Geophysical Research Abstracts
Vol. 13, EGU2011-7832, 2011
EGU General Assembly 2011

Effects of short-term ecosystem experimental warming on water extractable organic matter in an ombrotrophic Sphagnum peatland (Le Forbonnet, France)

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In a context of global warming, peatlands may switch from a carbon sink to a carbon source function. The aim of the present work is to investigate the effect of one year of an in situ experimental air warming induced by open-top chambers (OTCs) on labile and recalcitrant organic matter (OM) properties in the upper peat level (0-10 cm). The dynamics of water-extractable OM (WEOM) was studied through analyses of water-extractable organic carbon (WEOC), C stable isotope composition (δ13C), specific UV absorbance at 280 nm and sugars composition of peat cores taken from an open bog (DRY site) and a poor fen (WET site) in the "Le Forbonnet" peatland.
In the DRY site, the impact of the OTCs is weak on the soil temperature and the dynamics of the WEOM released under peat decay, whereas in the WET site, the treatment leads to a decrease in the water content suggesting that the supply of heat by air warming is mainly used for evapotranspiration. OTC treatment of the WET site also induces a smaller release of labile OM (indicated by WEOC contents) at the surface (0 to 7.5 cm depth) in comparison to the deeper peat (7.5 to 10 cm depth) where the treatment induces a greater release of WEOC. Furthermore, OTC treatment increases the seasonal sensitivity of peat to humidity changes and may therefore be responsible for a greater amount of OM leached with depth and enhanced OM decomposition.
Overall, the respective responses of the DRY and WET sites to experimental warming (i) emphasize that the WEOM is an efficient target for studying the OM dynamics in a warming context, and (ii) suggest that the spatial variability of moisture constraints may be a critical factor in understanding the impact of global warming on the peatland carbon cycle.