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Interactive comment on "Photomineralization and photomethanification of dissolved organic matter in Saguenay River surface water" *by* Y. Zhang and H. Xie

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Dear Y. Zhang and H. Xie.

Thank you for your interesting study, which we read with great interest!

We would like to comment concerning a statement in the introduction, which we find ambiguous. On page 14305 lines 21 to 23 you state that 'photomineralization alone or combined with photochemically enhanced biomineralization has been demonstrated to be a major sink of DOC in rivers and lakes (Bertilsson and Tranvik, 2000; Obernosterer and Benner, 2004).

[Bertilsson and Tranvik, 2000] state that 'photochemical degradation could be a major sink for DOM in the surface layer of lakes', but this statement explicitly refers to just the surface lake layer. [Obernosterer and Benner, 2004] determined the photo- and bioreactive components of dissolved organic matter from three different environments.

Above statement in the introduction of your current discussion paper may be understood as if photomineralization (direct or via stimulation of biomineralization) would, in general, be a major sink of DOC in inland waters, i.e. when integrated over water depth and on large spatial and temporal scales. Instead, several studies show that photomineralization is a relatively minor DOC loss pathway. For example, photomineralization contributed less than 3% to water column DOC mineralization in May and July in a subtropical lagoon [Ziegler and Benner, 2000], around 12% of the total epilimnetic DOC mineralization during July in Swedish lakes [Granéli et al., 1996], or 3% of mean annual CO2 emissions from a Swedish humic lake [Groeneveld et al., 2015]. Similarly, in a large-scale modeling study based on data from 1086 Swedish lakes we found that photomineralization corresponded to about 12% of the total annual mean CO2 emission from Swedish lakes, or to about 9% of the total DOC loss during transport through Swedish inland waters to the sea. Also, the first global upscaling suggested that direct photomineralization contributes just a small fraction of up to about one tenth to the annual global CO2 emissions from lakes and reservoirs [Koehler et al., 2014]. While photomineralization was reported to make a larger contribution to carbon cycling at certain times or places [Vähatalo and Wetzel, 2004; Cory et al., 2014] we think that introducing photomineralization as major DOC sink in rivers and lakes in general may be misleading.

We therefore suggest the respective statement to be modified during revision of your article.

Yours sincerely,

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BGD

12, C5922–C5924, 2015

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