Comparison of CO_2 fluxes and carbon balance measured at two agricultural grasslands with contrasting soil types in Finland

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Modern intensive agriculture is globally the second largest anthropogenic source of carbon emissions to the atmosphere, after industry and fossil fuel combustion, contributing more than 10% to GHG emissions. Conventional intensive management practices are the main cause for the high emissions in agriculture. Frequent ploughing, monocropping, intensive use of agrochemicals, and deforestation are the main contributors for the loss of soil organic matter and CO_2 emissions from land use. At the same time as the modern agriculture is being a significant emission source, one of the most potential tools to mitigate climate change is the sequestration of carbon from atmosphere into the agricultural soils.

It is well known that topsoil layer and especially humus rich mineral soils can store more carbon than atmosphere and vegetation together. Therefore, increasing the amount of SOM in the agroecosystems, by applying enhanced management practices such as no-tillage, high biodiversity and cover cropping, agricultural soils would not only help to mitigate climate change but also to restore soil quality and fertility. On the other hand, cultivation of peat soils is well known of causing net CO_2 emissions into the atmosphere. Methods to reduce these emissions are currently sought. To understand the carbon dynamics on different agricultural sites and to verify soil carbon and ecosystem models, continuous long-term monitoring of the GHG fluxes is essential at such managed ecosystems.

Here we will present eddy covariance flux data from newly established agricultural sites. Continuous CO_2 flux measurements have been conducted at Qvidja farm on a mineral (clay) soil grassland in Parainen, southern Finland (60.29550°N, 22°39281°E) since spring 2018. Another agricultural flux measurement site was established at a peat soil grassland, in Ruukki, located in Siikajoki, western Finland (64.68399°N, 25.10632°E) in spring 2019. In this presentation CO_2 fluxes and seasonal carbon balance of these sites are compared, and the effect of soil type and management measures on the CO_2 uptake are considered. Based on these initial results, the national potential to reduce the annual GHG emissions by enhancing carbon sequestration of grasslands is discussed.