Geophysical Research Abstracts
Vol. 19, EGU2017-12037, 2017
EGU General Assembly 2017

Paludified forests of Komi Republic (Northeastern Europe) do not act as hotspots of the CH4 emissions

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In the Komi Republic, which is situated in Northeastern Europe and is subject of Russian Federation, 306,000km2 or about 73 % of the total area are covered by forest. The predominant part of these forests lies within the boreal zone. Within the boreal forests the vegetation patterns are a result of the moisture characteristics and air temperature. Based on the moisture conditions forest communities can be grouped into wet, mesic and dry sites. In conditions of high soil moisture content forest peatlands can develop. In boreal forest landscapes it is not a rare phenomenon and can reach coverage of up to one third of the total area. In addition to the high water content of the soils forested peatlands are characterised by low soil temperatures, high organic matter accumulation and low organic matter decomposition. The thick moss-organic layer on the forest floor and waterlogged soils favours methanogenesis. Such process of accumulation of poorly decomposed organic matter mostly originating from Sphagnum which involves the formation of waterlogged conditions is defined as paludification. Highly favourable to forest paludification are sites characterised by fine-textured soils which highly hamper percolation. Paludified forests also occur at peatland margins as a result of peatland expansion. During the last years peatland margins were considered as potential biogeochemical hotspots within the peatlands and due to their high nutrient and dissolved organic matter content they may also be a major methane emitter. Paludification can also occur at forests sites after clear cutting, which is a very intensive logging type and usually leads to water table elevations.
In this study measurements were conducted at peatland margins and at a clear cut sites during three climatically different years. The summer of the year 2013 was considerably warmer and drier, and the summer of the year 2014 was considerably colder and wetter than the long term mean. The investigation period in 2015 was characterised by warm and dry spring and early summer, July was colder and very dry, and from August on the weather in the region was colder and wetter than the mean.
In this study we show, that regardless of the weather conditions and the water table levels related thereto, the peatland margins did not act as strong methane emitter but are mostly sources of methane and the clear cut sites emit very small amounts of methane or are even sinks for atmospheric methane.