimize the reincorporation of release DO14C, but most studies with short incubations that are interested in 'daily production' do several incubations over the day? In figure 4 they relate hourly 14C production to daily O2 production (converted to C units). Just estimating the slope suggests that there is a factor of 3 was the incubation duration (4h) 1/3 of the daylength? This all relates back to the value of the 14C incubation data.

4) P8926, L27 – the authors were obviously concerned about high vacuum pressures

giving artificially high PPd values so filtered at <50mm Hg, but then filtered the rest of the sample at 200mmHg to measure PPp and by using the PER value for the low pressure get a PPd value. This tells me that the PPp values are all too low, and by calculation the PPd as well. Is it surprising then that the slope of PPp(5ml) vs. PPp(160ml) is 1.5? Again, calls to question the value of the PPp data.

5) P8927, L11 – why did the authors use 24,000 for the concentration of DIC? Is this the value calculated from salinity? Is it a measured value? More information is needed.

6) P8931, L8 – I don't see that NCP = CR except at station C and that's only because of the huge error. Please clarify.

7) P8934, L27 – what large shifts in the properties of the phytoplankton community? Please clarify.

8) P8936, L19 – perhaps I'm missing something but isn't the definition of GCP being sufficient to meet BCD NCP > 0? From here to L24 are just the definitions of metabolic balance. They aren't a discussion. Rather the authors should discuss why +P drives the system to heterotrophy and +N does nothing. I think the paper by Thingstad et al. 2005 might have some relevance here.

9) P8937, L9-10 – Stating that nutrient additions couldn't relax the competition between heterotrophs and autotrophs is a result, but what would be really interesting is why the different response as from Table 1, it looks like all 3 eddies were equally deplete of nutrients.

10) P8937, L13 – again what differences in phytoplankton communities.

Technical Corrections: 1) P8925, L2 – the figure 1 referenced here (I'm guessing a map) is not provided with the manuscript. Please clarify/correct.

2) Page 8924, L1 – missing "in" after P-limited.

3) P8927, L14 – should be "where" not "were"

Interactive comment on Biogeosciences Discuss., 7, 8919, 2010.