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Biogeosciences Discussions

Interactive comment on "Distribution and bacterial availability of dissolved neutral sugarsin the South East Pacific" *by* R. Sempéré et al.

R. Sempéré et al.

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In the revised MS, we gave the mean values of TDNS at all stations (see abstract). The results did not show any significant differences (Mann-Whitney statistical test). Therefore, we slightly modified the sentence in the abstract: we replaced "...were higher in UPW (149–329 nM) and MAR (111–540 nM), than in GYR (79–390 nM) and EGY (58–492 nM)." by "...were in the same order of magnitude in MAR (387±293 nM), GYR (210±120 nM), EGY (312±158 nM), and UPW (247±68 nM), with the highest and lowest concentrations found in MAR (30 m, 834 nM) and GYR (40 m, 50 nM), respectively." (see page 2, lines 25-27 in the MS).

We also modified a sentence in the summary-conclusion: we replaced "...with relatively elevated concentrations in the center of the SPG (GYR) and to a lesser extent in the eastern border of the SPG (EGY)." by "Although distributions were very large along

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vertical profiles, maximum values were reached at stations of intermediary trophic status like MAR and EGY, but not the more eutrophic (UPW). At opposite, TDNS concentrations relative to bacterial production were higher in the center of the SPG (GYR) and to a lesser extent in the eastern border of the SPG (EGY)." (see page 15, lines 357-359 and 363-365 in the revised MS).

We disagree with the reviewer that because all sugar concentrations are similar, this may be a sign of a threshold. Similar concentrations have already been reported to other oceanic regimes and additional statistical analysis of our data (principal component analysis) showed that these sites could not differentiate in terms of their sugar composition. Unless the reviewer comes up with a better interpretation we feel confident with our data set.

The authors do not provide evidence that the radiation is in reality able to modify

the sugars - is the DOM photodegradation real? Fig. 5 may be explained by light harvesting

organisms capable of storage formation and of leucin incorporation - no

relation to DOM photodegradation. The variation in fig. 5 seems to be really high.

We disagree on this point with the reviewer:

(1)As written in our MS: "We did not detect any significant photochemical production of FDNS during the photodegradation experiments." However, other studies reported the photochemical production of sugars from DOM irradiation. For example, Kovac et al. (1998) have observed that the photodegradation of phytoplanktonic macroaggregates isolated from the Adriatic Sea could lead to the production of poly- and monosaccharides *via* cleavage of glycoside linkages. In the same way, Jørgensen et al. (1998) have measured from the sunlight irradiation of humic DOM, an increase in polysaccharide concentrations. Tedetti et al. (unpublished) measured a significant photochemical production of glucose and sucrose from irradiation of coastal waters

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in the northwestern Mediterranean Sea. These photochemical productions of sugars occurred for radiation levels much lower than those received by our DOM samples in the South East Pacific. Therefore, earlier investigations clearly suggested that solar radiation is able to modify DOM to produce sugars, even though we did not observe this phenomenon in this study (probably because the production of sugars depends also on the nature and quality of DOM, i.e. the presence of specific chromophoric compounds). Note that sugar photodegradation may indirectly through oxidation of OH radicals produced by photodegradation of dissolved organic compounds.

Kovac N, Faganeli J, Sket B, Bajt O (1998) Characterization of macroaggregates and photodegradation of their water soluble fraction. Org Geochem 29:1623-1634.

Jørgensen NOG, Tranvik L, Edling H, Granéli W, Lindell M (1998) Effects of sunlight on occurence and bacterial turnover of specific carbon and nitrogen compounds in lake water. FEMS Microbiol Ecol 25:217-227.

(2) Figure 5 cannot be explained by light harvesting organisms since as written in the MS: “During DOM-photodegradation, the bacterial inoculum was kept in the dark at *in situ* temperature”. This means that bacteria were never exposed to solar radiation during the DOM irradiation but maintained in the dark. Therefore, the variability of leucine incorporation rates reported in Figure 5 is due to the effects of solar radiation on DOM (production of labile or refractory organic compounds) and not to the direct effects of solar radiation on bacteria.

Although the authors report that a systematic, unknown peak coeluted with fructose and made its quantification impossible, the author claim that concentrations of fructose were very low.

In the revised MS we deleted this sentence (see page 12, line 273).

Interactive comment on Biogeosciences Discuss., 5, 725, 2008.