Geophysical Research Abstracts
Vol. 20, EGU2018-8076, 2018
EGU General Assembly 2018

Interactive effects of water table draw down and warming on vegetation and carbon dynamics in boreal peatlands

Eeva-Stiina Tuittila (1), Raija Laiho (2), Päivi Mäkiranta (2), Lauri Mehtätalo (3), Petra Straková (4), Kari Minkkinen (4), Timo Penttilä (2), and Hannu Fritze (2)

(1) University of Eastern Finland, School of Forest Sciences, Joensuu, Finland (eeva-stiina.tuittila@uef.fi), (2) Natural Resources Institute Finland (Luke), Helsinki, Finland, (3) University of Eastern Finland, School of Computing, Joensuu, Finland, (4) University of Helsinki, Department of Forest Sciences, Helsinki, Finland

Climate change affects peatlands directly through increased air temperatures and indirectly through changes in water-table level (WL). The interactions of these two still remain poorly known. We determined the separate and interactive effects of temperature and WL regime on vegetation and factors of relevance for the carbon cycle: plant community composition, phenology, biomass production, shoot:root allocation, ecosystem respiration and photosynthesis in southern and northern boreal fens in Finland.

Total biomass production varied from 250 to 520 g m-2, with belowground production comprising 25–63%. Warming had minor effects on phenology and maximum photosynthesis and negligible effects on community composition, biomass production and allocation.

Water-level drawdown (WLD) clearly affected the contribution of different plant functional types (PFTs) in the community and the biomass they produced: shrubs benefited while forbs and mosses suffered. These responses were not depending on the warming treatment.

The observed change was also reflected in plant phenology, with different PFTs showing different responses. Following WLD, aboveground biomass production decreased mainly due to reduced growth of mosses. Aboveground vascular plant biomass production remained unchanged but the contribution of different PFTs changed. Belowground production increased following WLD in the northern fen only, but an increase in the contributions of shrubs and forbs was observed in both sites, while sedge contribution decreased. Maximum photosynthesis and ecosystem respiration increased with WLD and with decreasing WL.

Moderate warming alone seems not able to drive significant changes in plant productivity or community composition. However, if warming is accompanied by WL drawdown, changes should be expected in the relative contribution of PFTs, which will reflect in the altered carbon dioxide dynamics. Warming with WL drawdown could lead to profound changes in the function of peatland ecosystems. Consequently, hydrological scenarios are of utmost importance when estimating future function of peatland ecosystems.