THE ROLE OF FLOATING PEAT ISLANDS ON GREENHOUSE GAS PRODUCTION AND FLUXES IN FLOODED WETLANDS

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Recent studies have shown that artificial reservoirs created by flooding wetlands are sources of greenhouse gases, but there is little information on pre-flood conditions. This paper presents results from a whole ecosystem flooding experiment carried out at the Experimental Lakes Area in northwestern Ontario. The experimental site was a 16.6 ha, boreal forest wetland composed of a 2.39 ha central pond (Lake 979) surrounded by 14.4 ha of peatland. Comparison between pre-flooded and post-flooded data shown the wetland to change from a small carbon sink, with respect to the atmosphere, of -6.6 g of C m-2 yr-1, to a large carbon source of 130 g of C m-2 yr-1. The formation of floating peat islands due to flooding caused changes in the hydrological and thermal regimes within the floating peat, which affected mineralization rates. Peat islands contributed approximately 70 % of the total CH4 flux from the entire flooded wetland to the atmosphere. Peat incubation experiments and in situ measurements show the high CH4 fluxes recorded in the floating islands was due to a combination of increased temperatures and altered hydrological conditions, and decreased oxidation in the unsaturated zone after flooding. Carbon isotope data on methane samples collected on sippers and gas chambers were essential to evaluate the role of oxidation on CH4 fluxes. This study shows the formation of floating peat islands within artificial reservoirs play a significant role on CH4 fluxes to the atmosphere.