Geophysical Research Abstracts
Vol. 21, EGU2019-18504, 2019
EGU General Assembly 2019

The impact of reverse drainage on greenhouse gas fluxes during a hot and dry summer in the Netherlands

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The aim of this study is to measure the effect of reverse drainage on greenhouse gas-fluxes. Greenhouse gas fluxes are measured using a Los Gatos gas-analyzer in combination with cylindrical automated flux chambers.

Drainage of peatlands in the Netherlands over the last millennium has led to substantial land subsidence but also the loss of the greenhouse gas, carbon dioxide into the atmosphere due to aerobic oxidation. Land subsidence is most severe in the peatland areas, the western half of the Netherlands. Land subsidence is of particular concern in this area due to the dense population. A mitigation option has been proposed to prevent land subsidence and elevated carbon dioxide emissions from continuing. An option, known as reversed drainage, has been suggested. Reverse drainage consists of subsurface drains capable of transporting water in (i.e. rewetting the drained peat meadows) and out, to maintain a consistent water level throughout the year. This differs to the standard drainage system in the Netherlands, which only allows water to be released transported away through ditches.

In this study measurements of CO_2 and CH4 were collected in May and June of 2018 at a peat meadow site in Driebruggen, the Netherlands. A reverse-drainage containing peat meadow is compared against a control site, a neighbouring peat meadow of the same soil type, where the reverse drainage system has not been installed. It is important to highlight that these measurements were taken during the extremely hot and dry summer of 2018.

Previous works on the subject showed reductions in CO_2 fluxes of 50-66 percent as a result of this system. In this study such differences in emissions have not been found. Only an average of 100mg/m2/h has been measured, which comes down to less than 10 percent. Taking this difference into account it is necessary to perform more research on gas-fluxes of peat meadows containing reverse drainage under varying conditions and over longer time periods. .

These initial results are a doorway to discuss the monitoring, installation, set-up and evaluation methods surrounding the extremely new reduce drainage concept. Whilst, this is a timely study because hot and dry summers are expected to occur more often with anthropogenic climate change, it is not recommended that these results be used to evaluate the efficacy of reverse drainage. These results are a relevant insight into the efficacy of reverse drainage during hot and dry summers.