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Methane and carbon dioxide fluxes in a hydrologically changed wetland in Canada

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Northern peatlands store about 30 % of the global soil carbon and account for a significant contribution to methane emissions from natural sources. The carbon cycle in peatland ecosystems is very sensitive to hydrological changes so that it is important to quantify and analyze the direction and magnitude of carbon fluxes under such conditions. For example, increased water levels might decrease the carbon dioxide uptake and increase methane emissions.
The Luther Bog in Ontario, Canada, has been flooded to create a reservoir in 1952. This changed the hydrological regime of the adjacent areas and the question arises whether the changed ecosystem acts as a sink or source for carbon, and how it affects global warming. In 2014, an eddy covariance measurement station was operated there from May to October to quantify the exchange of water vapor, carbon dioxide and methane between the bog and the atmosphere. The station was located in an area that got wetter through the construction of the dam.
The magnitude and direction of the methane fluxes were independent from daily patterns. The constantly high water level excluded the effect of temperature changes on the methane production. A seasonal variation with increased emissions during the summer period was visible despite the slightly decreased water level. However, the difference was small.
The study site was found to be a clear methane source.
The carbon dioxide fluxes showed typical diurnal courses. Their magnitude was relatively constant during the measurement period apart from a slight decrease in fall.
The uptake of carbon clearly overweighed the carbon loss, meaning that the bog is sequestering carbon. However, considering the global warming potential of carbon dioxide and methane the effect on climate change is only slightly negative. This points out that even changed wetland ecosystems can keep their important function of sequestering carbon and thereby counteract global warming.
A comparison and combination of this eddy covariance flux measurements with chamber flux measurements on additional sites in the influenced and hydrologically changed area will deepen the understanding of the wetting effect.