Geophysical Research Abstracts
Vol. 21, EGU2019-19087, 2019
EGU General Assembly 2019

Methane production in Central European fen peatlands is primarily linked to edaphic properties, not large scale climatic gradients

Marie Davey (1), Rudy van Diggelen (2), Camiel Aggenbach (2), Agata Klimkowska (2), Lukasz Kozub (3), Yvonne Liczner (2), Elke Seeber (4), Franziska Tanneberger (4), Pablo Rios Tubío (1), Erik Verbruggen (5), and Hanna Silvennoinen (1)

(1) Norwegian institute of Bioeconomy Research, Soil quality and climate change, Norway, (2) University of Antwerp, Department of Biology, Ecosystem Management Research Group, Belgium, (3) University of Warsaw, Department of Plant Ecology and Environmental Conservation, Poland, (4) University of Greifswald, Institute of Botany and Landscape Ecology, Department of Experimental Plant Ecology, Germany, (5) University of Antwerp, Department of Biology, Plants and Ecosystems Research Group, Belgium

Percolation mires were sampled at thirteen locations across Europe, spanning 4.5 degrees of latitude and representing a nearly 4 degree Celsius gradient in mean annual temperature. At each location, the concentration of dissolved methane was measured in drained, restored, and undrained peatlands at three depths (0-5, 15-20, 45-50 cm) during the height of the growing season. Linear models were used to explore the effects of management, depth, climate, and physicochemical edaphic properties on methane concentration. Methane concentration was consistently lower in drained peatlands, as compared to restored and undrained peatlands, likely due to a lack of the anoxic conditions that promote methanogenesis. In all management types, significantly less methane was measured in the shallowest soil layers, although this likely reflects the impacts of diffusion to the surrounding air, rather than a meaningful gradient in methane production. Due to negligible methane concentrations in the drained peatlands, the effects of climate and physicochemical edaphic properties were explored only in undrained and restored peatlands. Methane concentrations did not vary significantly across the European climatic gradient irrespective of management type. Variation in methane concentrations was best explained by iron and sulphate levels in the peat. Furthermore, methane production rates were determined for soil samples from each of the three depths in restored and undrained sites, where anoxic processes are dominant throughout the peat profile. Root-free soil samples were made anoxic and methane production rates were determined in high temporal resolution over five days. Methane production rates were highest in the shallowest soil layers, regardless of management type, but restored peatlands consistently had lower methane production rates than undrained peatlands.