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Interactive comment on “Dissolved organic matter composition and bioavailability reflect ecosystem productivity in the Western Arctic Ocean” by Y. Shen et al.

Anonymous Referee #4

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The manuscript represented a contribution to progress in our understanding of DOM in the western Arctic Ocean, specifically contrasting the Beaufort and Chukchi Seas and building on prior work. These are new data but not new methods or concepts. A novel conclusion was reached regarding some inherent “depression” of the microbial loop in the region. The data were of good quality and generally the presentation was good to excellent. 1. Does the paper address relevant scientific questions within the scope of BG? Yes. The question of bioavailable DOM enriched in the Chukchi Sea relative to the Beaufort Sea, despite similar DOC concentrations is important to answer to understand fully the Arctic carbon cycle. The results have implications for our predictability of Arctic food web function which, in the Western Arctic, is sensitive to

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the more productive Chukchi Sea. 2. Does the paper present novel concepts, ideas, tools, or data? Data are novel because AA have not been studied in great detail in this region, whereas DOC concentrations have. The comparison between the Beaufort and Chukchi Seas is novel as is a more in depth analysis of temporal variability in the Chukchi. It was interesting to learn the DI is not applicable in some oceanographic settings. 3. Are substantial conclusions reached? Fig 3c showed ca. 1000 nM difference in DOC between the Chukchi and Beaufort Seas in the surface waters (<200 m) of their respective basins. Fig 4c showed ca. 300 nM difference, but much more variable. Statistically, the DOC was not different, but it is interesting to consider this as evidence of the turnover of bioavailable DOC that partly explains why the DOC concentrations are so similar. TDAA is a very labile pool of DOC, so it is sensible to make the observation with a caveat of the statistical result. However, the authors conclude that the microbial loop possibly is depressed. I think this should be explained better or another explanation offered. For example, the possibility of AA adsorption to particles, especially in Mackenzie River Plume. I think the term bioavailable is misleading as used in this manuscript. Rather I suggest only referring to the DOM as labile. Bioavailable could be used when discussing degradation or utilization (as was referenced in the manuscript). A sentence such as “the accumulation of labile DOM indicated that this material was not bioavailable and suggests that the microbial loop is depressed,” is more appropriate. The inference of a lack of bioavailability from the accumulation of labile material is appropriate, but should be written that way. 4. Are the scientific methods and assumptions valid and clearly outlined? Yes. 5. Are the results sufficient to support the interpretations and conclusions? Yes, but see comments about conclusions. Bioavailability implies that labile DOM is being utilized. So the interesting observation suggesting that the microbial loop is “depressed” (though see comments above) stands: the labile DOM is not bioavailable. If it were, it would be utilized, but it is not. Why is this? Despite lacking tandem AA utilization rates, I think the authors make a very strong case for investigating this problem in more detail. 6. Is the description of experiments and calculations sufficiently complete and precise to allow their repro-

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duction by fellow scientists (traceability of results)? Yes. 7. Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes. 8. Does the title clearly reflect the contents of the paper? I would remove “bioavailability” from the title. 9. Does the abstract provide a concise and complete summary? Yes. 10. Is the overall presentation well structured and clear? Yes. 12. Is the language fluent and precise? Yes. 13. Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes. 14. Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? No. 15. Are the number and quality of references appropriate? Yes. Is the amount and quality of supplementary material appropriate? n/a

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