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**Biogeosciences Discussions**

# *Interactive comment on* "Dissolved and particulate primary production along a longitudinal gradient in the Mediterranean Sea" *by* D. C. López-Sandoval et al.

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Anonymous Referee #1

We thank this reviewer for his/her comments, which have helped us in improving our manuscript.

1. P. 8595, Ln 17-19. It does not seem appropriate to qualify studies such as those in the Almeria-Oran Front of the Alboran Sea as "local observations mostly in coastal waters. . ."

Change as suggested.



2. P. 8596, Ln 14-15: The interpretation of the end point DOCp values reported in the manuscript and their comparison with bacterial production rates need a much deeper and more detailed consideration than simply stating that the DOC results "must be regarded as net production rates"

Changes were done both in the methods and discussion section. However, we would like to mention that our intention was to provide a broad picture of the importance of the recently fixed dissolved carbon that is excreted by phytoplankton, as one on the sources of dissolved organic matter available to fulfill bacterial requirements. We are aware that heterotrophic removal of DOC occurs during the incubation period (especially during long incubation experiments) and the magnitude of this removal, which can be up to 50-60%, cannot be quantified with end-point experiments. Nevertheless, since we found that BCD estimates were on average 6- to 14-fold higher than DOCp net rates, even if bacteria had removed 50-60% of the DOC produced during our experiments, the conclusions of the manuscript remain the same.

3. Given its importance in the context of the manuscript, it would be helpful to point out potential limitations and discuss alternatives to the models used to calculate bacterial respiration.

Due to the lack of direct measurements of bacterial respiration, we used two different models to obtain the bacterial growth efficiency (BGE), which is the ratio between the bacterial production (BP) and the total organic carbon assimilated by bacteria (BGE= BP/[BP+BR]).

1) BGE = (0.037 + 0.65 BP) / (1.8 + BP) 2) BGE = 1- [1 / (0.727 ïĆť [Chl-a / (Chl-a + 4.08)] + 1.02)]

The first equation proposed by Del Giorgo and Cole (1998) was obtained by fitting BP and BGE, from a data set of 237 paired observations of BR and BP taken from the literature. The equation represents a rectilinear hyperbole with a fixed lower limit. Equation two describes the dependence of BGE on resource availability by using the chlorophyll

concentration (Chl-a) as a proxy (López-Urrutia and Morán, 2007). The model was obtained from a large data set of BP measured by the incorporation of 3H-Leucine. However, it must be considered that there are intrinsic limitations in both models, which are inherent to the method used to measure bacterial production (3H-leucine incorporation) in the data set used to obtain such equations. Limitations such as the incubation period or the leucine to carbon conversion factor used will directly affect the magnitude of BGE. An alternative to the models used was proposed by Rivkin & Legendre (2001), they suggested an empirical relationship between temperature and BGE that can be used to calculate BCD from BP. However, subsequent analyses indicated that the correlation between temperature and BGE may be in fact, to some extent, a result of the covariation between temperature and resource availability (Lopez-Urrutia & Morán 2007).

4. The DCM Chl a data in Table1 shows the west to east gradient in oligotrophy, but also high variability within the regions studied. Perhaps the authors could consider and discuss additional indicators of trophic situation.

More information is now included in section 3.1.

5. The paragraph in lines 13-19 of page 8600 states that there were no relationship between PER and taxonomic composition of phytoplankton. It would be helpful here to indicate what phytoplankton groups were considered.

This information is now given in the Results section (page 8599).

6. The Boum and the Celtic Sea data in Fig. 6 do not seem to belong to the same regression line. Could the authors discuss this point?

We agree that BOUM data seem to be somehow further from the regression line, this is mainly due to the low production rates measured during the summer stratification period in the Mediterranean Sea which were associated with substantial rates of DOCp. Our intention here is to show the increased importance of dissolved primary production



under strong oligrotrophic conditions.

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Interactive comment on Biogeosciences Discuss., 7, 8591, 2010.