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***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.**

E. Ortega-Retuerta et al.

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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 #2 This manuscript presents bacterial abundance and metabolism in an Arctic shelf sea environment, and investigates the balance between heterotrophy and autotrophy. The study contributes to the still comparatively scarce knowledge of microbial carbon cycling in the Arctic Ocean, and is therefore an important contribution to this field of marine science. Regulating factors of bacterial production are determined, and it is suggested that temperature and avail-

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ability of labile substrates together drive the observed patterns in bacterial production. Furthermore, the role of river discharge for the observed net heterotrophy is discussed. The study is based on extensive fieldwork during one month, and the results are thoroughly compared to previous Arctic studies. The conclusions are supported by the data; I consider the manuscript to be of high quality.

We appreciate very much the reviewer's comments. All specific questions and comments have been addressed in the revised version of the MS and are detailed below

SPECIFIC COMMENTS Page 6026, line 17. Comparison of BP:PP ratios is said to be significant, but no statistics are given; add test results or remove "significantly".

We have included the p level ($p < 0.001$) as the difference is statistically significant

Page 6026, line 27-28. Does the P value refer to both comparisons (coastal vs. off-shore AND surface vs. Chl max)? Please specify.

It refers only to coastal vs. offshore waters as only one datapoint was obtained in Chl Max waters using non-fractionated samples. As the result is not crucial for the conclusions, we have deleted that information to avoid confusion.

Page 6027, line 25. The regression slope was "steeper", not "higher".

Corrected

Discussion and Tables 4 and 5. I suggest adding your own data to these tables to facilitate comparisons with previous work. Table 6 in the text is really Table 5.

Done

Page 6030, line 12. Please add the BGE and BCD numbers based on TCR here to better illustrate the "minor changes" when using size fractionated BR.

Done. We have also included BGE using fractionated samples in Table 2

Page 6031, line 19. The range from 0.03 to 544 is 4 orders of magnitude, not 2, right?

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Corrected

Page 6032, line 20-24. The percentage of DOC as amino acids should be added to the results, e.g. in Table 1 or 4. These data are important for the arguments being made, and should therefore be shown along with the other results, supported by variability and a test of differences among water masses.

This information is accessible in a separate manuscript: Shen Y. et al 2012: Dissolved organic matter composition and bioavailability reflect ecosystem productivity in the Western Arctic Ocean. BGD 9: 9571-9601

Page 6032, line 27. I suggest reiterating the most important sources of organic matter to bacteria in the system to make the discussion clear.

We have included this in the sentence (page 20, line 427 “such as organic carbon fixed upstream in the Mackenzie River”)

Page 6033, line 13-16. Where would this refractory material be exported? Horizontally to fuel pelagic communities off the shelf, or vertically and fuel shelf sediment communities or burial on the shelf? Probably both, but indicating the main pathway, if known, would be useful since it has bearings for carbon cycling in this environment.

While both sedimentation processes and horizontal export are likely to occur, horizontal export of DOC off the shelf is probably to be the main pathway, fueling the central Arctic. Riverine organic carbon sedimentation may represent a lower fraction of OC removal (e.g. Rontani et al. 2012 BGD), and dense water formation export to deep Arctic water is also of less importance (Opsahl and Benner 1999, Limnol.Oceanogr. 44:2017-2023). We have included this in the paragraph (page20 line 444)” from the shelf to the central Arctic basin (Davis and Benner 2005)”

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