Biogeosciences Discuss.,
doi:10.5194/bg-2015-612-AC1, 2016


Biogeosciences Discussions

# *Interactive comment on* "Dynamics of transparent exopolymer particles (TEP) during the VAHINE mesocosm experiment in the New Caledonia lagoon" *by* I. Berman-Frank et al.

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Received and published: 2 April 2016

Reviewer 1 1.Line 128: I think you mean microM, rather than micromol.

Yes, changed

2.Line 134-135: describe briefly here the rationale for the delineation of the P1 and P2 time periods. I know they are described in other parts of this special issue, but if someone were to read only this paper, it would be good to describe why this choice was made here.

The chemical and biological changes that occurred in each of the experimental stages are described in detail at the beginning of the results section. Section 3.1). We have,



however, added the following sentences at end of section 2.1 to clarify the rationale of these delineations. "Based on the results of different biogeochemical and biological parameters during VAHINE (Turk-Kubo et al., 2015; Berthelot et al., 2015; Bonnet et al., ), three specific periods were discerned (see detailed description in section 3.1) within which we have also investigated TEP dynamics: Days 2-4 (P0) are the pre-fertilization days when the DIP concentrations were 0.02-0.05 PO43- and combined DIN were extremely low; days 5-14 (P1) –After fertilization on day 5 the PO43- concentrations were 0.8 $\mu$mol L-1 and diazotrophic populations were dominated by diatom-diazotroph associations. The second stage of the experiment (P2) from days 15 to 23 was characterized by simultaneous increase in primary and bacterial production as well as in N2 fixation rates which averaged 27.7 nmol L-1 d-1 (Berthelot et al. 2015) and diazotrophic populations comprised primarily by the unicellular UCYN-C (Turk-kubo et al 2015)."

3.Line 230: close parentheses around Synechococcus parentheses added

4.Line 274-277: I think the reader would benefit from a slightly different description of the trends seen in the first days. Upon my first reading, I only imagined the spike that occurred after the phosphate addition, but the TEP was increasing during the entire P0 phase, spiked in the hours after phosphate addition, then decreased during P1 Line 274-277: TEP concentrations increased from the lowest volumetric concentrations (averaging 50 $\mu$g GX L-1) measured on day 2 to reach maximum concentrations in each of the mesocosms (average of 800 $\mu$g GX L-1) on day 5, 15 h after the mesocosms were fertilized with DIP (Fig. S1, Fig. 1a).

5.Line 284-285: the sections seem to be mixed up here. Do you mean that the lagoon increased in TEP during P0 and P2, but decreased during P1? Yes, there was a mistake in the sentence. Fixed to: "TEP concentrations in the lagoon water were compared with those in the mesocosms. These showed a similar pattern of increase in TEP during P0 and P2 while the gradual decline in TEP concentrations during P1 was not statistically significant as observed in the mesocosms (Fig. 1, Fig. S1)."(there is no

P3 it's a mistake- deleted and change in text)

6.Line 350-351: DIP turnover rates indicate DIP stress or deficiency. That cannot fully indicate limitation without some sort of calibration. You are right. Turnover rates alone do not indicate deficiency. However, increasing Alkaline phosphatase activity (APA) in M1 and M2 from day 18 and in M3 from day 21 suggests that the cells were responding to P stress (Van Wambeke et al. this issue). We have rephrased the sentence.

7. Line 467: I suspect the organic matrix around the UCYN-C was EPS produced by and remaining close to the cells (similar to what some phenotypes of UCYN-B do), rather than material that was released and then aggregated free-living cells of UCYN-C. I know it's a small distinction, and perhaps meaningless to many, but I also think it's worth noting that this is a possible scenario and there is precedent to believe that is what happened.

We agree with you as to the mechanism of aggregation. We have modified the sentence making this distinction "Furthermore, UCYN-C probably produced an organic matrix possibly also comprised of TEP that aided the formation of large aggregates (100-500 $\mu$m) (Fig. 6g-h). These aggregates were predominantly responsible for the enhanced export production (22.4 $\pm$ 5

8.Lines 473-490: was this Trichodesmium bloom at the lagoon control sampling site, or elsewhere in the lagoon? Does it explain any of the results from the experiment or the lagoon results? If not, I don't really think it belongs here, as it is a description of a non-related phenomenon.

Yes, Trichodesmium bloomed at the lagoon control sampling site. However, upon rereading the paragraph and your comment, we agree that it does not provide any further explanation of the results and have thus removed the whole paragraph.

Paper Figure 1: I would like to see all the figures put on the same X axis to make them more directly comparable. I know it will be harder to see patterns, but the comparison



is more important, I think All plots of Fig 1 are on the same X axis. We have now presented them with the same Y scale. We here include a supplemental figure with the average TEP concentration from each mesocosm and from the lagoon on the same plot to easily compare. These show how uniform overall TEP content is but when dissected each mesocosm shows a similar pattern of increase and decrease that we want to emphasize.

Please also note the supplement to this comment:
http://www.biogeosciences-discuss.net/bg-2015-612/bg-2015-612-AC1-supplement.pdf

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2015-612, 2016.

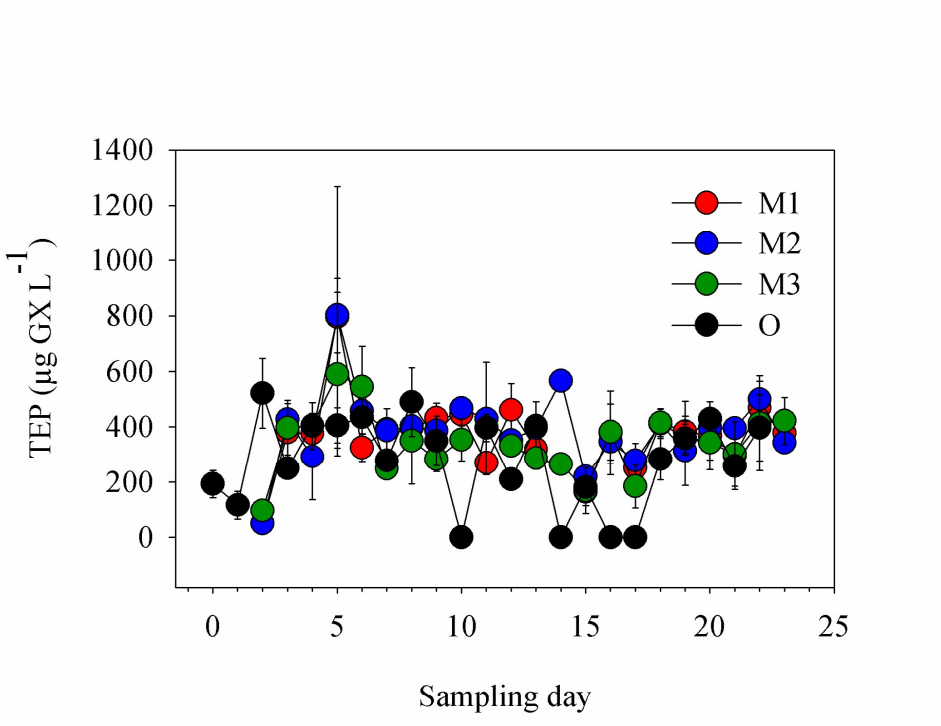


**Fig. 1.** Temporal dynamics of depth averaged TEP concentrations in all mesocosms (M!, M2, and M3) and lagoon water (O) during the VAHINE experiment