

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.

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Anonymous Referee #1: General comments This paper addresses an interesting issue, i.e. what will be the effects of varied nutrient supply and stoichiometry on the production and dynamics of gel particles. While I find the question interesting and the paper well written, I find the rationale to justify such a study rather weak. The first sentence of the abstract suggests that "oxygen minimum zone (OMZ) will expand in the tropical oceans as a result of global change with potential consequences for marine element cycling, resulting in a lower supply of nitrate relative to phosphate". However,

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neither the Introduction nor the Discussion develop this argument, and the link between OMZ/global change/nutrient supply is rapidly lost, which leaves the reader with the question: What happens for gel particles if the nutrient availability is altered? Instead, the Introduction develops on the general role of inorganic nutrient availability on ecosystem productivity. It would certainly be beneficial for the paper to focus the Introduction on the expected alteration of the nutrient input/stoichiometry/cycling in OMZ, and in particular in the studied site and in the context of global change. If the link with global change and OMZ is kept in the Abstract, it also seems necessary to discuss the impact of changing nutrient availability on the long term perspective (global change) and for this specific environment (OMZ). I find the main conclusion, i.e. increasing inorganic N supply (relative to inorganic P) favors gel particles formation, rather convincing despite the limitation of the mesocosm approach to extrapolate to long term responses of natural systems (already acknowledged by the authors on page 6610).

Response: We agree with the referee that the impact of altered nutrient concentration and stoichiometry should be discussed more extensively with respect to biogeochemical consequences of oxygen minimum zones. We will expand the link between nutrients and sub/anoxia in the introduction (e.g. sinks of NO₃, sources of PO₄) and give a perspective on potential consequences for gel particles production in the discussion section.

Referee: Specific comments/questions Page 6594, Line 20: A mesh to filter out zooplankton was not used. Do you mean "was used"?

Response: A mesh was not used in order to avoid changes of the community composition tested, compared to the natural situation.

Referee: Page 6596, Line 21: The microscopic study of gel particles was conducted at a 200xmagnification. Although this magnification covers most of the gel size spectra (at least for TEP), it is probably too high to allow a good statistical determination of large particles (that are less abundant), and it probably renders the observation of

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small micrometric particles very difficult. This limitation is somehow acknowledged by the authors since in Fig. 5, the regression line is fitted to the data only until 14.14 μm , suggesting that above this size, the large particles are not well represented. I think this limitation should be acknowledged in the paper.

Response: Gel particles were determined in the size range 1-760 μm . We choose to fit the size distribution line to a largest size of 14.14 μm ESD to assure a minimum number of 10 ml⁻¹ in all samples (TEP and CSP at all time points, throughout the study) for better comparability. Larger gel particles were too seldom and variable to meet this criteria and thus would not allow for a good fit. We will include this explanation in the method section. Larger TEP thus were included in the enumeration but not in determination of the size distribution.

Referee: Page 6612, Lines 24-29: It is suggested that the high [TEP-C]:[POC] ratio is due to an underestimation of POC due to TEP passing through GF/F filters. While this possibility exists, it should also be mentioned that TEP-C could be overestimated using the TEP-C versus TEP size relationship. Indeed, the use of this relationship is very sensitive to the determination of the TEP size distribution, and one could argue that the determination of the TEP size spectra at a single x200 magnification does not allow such an accurate description of their distribution. Furthermore, this relationship has been established from phytoplankton cultures and could overestimate TEP-C of naturally occurring TEP particles.

Response: The referee raises valid arguments and we will include this potential bias of the TEP-C calculations in the discussion.

Referee: Page 6609, Lines 22-27: This paragraph brings to light the possible impact of various nutrient supply for the phytoplankton community composition. Since phytoplankton composition strongly influences the release rate and composition of TEP precursors (and probably also that of CSP), it would be useful to mention some results from the phytoplankton composition (if available). If the community composition

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differs significantly between treatments, the effects of changing nutrients supply and stoichiometry on the dynamics of gel particles could be only due to phytoplankton composition.

Response: Unfortunately, we do not have data to test for community differences among mesocosms. We refer to the study of Meyer et al. (2015, BGD, doi:10.5194/bgd-12-9991-2015), who describe development of cyanobacterial (nifH gene and transcript abundances) communities over time.

Referee: References The following references are listed, but are not cited in the text: - Azam and Long 2001 - Carlson 2002 - Engel et al. 2014 - Finkel et al. 2010 - Graziano et al. 1996 - Kreuz et al. 2014 - Mills et al. 2004 - Moore et al. 2008 The following references are cited, but are not in the reference list: - Fraga 2001 - Hauss et al. 2012 - del Giorgio and Duarte 2002 - Chin et al. 1998 - Verdugo et al. 2004 - Hauss et al. 2013 - Meyer et al. 2015 - Berman and Viner-Mozzini 2001 - Claquin et al. 2008 - Underwood et al. 2004 - Alldredge et al. 1995 - Arrigo 2005 The following references are not cited properly: - Rhee 1974 or 1978? - Fogg 1966 or 1983? - Bakker et al. 2007 or Baker et al. 2007? - Logan et al. 1995 or 1994?

Response: We thank the referee for carefully checking the references. We will correct the list during revision.

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