Geophysical Research Abstracts
Vol. 19, EGU2017-7500-3, 2017
EGU General Assembly 2017

Response of microbial communities to experimental warming and precipitation decrease in Rzecin peatland (Poland)

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In the last decade researchers are intensively testing the consequences of different climate change scenarios. Due to high biodiversity, huge amount of stored carbon and their sensitivity to environmental changes, peatlands became important for the temperature increase and drought experiments. Analyses showed that mosses, vascular plants and microbial communities were affected by warming or drought, but still not all effects are clear. Studying the response of microbial groups and indicators (e.g. mixotrophic species of testate amoeba) to warming in combination with decrease of precipitation will allow to better understand the future environmental changes. To recognize the inflow of organic matter and the carbon fixing processes in disturbed environment, we need to analyse the structure and biomass of main groups living in peatlands and the response of those groups to disturbances. The Polish - Norway “WETMAN” project was designed to recognize biotic and abiotic components of ecosystem response to active warming and decrease of precipitation. In this study we present the response of microbial communities and chosen testate amoeba species (TA) to different treatments: warming, warming and decreased precipitation and only decreased precipitation, in relation to control plots. The microbial biomass of upper and lower Sphagnum segments were analysed separately. Particular microbial groups were positively correlated with manipulations e. g. microalgae and rotifers, and other were negatively affected by combination of drought and warming e.g. cyanobacteria and testate amoeba. The structure of community was modified by manipulations, and differed in the case of upper and lower segment of Sphagnum. RDA analyses showed that different factors were crucial for the biomass of microbial groups in upper (conductivity, temperature and phosphorus) and lower (nitrates and sodium) segment. Considering higher taxonomic resolution we found that at the beginning of the experiment TA community was characterised by higher abundance of mixotrophic species (Hyalosphenia papilio, Archerella flavum, Heleopera sphagni) in all plots, after half year of warming and decreased precipitation we found significant decrease of mixotrophic species biomass. Redundancy analysis showed that TA species distribution (in first year of manipulation) was significantly affected by the treatment type and upper and lower Sphagnum segment. The combination of warming and decreased precipitation led to significant testate amoeba biomass decrease (especially of mixotrophic dominant Hyalosphenia papilio). For less abundant species like Nebela tincta we found an increase of biomass in all treatments, compared to control plots.
Changes in microbial communities structure, caused by the combination of drought and warming can influence peatland functioning. For instance, reduction of microbial primary production and intensified consumption may modify physicochemical water parameters as well as carbon dynamics.

Project financed by the Polish-Norwegian Research Programme operated by the National Centre for Research and Development under the Norwegian Financial Mechanism (No. Pol-Nor/203258/31/2013, WETMAN). Anna M. Basinska acknowledges support from Franche-Comté regional council and Université Bourgogne Franche-Comté.