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Interactive comment on "Partial coupling and differential regulation of biologically and photo-chemically labile dissolved organic carbon across boreal aquatic networks" *by* J.-F. Lapierre and P. A. del Giorgio

Anonymous Referee #1

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I appreciate the author's responses to my comments, but I still can't follow (or reproduce) how the authors responded to my main point and how they have normalized their photochemically degradable DOC (Pd-DOC) to account for differences in light absorption by CDOM. The authors state that they have normalized Pd-DOC by taking into account 2 factors: (1) the absorption of light by the vials (same for all samples), and (2) the absorption of light by CDOM (varies widely in this study). There are several problems with their assertion. First, (1) and (2) are wavelength dependent (Fig. A1), but they don't tell us which wavelength(s) were used or how their results are wavelength

corrected (all light is lumped into "Watts per m2"). Second, if the light dose on the outside of the vials was constant at 130 W m-2 as stated by the authors, how is it possible that some of the samples received MORE light (up to 140 W m-2), given that both the vials and CDOM absorb the incoming light? Third, giving the authors the benefit of the doubt that (1) and (2) above are just a misunderstanding, I assumed they normalized their Pd-DOC values using a light screening factor. I assumed they calculated this light screening factor by multiplying the incoming light dose (assuming 1 mW m-2 at 300 nm), by e(-aλ) (where aλ is the absorption coefficient of CDOM at a given wavelength and z is some depth in the vial). I calculate that this light screening factor ranges from $\sim$ 0.3 at 300 nm to 1 at 600 nm (and depending on the CDOM in the sample). Instead of correcting for the maximum light screening factor (0.3), as is the minimum approach used by some in the literature to correct for differences in light absorption by CDOM, I suspect that the authors used the average light screening factor across all wavelengths (300-600 nm or so. . .), which is a factor of about 0.7-0.8 for a high CDOM sample, consistent with their assertion that the "maximum" effect of differences in initial CDOM is $\sim$ 20%. However, this average light-screening factor is large underestimate of the effect of differences in CDOM concentration because as has been shown in the literature, most of the mineralization of CDOM is driven by absorption of light in the UVB or low UVA range (i.e. 300-320 nm), where the correction factor is much larger than 20% (more like 70%). In summary, the results of this study are biased and can't be assessed or compared with the photochemistry literature because the authors still have not correctly considered the effect of CDOM absorbance on the amount of DOC available to be broken down by sunlight.

Interactive comment on Biogeosciences Discuss., 11, 6673, 2014.