

## ***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 #1**

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This manuscript is a comparison between satellite remote sensed estimates of DOC entrained with the Mackenzie River plume and biogeochemical model outputs. The authors find good agreement between the two estimates and suggest that additional insights could come from extending the work to the Arctic Ocean scale and in the context of climate warming that could be expected to affect DOC outflow from Arctic rivers.

The paper is authored by several of the prominent contributors to understanding dissolved organic carbon cycling in the Arctic, and is succinct, but I found the reasoning

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circular as to the outcome of the study. Satellite remote sensing obviously can convey information on the directional flow of river plumes carrying DOC, but depth penetration from satellite platforms is modest, so without field sampling, comparison of one set of estimates with another produced by biogeochemical modeling seems like a limited and incomplete outcome. Moreover, many of the important areas of concern in the context of climate change revolve around the dynamics of DOC degradation. This process has higher rates in the spring freshet that later in the summer, and the different pools of marine and riverine DOC have different degrees of bioavailability. I didn't see this addressed significantly, including the extent to which DOC is removed in the river delta or near-shore zone, and after it is accounted for in flux estimates, but before it reaches the open ocean where estimates can be made from satellite platforms. It is also significant that much of the spring freshet flows over and under coastal sea ice from the Mackenzie River, but there is little inference about how that is accounted for. Comparisons are made to primary production, and it is stated that DOC from rivers represents 10-19% of the carbon fixed by primary production in the Arctic Ocean as a whole and up to 34% of primary production in the coastal Beaufort Sea, but the labile nature of organic carbon that is formed by marine production is quite different from most of the organic carbon in RDOC. It should be mentioned that the authors acknowledge some of these limitations in a general sense, including seasonal challenges to gathering satellite data, and the complex nature of RDOC in the Perspectives section, although those limitations are not reflected in the abstract of the study, which reads more optimistically.

The manuscript could be improved by light editing by a Native English language writer. Data supporting the study are available on-line, but no metadata or “read-me file” explaining use of the on-line files is provided. Ultimately, this manuscript is most appropriately seen as a limited follow-on to the Le Fouest et al. 2015 biogeochemical modeling paper, with the addition of a comparative approach to assessing satellite remote sensing data. I see no reason the manuscript couldn't be improved and accepted for publication, but I am skeptical of its potential for providing a more transformative understanding of dissolved organic carbon cycling in the Arctic.

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