Biogeosciences Discuss.,
doi:10.5194/bg-2016-296-RC2, 2016
© Author(s) 2016. CC-BY 3.0 License.

Biogeosciences Discussions
Open Access
EGU

Interactive comment on "Temporal changes in photoreactivity of dissolved organic carbon and implications for aquatic carbon fluxes from peatlands" *by* Amy E. Pickard et al.

Anonymous Referee #2

Received and published: 3 October 2016

This study investigates the seasonal and spatial variability in the photoreactivity of DOM from Scottish peatlands. Novel observations are presented on the chemical composition of peatland DOM, the influence of precipitation events on DOM mobilization and the significance of water residence time on DOM photodegradation and export. Peatland systems export high concentrations of photoreactive DOM, and this study demonstrates solar radiation can play an important role in carbon gas fluxes from these systems.

It is important to use lamps that provide a good simulation of sunlight (spectrum and intensity) when investigating photochemical alterations of natural organic matter in the environment. The UV-B 313 lamp used in this study emits short wavelength UV (below

Printer-friendly version

Discussion paper

CC BY

the 295 nm solar cutoff) that is particularly destructive of organic molecules. Therefore, while providing useful information about the relative photoreactivity of DOM among different seasons and locations, the results from this study should not be used to estimate rates of photodegradation in natural waters. In addition, comparisons of the results from this study with those of other studies should be of a qualitative, rather than quantitative, perspective.

A couple of additional optical parameters can provide insights about the source, composition and alteration of DOM. The following parameters should be included: spectral slope (S) 275-295 nm, and the absorption coefficient at 350 nm (a350). The S275-295 is an indicator of DOM molecular weight and extent of photochemical alteration, and the a350 has been used as in indicator of lignin phenol concentrations (Helms et al., 2008; Fichot and Benner 2012).

Specific comments:

Line 48: include Miller and Zepp 1995

Lines 140-141: Filtration (0.22 um) does not exclude microbial activity, it reduces microbial activity (filtered samples contain some active bacteria)

Line 151 – report the wavelength range of light measured by the PMA2102 broad-band sensor

Lines 160-161 – estimation of the exposure time of DOM to solar irradiation needs to consider mixing processes and extinction coefficients for the solar spectrum

Lines 180-182: provide information about the GC column and chromatographic conditions

Line 186: concentrations of DIC were not measured

Line 189: give the pathlength, not volume, of the quartz (?) cuvette

Line 216: provide information about the column and chromatographic conditions

CC BY

Additional insights about lignin photodegradation can be found in Benner and Kaiser 2011 Biogeochem.. and Lu et al. 2016 Frontiers Mar. Sci.

The clarity of Figures 1, 3, 5, 6 and 7 would be improved by the use of different colors for different parameters

Figure 3: present the change in absorbance as a percentage of the controls and only show the wavelengths starting at 250 nm

Molar units are preferred for all chemical measurements

Interactive comment on Biogeosciences Discuss., doi:10.5194/bg-2016-296, 2016.

Printer-friendly version

Discussion paper

CC BY