

## ***Interactive comment on “The composition and distribution of labile dissolved organic matter across the south west Pacific” by Christos Panagiotopoulos et al.***

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Received and published: 9 May 2018

This study presents novel DOC and dissolved carbohydrate data along a transect in the South Pacific that spans a range of oligotrophic waters as part of the OUTPACE project. This is an understudied region of the global ocean, and these data provide interesting insights about carbohydrate dynamics in these oligotrophic waters. The study also provides a valuable portrait of DOC and carbohydrates for comparison to other ocean basins.

The carbohydrate reservoir in the ocean is large and molecularly diverse. Carbohydrates account for about 15-20% of marine DOC and are among the most abundant

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biochemicals in seawater (Benner et al. 1992; Pakulski and Benner 1994; Goldberg et al. 2010). Neutral sugars were measured in this study and while they are important and relatively abundant carbohydrates, they are not the only carbohydrates in seawater. This is implied in the Introduction (lines 68-71) and in the first paragraph of the Discussion. The manuscript needs revision to clarify the diversity and abundance of carbohydrates in the ocean and to place neutral sugars within the broader carbohydrate reservoir. For example, many carbohydrates besides neutral sugars contribute to semi-labile DOC (lines 238-241).

The reported DCNS %DOC values in this study are similar to those observed in the N. Atlantic and N. Pacific (Goldberg et al. 2010, 2011; Kaiser and Benner 2009). This suggests carbohydrates are of a similar diagenetic state among these major ocean gyres. In contrast, the mol% glucose (~50-75%) values in this S. Pacific study are high compared to values reported (~20-50%) in the N. Atlantic and N. Pacific (Goldberg et al. 2010, 2011; Kaiser and Benner 2009). They are particularly high in surface waters (~50%). Is this indicative of a different source of carbohydrates in surface waters? Given the similar yields (%DOC) among ocean basins it seems unlikely the high mol% glucose in the S. Pacific is due to greater diagenetic processing. The authors need to address the high mol% glucose values in the Discussion section.

I recommend the authors include a table with depth, chlorophyll, [DOC], [DCNS], DCNS %DOC, and mol% glucose data from all stations in the upper 200 m of the water column. It is not possible to derive quantitative values from the figures (2, 3). The authors should take a look at the article by Shen et al. 2016 in L&O. This study shows the accumulation of carbohydrate-rich DOC during the summer in productive waters of the Gulf of Mexico. Nutrient limitation appears to play a role in carbohydrate-rich DOC accumulation.

Specific comments: Methods: It is unclear how Dissolved Combined Neutral Sugar (DCNS) is calculated. The DCNS terminology implies that free sugars have been subtracted from total sugars. If so, this should be stated. If not, the DCNS terminology

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needs clarification because the term implies free sugars are not included. Clarification is important for comparison of values among studies using different terminologies. Line 31: change “also reflected” to “observed” Line 34: delete “high” and change “higher” to “longer” Line 39: change “higher” to “longer” Line 49: change to “life” to “productivity” Line 72-73: The carbohydrate pool also includes oligosaccharides. Line 75: add reference McCarthy et al. 1996 Line 78: change “that” to “they” Line 79: delete “ultra” Line 116-118: Are these values for multiple injections of a single sample or replicate samples? Report the average  $\pm$  SD concentration for the reference standard. Line 154: provide a reference for the carbon conversion factor Line 165-166: include the range of mixed layer depths observed along the transect Line 173: change “prokaryotic” to “bacterial” production (BP) Line 182-183: reported range (55-78) is inconsistent with the highest value being 85, add the median value along with the range Line 242-246: This sentence needs revision for clarity, e.g. 3H leucine concentrations. Duhamel et al. 2018 is not in the references. Total dissolved amino acids are known to contribute to semi-labile DOC and are measurable in mesopelagic waters of the Pacific. Line 194 and 196: add reference Kaiser and Benner 2009, values for the Pacific HOT station should be added for comparison Line 211: Fig. 5 is presented before Fig. 4. Figure 4 is first presented in the Discussion and should therefore be presented as Fig. 5. Line 251-252: Residence time (d) should be changed to Turnover time (d-1) because the calculation is based on microbial utilization (BCD) of DOC.

Fig. 1: The station symbols and numbers should be changed to colors that stand out from the background. Fig. 2: The legend states data are presented from 0-300 m depth, but the figure shows 0-200 m depth. Fig. 3: The masking of data on figures 2B and 2C due to abnormal extrapolation of data is confusing and inappropriate. Rather than mask areas on the figures, these odv plots should be adjusted to properly extrapolate among profiles (i.e. not connected between profiles that are many kilometers apart). Fig. 4: Residence time (d) should be changed to Turnover time (d-1). Fig. 5 – The relative abundance of dissolved monosaccharides should be referred to as the mole percentage (mol %).

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Additional editing for grammar would improve the text.

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Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2018-158>, 2018.

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