EGU General Assembly 2022

EGU22-791, updated on 19 Aug 2022
https://doi.org/10.5194/egusphere-egu22-791
EGU General Assembly 2022

Mapping Peatlands in Denmark Using Electromagnetic Methods

Triven Koganti[1], Diana Vigah Adetsu[1], Frank Andreasen[2], Kristoffer Skovgaard Mohr[3], Amélie Beucher[1], and Mogens H. Greve[1]

[1]Department of Agroecology, Aarhus University, Blichers Allé 20, 8830 Tjele, Denmark
[2]Dansk Geoservice, Nakskovvej 16, 4000 Roskilde, Denmark
[3]Airborne Instruments, Dyssen 2, 8200 Aarhus, Denmark

Peatlands play a major role in the global carbon cycle as they constitute around 20% of the soil carbon (C) stock and act simultaneously as C sinks (for CO_2 absorption) and sources (of CH_4 emission). Additionally, they support biodiversity preservation and provide important ecosystem services like climate regulation. Draining the peat for agriculture purposes results in its consolidation, enhanced decomposition, and subsequent subsidence. This accompanied by global warming promotes the emission of greenhouse gases making peatlands a C source ecosystem. Globally, as pent-up demand, different initiatives are put forward to protect, properly manage, and restore peatlands mainly to reduce these emissions and slow down climate change. For example, from 2021 onwards, under the EU 2030 climate and energy framework, all the member states are supposed to report on the emissions and removals of greenhouse gases from wetland areas. Denmark has its own national goal of reducing CO_2 emissions by 70% by 2030. However, the extent and status of peatlands are still poorly determined. Comprehensive mapping is required to enforce measures to prevent their further degradation, estimate the C stock and forecast the future emissions from peatlands. The conventional mapping approach using peat probes is time-consuming, tedious, and provides only localized and discrete measurements. Though these measurements are somewhat reliable, it is still challenging because occasionally the probes are obstructed by stones or human artefacts. On contrary to the latter, sometimes they might also easily penetrate the soil underlying the actual peat. While remote sensing based on satellite and aerial imagery makes delineation of the spatial extent possible, electromagnetic methods that have a deeper penetration into the soil are required to provide knowledge on peat volume estimates and groundwater depth. As a part of the ReDoCO2 (viz. Reducing and Documenting CO2 emissions from Peatlands) project, we employ state-of-the-art geophysical sensors, precisely, working on electromagnetic induction, ground-penetrating radar, and gamma-ray radiometric principles to accurately characterize three peatland areas in Denmark. The sensors are being tested in both proximal and remote configurations and efforts are underway to develop a novel drone-based transient electromagnetic induction sensor. Later, we plan to fuse the multisource datasets using machine learning to improve the prediction accuracy and advanced modelling techniques to study the effects of different management scenarios on greenhouse gas emissions. We envision developing a framework for detailed three-dimensional mapping of peatlands and a tool to estimate the reduction in greenhouse gas emissions to support decision-makers in

choosing an appropriate management strategy. The project outcomes will have a significant economic, societal, and environmental impact strengthening Denmark's position as a green frontrunner.