Geophysical Research Abstracts
Vol. 18, EGU2016-7773, 2016
EGU General Assembly 2016

Carbon dynamics in peatland pool systems: the role of light

Amy Pickard (1,2), Kate Heal (1), Andy McLeod (1), and Kerry Dinsmore (2)

(1) School of GeoSciences, The University of Edinburgh, Edinburgh, United Kingdom, (2) Centre for Ecology and Hydrology, Edinburgh, United Kingdom

Open-water pools are widespread in peatlands and are considered to represent biogeochemical hotspots within the peatland landscape. However the contribution of pool systems to wider peatland C cycling has not been quantified fully and there is a lack of knowledge of the role of photochemical processes in such environments. In this study, light exposure experiments were conducted in two contrasting pools to test the reactivity of aquatic C. The first study site was located at Cross Lochs (CL), Forsinard, in the Flow Country of Northern Scotland, in a 412 m^2 pool characterised by low dissolved organic carbon (DOC) concentrations ($\sim$15 mg C L^{-1}). The second site was located at Red Moss of Balerno (RM), a raised bog in central Scotland, in a 48 m^2 pool with high DOC concentrations ($\sim$35 mg C L^{-1}). Experiments took place over 9 days *in situ* at each pool in mid-summer 2015, with 500 mL water samples contained in bags transparent to sunlight and in opaque control bags. After field exposure, optical, chemical and stable C isotope analyses were conducted on the samples. Significant differences in biogeochemical cycling of DOC were detected between the two systems, with DOC losses as a percentage of the total C pool 15% higher at RM than at CL after light exposure. The mean DOC concentration of light exposed samples at RM declined steeply initially, with 83% observed DOC degradation occurring by day 3 of the experiment. Total losses of 7.9 mg DOC L^{-1}were observed in light exposed samples at RM, along with decreasing E4:E6 ratios, suggesting that material remaining at the end of the experiment was humified. Depletion of DOC was positively correlated with production of CO_2 at both sites, with concentrations of up to 4.3 mg CO_2-C L^{-1} recorded at RM. Stable C isotope signatures at both sites were altered under light treatment, as demonstrated by the production of enriched δ^{13}C-DOC (+0.46 ‰ relative to opaque bags) and depleted δ^{13}C-DIC (-0.97 ‰ relative to opaque bags) at RM. However, at CL, the δ^{13}C-DOC signature in both the light exposed and opaque bags was depleted (-0.2‰ and -0.4 ‰ respectively), suggesting that microbial processing was the preferential DOC processing pathway in this system. These results show that C in peatland pools is highly reactive and further demonstrate the importance of photochemical processing of C, which should be considered as a significant driver of biogeochemical cycling.