

## ***Interactive comment on* “Bacterial production and transformation of dissolved neutral sugars and amino acids in seawater” by L. Jørgensen et al.**

**L. Jørgensen et al.**

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We would like to thank anonymous referee #2 for detailed comments on the manuscript.

Our study provides insight to microbial production and transformation of biomolecules in the Ocean. Referee #1 also questioned the novelty of the paper, and a detailed description of the new findings of our study is written in the reply to referee #1.

Reply to specific comments:

P6152, L9: The term ‘long-term’ has been changed to ‘32 days’.

P6152, L10: It is now stated in the abstract that the incubated seawater originates from the Arctic Ocean and the North Atlantic Ocean.

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P6152, L21: Although the microbial carbon pump (MCP) needs to be studied in more detail to better understand it mechanistically, many studies support the existence of the MCP, and we therefore think it is reasonable, in fact important, to discuss our results in light of the MCP. The time it takes for microbes to generate semi-labile or refractory DOM via the MCP is unknown, and we agree that the setup of our experiment may be too simple to make 'strong statements' about the MCP. We have therefore tried to keep the conclusions to 'indications' and 'suggestions' which we do not think imply 'strong statements'. See also our reply to comment 'P6152, L22 + L23' from referee #1.

P6155, L7: The term 'long-term incubation' has been changed to '32 day incubations' in the Methods section and the figure legend for Figure 1.

P6156, L1: The word 'amble' has been changed to 'ample'.

P6158, L7: This is a good point. Making the calculation from ASWglu alone reveals almost the same result, though. We have now addressed the uncertainty associated with calculating the bacterially-produced neutral sugars from the NSWglu data in sub-section 4.2 of the Discussion section.

P6164, L13-15: We do not claim that the molecular compositions of semi-labile/refractory biomolecules and microbially produced biomolecules are identical. We point out, that they are approaching each other during our 32-days experiment and use this fact to provide a possible explanation for production of semi-labile/refractory DOM. Based on the available data, we have presented this as a 'hypothesis' which we believe is reasonable.

P6167, L26-27: The MCP prolongs the residence time of DOM in the ocean (Jiao et al. 2010), but the operation time of the MCP is not necessarily on the same long time scale. At least, we do not know of any studies that state that microbial production of semi-labile or refractory DOM only happens on year-long (or even longer) time scales. In fact, studies of fluorescent DOM indicates that microbial production of (what is believed to be) a refractory DOM component happens continuously over

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time (Jørgensen et al. 2014). Although our experiment follows a very simple design, we believe it provides preliminary insights into the microbial production of semi-labile and refractory biomolecules. The fact that there is a clear resemblance between semi-labile/refractory biomolecules (left in NSW samples after 32 days) and bacterially-produced biomolecules (left in ASWglu after 32 days) indicates that microbes can be a source of semi-labile or refractory biomolecules. See also our reply to comment 'P6152, L22 + L23' from referee #1.

Table 1: We will discuss this point with the copy-editors at Biogeosciences. They probably prefer having the units only at the top of the table, but we do not mind having the units further down in the table as well.

#### References:

Jiao, N., G.J. Herndl, D.A. Hansell, R. Benner, G. Kattner, S.W. Wilhelm, D.L. Kirchman, M.G. Weinbauer, T. Luo, F. Chen, F. Azam. 2010. Microbial production of recalcitrant dissolved organic matter: long-term carbon storage in the global ocean. *Nature Reviews Microbiology*, 8: 593-599.

Jørgensen, L., C.A. Stedmon, M.A. Granskog, M. Middelboe. 2014. Tracing the long-term microbial production of recalcitrant fluorescent dissolved organic matter in seawater. *Geophysical Research Letters*, 41 (7): 2481-2488.

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Interactive comment on Biogeosciences Discuss., 11, 6151, 2014.

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