Geophysical Research Abstracts
Vol. 16, EGU2014-7864, 2014
EGU General Assembly 2014

Old carbon efflux from tropical peat swamp drainage waters

Leena Vihermaa (1), Susan Waldron (1), Stephanie Evers (2), Mark Garnett (3), and Jason Newton (4)

(1) University of Glasgow, School of Geographical and Earth Sciences, Glasgow, United Kingdom (leena.vihermaa@glasgow.ac.uk), (2) University of Nottingham Malaysia Campus,School of Biosciences, Semenyih, Malaysia, (3) NERC Radiocarbon Facility, East Kilbride, UK, (4) Scottish Universities Environmental Research Centre (SUERC), East Kilbride, UK

Tropical peatlands constitute $\sim$12% of the global peatland carbon pool, and of this 10% is in Malaysia[1]. Due to rising demand for food and biofuels, large areas of peat swamp forest ecosystems have been converted to plantation in Southeast Asia and are being subjected to degradation, drainage and fire, changing their carbon fluxes $^{eg.2,3}$. Dissolved organic carbon (DOC) lost from disturbed tropical peat can be derived from deep within the peat column and be aged from centuries to millennia[4] contributing to aquatic release and cycling of old carbon.

Here we present the results of a field campaign to the Raja Musa Peat Swamp Forest Reserve in N. Selangor Malaysia, which has been selectively logged for 80 years before being granted timber reserve status. We measured CO_2 and CH_4efflux rates from drainage systems with different treatment history, and radiocarbon dated the evasion CO_2 and associated [DOC]. We also collected water chemistry and stable isotope data from the sites.

During our sampling in the dry season CO_2 efflux rates ranged from 0.8 - 13.6 μmol m^{-2} s^{-1}. Sediments in the channel bottom contained CH_4 that appeared to be primarily lost by ebullition, leading to sporadic CH_4 efflux. However, dissolved CH_4 was also observed in water samples collected from these systems. The CO_2 efflux was aged up to 582$\pm$37 years BP (0 BP = AD 1950) with the associated DOC aged 495$\pm$35 years BP. Both DOC and evasion CO_2 were most ^{14}C-enriched (i.e. younger) at the least disturbed site, and implied a substantial component of recently fixed carbon. In contrast, CO_2 and DOC from the other sites had older ^{14}C ages, indicating disturbance as the trigger for the loss of old carbon.

[1]Page et al., 2010

[2]Hooijer et al., 2010

[3]Kimberly et al., 2012

[4]Moore et al., 2013