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Discussions

# *Interactive comment on* "Effects of varied nitrate and phosphate supply on polysaccharidic and proteinaceous gel particles production during tropical phytoplankton bloom experiments" *by* A. Engel et al.

**Anonymous Referee #2**

Received and published: 10 June 2015

General comments: Very little is still known about CSP formation and dynamics and even for TEP many questions about their dynamics remain. This paper is generally well written and indeed addresses a noteworthy issue as to what effects varying nutrient supply and stoichiometry will have on marine gel particles. However, I fully agree with the general comments made by the anonymous reviewer #1, exspecially regarding the disconnection between the abstract introducing the potential for increased OMZ zones, global change impacts, etc, and the main body of the manuscript itself. Reading the abstract would lead the reader to believe quite a different story would follow. If the

decision is made to keep this reasoning, then it will have to be fully integrated and explained also in the introduction and discussion parts.

We are, however, clearly shown how TEP and CSP particles behave differently and relate differently to the other measured biogeochemical parameters. Despite it being a mesocom approach with inherent difficulties we can observe these differences already over this short time period. However, it needs to become clearer as to whether potential changes in phytoplankton community (see below) could have affected this. Overall, this certainly brings forward the field on marine gels in relation to CSP formation and dynamics in comparison to TEP since very little data has still been published on these particles.

Specific comments: Comments by reviewer #1 also reflect my concerns. In particular, I would like to see some information given on the phytoplankton community composition.

P6594 L17: Already stated by anonymous reviewer #1: a mesh was used I presume? What size was the mesh and if no mesh was used, what is the reasoning behind this, as this would have serious consequences for these mesocosm experiments.

P6594 L23: So only one beaker was taken from which all subsamples for the various analyses were obtained? What volume did the beaker have? Also where was this sampled i.e. was it thus only surface water? Was the water in the tank mixed before sampling? Please clarify this for the reader. This would have an impact on how representative the sample is. If there was any mixing then this would have had to be very gentle to not influence gel particle formation, etc., so I presume there wasn't any? The depth of sampling would also affect gel particle abundance since it can be expected that particles will potentially settle out as they aggregate and bloom dynamics change.

P6590 L6ff: I suggest to exclude the description of TEP and CSP from here: "Here, were investigated how different ... affect the abundance and size distribution of polysaccharidic transparent exopolymer particles (TEP) and proteinaceous Coomassie stainable particles (CSP)." The phrase "which are suggested to enhance particle aggrega-

tion and export fluxes" could also be applicable to CSP and it is unclear why only CSP would be a "supposedly" good substrate for heterotrophic bacteria and not also TEP.

P6592 L10: Perhaps write: "To date, mostly two types of gel particles have been studied in seawater:. . ." Since other gel particles have also been 'described' or at least suggested to be present in seawater . . .

P6596 L11ff and 18ff: Why do you mention that a certain number of tanks was similar or smaller in ratios to the Redfield value, whilst for the other you mention those that had a larger ratio? What is the rationale behind this?

P6600 L9: You refer here to there also being a higher variability in the varied N experiment, however, you also have a higher number of different treatments compared to the P experiment.

P6606 L9: Perhaps it would be good to also include a similar figure as Fig. 5 for CSP.

P6607 L5: You mention you relate the gel particle abundance to bloom development but in fact you mostly only relate it to the period until day 6 and thus exclude the bloom decline. In addition you have no data for 3 and 4, which should be acknowledged somewhat when interpretations are being made. You also mention in the next part that abundances were related to chl a until the bloom peak, however, the bloom peak for Varied P was on day 5 and large changes in the biogeochemistry have already happened on day 6 in these mesocosms.

P6614 L9: I may have not understood correctly but is it really new formation of CSP or CSP potentially disaggregating? You mention only a few sentences later that CSP numbers decreased at the end of Varied N with a potentially higher loss than new formation.

Table 4 and in the main text: Why do you use Mol% for TEP-C:POC but mol:mol for TEP-C:PN?

Unclear sentences/phrases are the following lines, which either do not make sense as

they currently stand or do not fully explain what aspects are meant, and would require reworking:

P6591 L12-16, in particular the last part does not fit well. Why also a new paragraph here? The next sentence is also unclear (L16-21).

P6591 L17-21

P6608 L12: thereby – not the right word to use here.

P6608 L28: what factors? Which factors do you refer to here?

P6609 L17-21, especially the last part.

P6609 L26 - P6610 L4

P6610 L10-14: what is meant by 'potential variability of ecological responses towards nutrient supply'? . . .What ecological variability??

P6612 L13-15: may contrasts??

P6615 L2-3

Technical corrections: - Please make sure that throughout the document coomassie stainable particles is in fact written as Coomassie stainable particles i.e. Coomassie with a capital letter.

