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Biogeosciences Discussions

Interactive comment on "Carbon fluxes in the Canadian Arctic: patterns and drivers of bacterial abundance, production and respiration on the Beaufort Sea margin" *by* E. Ortega-Retuerta et al.

Anonymous Referee #1

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General comments

This manuscript presents new measurements of bacterial abundance, production and respiration in the coastal Beaufort Sea during August. These data are used together with primary production and dissolved organic carbon measurements to compare bacterial carbon utilization with carbon standing stocks. The results show the region was mostly net heterotrophic, the measured bacterial carbon demand exceeding primary production by 3 to 22 times. Using the average BGE measured at 6 stations, the bacterial C demand was calculated at all stations and compared to depth-integrated primary production. Surprisingly, the only net autotrophic stations were found in the

Mackenzie River mouth, a region previously found to be strongly net heterotrophic.

The manuscript is well written. The numerous methods utilized are valid, complementary and properly integrated. The results are very well put in perspective and offer new insights into the controlling factors of bacterial production and whether the Arctic Ocean is acting as a sink or a source of CO2.

Specific comments:

p. 6019, line 15 - A scale bar would be useful in Fig 1. The 50-m isobaths could also be added.

p. 6019, line 23 - The stations sampled with the zodiac correspond to the southern portion of Transects 600 and 300?

p. 6020, line 11 - The same regions (gates) were ascribed to LNA and HNA for all samples? The two populations were clearly discernible at all stations and depths?

p. 6020, line 25 - 10-20 nM of 3H-leucine was saturating even at river stations? Vallières et al. (2008) have found 10 nM to be below saturation.

p. 6021, line 12 - Based on the bacterial biovolume measurements made using DAPI, could you estimate what fraction of the total bacterial population would pass a 1 μm filter?

p. 6021, line 24 - What is the approximate limit of detection of the TCR and BR measurements? This information would be relevant given that 6 out of 19 respiration experiments showed no significant O2 decrease.

p. 6021, line 28 - It would be appropriated to state here why TCR was used instead of BR in the bacterial carbon demand calculations (the explanation appears only at p. 6030).

p. 6022, section 2.2.4 - Detailed PP results will be presented elsewhere?

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9, C2402–C2405, 2012

p. 6026, line 21 - In Table 2, “na” refers to the samples where no significant O2 decrease was measured?

p. 6026, line 29 - It would be appropriate to point that only one BGE measurement was made at the CHLa maxima depth, lessening the significance of the comparison with surface values.

p. 6027, line 13 - In Fig. 4, it would be good to change the scale so that values <1 are more clearly visible (this can be done by changing the median and non-linearity of the ODV color mapping).

p. 6028, section 3.4 - What are the DOC and DN concentrations of these two samples? What increases were caused by the river water addition?

p. 6030, line 8 - The size fractionated BP data are not shown. How many samples were used to derive that 36% of total BP was due to bacteria attached to particles? Stations near the river were similar to offshore stations in that respect? Garneau et al. (2006) and Vallières et al. (2008) have found a much larger contribution of the particle-attached bacteria in the Mackenzie River and the region influenced by the river.

p. 6033, line 8 - The “concentration of added C” is not discussed, but it should be.

p. 6034, line 3 - The statement: “the experiment results suggested that organic matter coming from the river could partially stimulate bacterial in surface waters. . .” seems in contradiction with line 5-13 of page 6033 where the stimulation of BP was attributed to dissolved N. Dissolved N is mostly organic in the region?

Technical corrections:

p.6018 line 22 - “Microbial food web” would be more appropriate than “microbial loop”.

p. 6024, line 17 - What is considered as the “top layer”?

p. 6028, line 23 - To facilitate comparisons, the values observed in the present study could be added to Table 4.

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9, C2402–C2405, 2012

Interactive Comment

p. 6029, line 27 - Please add that “free-living bacteria” refer to those passing a 1 μm filter.

p. 6034, line 4 - “Bering Sea”??

END OF REVIEW

Interactive comment on Biogeosciences Discuss., 9, 6015, 2012.