

## ***Interactive comment on “Towards an assessment of riverine dissolved organic carbon in surface waters of the Western Arctic Ocean based on remote sensing and biogeochemical modeling” by Vincent Le Fouest et al.***

**Anonymous Referee #2**

Received and published: 29 August 2017

Towards an assessment of riverine dissolved organic matter in surface waters of the Western Arctic Ocean base on remote sensing and biogeochemical modeling

Overall: This study presents an interesting comparison of satellite-derived riverine DOC (RDOC) with biogeochemical model outputs. They find that estimates of RDOC in surface waters of the Canadian Beaufort Sea computed for 2003-2011 by both optical remote sensing and a physical biogeochemical mode compare favourably. Both display similar seasonal and spatial patterns in RDOC, with greater quantities of RDOC in June and a reduction in concentrations during summer to autumn months. How-

C1

ever, some large differences in the absolute concentrations were discovered (e.g up to 44%). These results demonstrate the utility of validating model estimates using satellite-derived optical measurements of terrestrial OM flux during the summer. Overall, I found that the manuscript was a useful addition especially as it highlighted many of the potential current limitations with model and satellite approaches (e.g. adequately parameterising seasonal changes in lability, model estimates potentially not representing transformation and losses - esp. over summer months). I see the manuscript strengths as showing the direction of travel for this type of research, so as such I would like to see the later section about future directions to be strengthened, and more definitive suggestions provided. Further, it was not always clear to me what was new, or re-analysis of previously published research. This should be made more clear.

Specifics:- Introduction Line 27 - no need for thus. Line 31 - no need for riverine as implicit in RDOC. Line 32 - with \*the\* potential for fueling Line 35 - Awkward ending. Maybe consider something like: “Future studies could apply ... the entire AO to quantify.. Line 39 - did you mean from the \*six\* great Arctic rivers in this paper? Line 40-41 - other factors contribute to the this intensification e.g. snow cover reduction, terrestrial productivity changes. Needs more detail here or suggest that increasing precipitation is one example. Line 41- grammar needs correcting Line 43 - contains half the soil \*organic C stock Line 45 - maybe worth mentioning that it is currently unclear though if aquatic OC concentrations will increase, and that some studies suggest that OC concentrations may reduce (see Abbott et al 2016 and Striegl et al. 2005 for example) . Line 46 - not particularly suitable reference for the later part of the sentence re. changing OC concentration and composition. Suggest you use another and move the excellent Romanovsky one earlier in sentence. Line 49 - these rivers flow all year round, so OM supply does not only occur after the ice breakup period. Line 50 - seasonal in twice. Line 57 - unusual to have a pers comm here as well as the Manizza paper. Recommend removing as adds little evidence. Line 61 - can this be written more clearly. Its an important point, so how is RDOC reducing C uptake by 10%? Or is it offsetting this? Line 70 - so this is the same biogeochemical model

C2

results from Le Fouest 2015? Please make this explicit here. What about the remote sensing component, is that new or also from previous work?

Materials and methods 90 - more details on the satellite products used and their source would be useful here. 93 - unclear grammar here so not sure how you are coming up with this uncertainty value. 97 - so are you including new model runs here or are they the same as subsequently published? 112 - please state how Raymond calculated this estimate. 119 - does Wickland really show this? I think she shows that between 12-18% of RDOC is available but that the average % is 15% in the Yukon river only. Please provide detail on assumptions. 136 - please reword this sentence for clarity.

Results & Discussion 146 - you define an acronym for simulated RDOC (RDOCsim) in the methods but then don't use it in this section. 148 - quite speculative this. Are you suggesting that this may account for the differences and can you justify this with any estimates? Most would not consider ice-derived plankton terrestrially derived also, so please re-phrase. 150 & 154 - should this read  $2 \times 10^?$  Please update. 156 - ok so here you say this is not likely to be the cause. 157 (e.g. ??) 162 - less than 20 m of depth/ distance? 168 - Further offshore? 183 - I'm not clear on how this works? RMSE shows that the model was more 'accurate' after the spring flush. Yet, the MEF index shows that model and observations were closest during and just after the flush? Can you explain the discrepancy here, or am I misunderstanding? 184 - why does a positive MEF indicate this? 195 - please re-word to make this sentence clearer.

General Text could benefit from editing for English grammar. References are not in alphabetical order in places e.g. Raymond ref higher up etc. Is it appropriate to use RDOC as a term for the flux of C in the shelf region when it may be derived of a significant proportion of non riverine-derived OC?

Refs: Abbott, B. W., Jones, J. B., Schuur, E. A. G., Chapin, F. S., III, Bowden, W. B., Bret-Harte, M. S., et al. (2016). Biomass offsets little or none of permafrost carbon release from soils, streams, and wildfire: an expert assessment. *Environmental*

C3

Research Letters, 11(3), 034014–14. <http://doi.org/10.1088/1748-9326/11/3/034014>

Striegl, R. G., Aiken, G. R., Dornblaser, M. M., Raymond, P. A., & Wickland, K. P. (2005). A decrease in discharge-normalized DOC export by the Yukon River during summer through autumn. *Geophysical Research Letters*, 32(21), L21413. <http://doi.org/10.1029/2005GL024413>

---

Interactive comment on Biogeosciences Discuss., <https://doi.org/10.5194/bg-2017-286>, 2017.

C4