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Assessment of carbon sinks in eutrophic and oligotrophic peatlands at south of Western Siberia

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The carbon (C) budget of an ecosystem determines by the difference between the total net primary production (NPP) and total ecosystem respiration. The feature of peatlands is open cycle of elements, when sinks prevailing sources. Peatlands have been persistent long-term sinks of C since last deglaciation. The purposes of this study were to estimate C budget, weather and hydrothermal conditions at typical peatland ecosystems in Western Siberia. The measurements were made at three oligotrophic and two eutrophic peatlands from 1999 to 2007.

NPP indicates the C accumulation in a form of vegetal matter and is the difference between photosynthetic uptake and autotrophic respiration of plants. Results have shown that studied oligotrophic bog ecosystems have similar values of productivity for tall ryam, low ryam and open bog (558, 587 and 571 $gC/m^2/yr$) despite substantial difference in vegetation composition. NPP at eutrophic peatland is 1.7 times higher than at oligotrophic bog. The main contribution to NPP at oligotrophic bogs gives roots of herbs, sedges and shrubs (47-57%) and Sphagnum mosses (23-37%). NPP composition at eutrophic peatland is essentially different. The main part to production gives shrubs (31%). Shares of mosses and roots are equal in value (26%).

Emission of CO_2 from peatland surface is very variable parameter with high interannual variability and dependence from weather and hydrothermal conditions. At oligotrophic bog the maximal emission observes in tall ryam ecosystem (176 $gC/m^2/yr$), low ryam and open bog have smaller emission (127 and 101 $gC/m^2/yr$). CO_2 fluxes at eutrophic peatland are comparable with fluxes at oligotrophic ecosystems.

Correlation analysis allowed us to reveal dependence of CO_2 emission from ambient CO_2 concentration. Analysis of the other ecological and climatic controls have shown presence of correlation links between CO_2 flux and water table level (r=-0.67), air humidity (r=-0.40), air temperature (r=0.59), peat moisture (r=-0.41), peat temperature at 10 cm depth (r=0.65).

Comparison of NPP and CO_2 emission from peatland surface has shown that C accumulation in vegetation prevail CO_2 emission from peat at all studied ecosystems. The positive C budget is typical for native peatland ecosystems at present climatic conditions. Future climate changes can influence both ecosystem respiration and productivity, and peatland ecosystems may switch from sinks to sources if warming stimulates bulk soil organic matter decomposition and CO_2 release to the atmosphere.