- Throughout please make sure you use "gel particle" when written together with other words such as 'gel particle formation', 'gel particle abundance' and not gel particles abundance or gel-particles abundance. Only if 'gel particles' is used on its own and the plural is meant do you write it with an -s.

Abstract: L7: we investigated how. . .

L14: In the days until the bloom peak is reached, a positive correlation ...

L17: After the bloom peak, . . .

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Introduction: P6591 L16ff: Add onto previous paragraph, not a new paragraph. Separate paragraphs later in line 21.

P6591 L22: . . . in the form of dissolved. . .

P6592 L8: Verdugo et al., 2004). ->Begin a new paragraph here. "The formation of gel particles thus represents. . ."

P6592 L16: been reported ([add some newer references here]), with higher. . .

P6592 L17: It has been shown that the rate. . .

P6593 L12: . . .nitrogen in the form of CSP thus represents. . . important source of nutrition.

P6595 L5: . . .(Table 1) for 14 tanks. Two additional. . .

P6596 L3: Samples for the dissolved. . .

P6596 L5: is it really Quaatro? Perhaps Quattro?

Section 2.2.1.: Please specify what volume of sample was used for these analyses. P6596 L10: Please specify at least for how long the staining was done.

P6598 L7: the range found in samples were prepared. . .

P6599 L5: HCl not HCL

P6599 L10: experiments were statistically tested. . .

P6600 L12: . . . response was much stronger. . .

P6600 L15, 19: mesocosm; also check other places where 'mesocosms' is in combination with 'experiment' or other words and should be 'mesocosm' instead.

P6603 L7: . . . initial (day 1) TEP numerical . . .

P6605 L17: at the end of the experiment.

P6606 L3: the figure reference (Fig 6b, left) is incorrect:

P6606 L20: Multiple comparison (Holm-Sidak) tests revealed . . .

P6607 L18: the figure reference (Fig 8b-f) is incorrect:

P6608 L27: the increase in CSP abundance over time. . .

P6609 L7: in a large variation. . .

P6609 L24: remove superfluous comma after . . .days.

P6610 L8: . . . to long-term responses of natural . . .

P6610 L18: Chow et al. (wrong by Marine Chemistry but how it will be cited)

P6610 L23: . . . influencing this release. . .

P6611 L12: In addition, phosphorus. . .

P6611 L25: . . .North Pacific (offshore Hawaii).

P6612 L15: . . .bloom build-up and decay.

P6612 L21: . . .to the POC pool in the form of TEP. . . . accounted for 0.5 $\mu$Mol C (initial days) to . . .

P6613 L13: about the role of CSP on the organic carbon and, more importantly, on organic. . .

P6613 L15: . . .for auto- and heterotrophic growth. During this study [also no new paragraph here]

P6613 L21: . . .at a later time. Because. . .

P6614 L14: accordance with findings. . .

P6615 L4: Particle dynamics of TEP and CSP differ..

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P6615 L9: . . . will likely impact the biogeochemistry [of what??] during phytoplankton blooms.

References: - Szlosek Chow is accidentally in the system of Marine Chemistry as Chow. Please also add a DOI here.

-Cisternas-Novoa 2015: add DOI

-Pantoja: Deep-Sea Res. Pt. II

-Prieto: Deep-Sea Res. Pt. I

- Throughout check Mar. Ecol. Prog. Ser. not Mar. Ecol.-Prog. Ser. or other versions.

Figures and Tables:

Figures 1-4,6: use days or day for x-axis label but be consistent.

Figure 1: increase the font for all axes and labels a-f. Use marks for each day (instead of every two days) on the x-axis for consistency between different figures.

Figure 3: fix the mistake with the delta symbol on the y-axes. Increase the font size for all labels.

Figure 5: of poor quality, submit a better quality version

Figure 6: add the delta symbol to the y-axes. Increase the font size for all labels, why do you not show the mean values for the Varied P? This could at least be done for days 1-2 and 5-8.

Figure 7,8: Increase the font sizes for all labels.

Figure 8: in y-axis label write [x10. . .

Figure 9: This is impossible to read! Not only the labels but the graphs itself too. Please make these larger or rethink on how to present this better.

Table 1: the small font is ok, but to make it more readable please provide spacing be-

tween the different treatments i.e. add some spacing between the line for MK16 and MK1, between MK10 and MK6 and so forth. Please do this for both treatments. Also increase the spacing between the Varied P and Varied N block. Place the nutrient concentrations/ treatments listed in the legends in the same order. Correct in the legends 6.35 not 5.35

Tables 1, 2 and 4: always use the same order of listing the treatments for all of these tables.

Table 2: also add spaces here between treatments for better readability. In caption: add what 'Bact' stands for i.e. bacterial abundance . . .significant correlations (p<0.05).

Table 4: add space between Day 1 and Day 8.

Table 3: please specify in caption what the regression parameters a and b stand for.

Interactive comment on Biogeosciences Discuss., 12, 6589, 2015.

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