of methane and carbon dioxide. However, data on the emissions of trees and ditches is still scarce for the temperate region. Here, we present data on the exchange of methane and carbon dioxide from the soil, tree stems and ditches in six temperate fens from the first measurement year of a three-year measuring period. The study sites comprise three different kinds of fens including percolation fens, coastal fens and forested fens of which there is a drained and rewetted one for each type. In all study sites, we use non-steady-state manual chambers to measure gas exchange at the soil surface. We additionally asses the gas exchange at the stem surface of black alder (stand age: ~40 years) in one drained and one rewetted alder plantation. Additionally, we study the heterogeneity of stem exchange among different trees and different heights in regular campaigns. To quantify gas emissions from ditches we use floating chambers and bubble traps in two non-forested sites. In this way, we aim to evaluate the relative share of stem and ditch emissions compared to those of soil and herbaceous vegetation. At the same time, we show the wide range of greenhouse gas exchange values that can occur in temperate fens across fen types and hydrologic conditions.

O-4.3

Climate change modifies carbon sequestration in copper-polluted forest soils

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Soil carbon (C) storage is a key ecosystem function which can provide globally important services such as climate regulation. The effect of climate change on the restoration of soil C storage potential on post-mining land, where the development of both soil and vegetation starts *de novo*, is still insufficiently understood.

In this work we discuss how the recent changes of climate, effectuating temperature increase and overall habitat xerophytization have, during about 40 years, markedy modified the course of spontaneous succession and concomitantly the soil C sequestration potental in a model floodplain severely altered by long-term deposition of sulphidic waste from a copper (Cu) mine. Excessive Cu strongly reduces turnover of soil organic matter and adversely affects the revegetation process. Natural floods in this complex geomorphic setup on the other hand bring both pollutants and deficient nutrients to the affected floodplain. As the recent climate changes reduce the intensity of natural floods, two very different but highly specialized forest types are developing along the microelevation gradient (transects perpendicular to water channel) with up to 3-fold different topsoil C sequestration.

This work shows how climate change can increase the vunerability of spontaneous restoration process primarily by reducing nutrient fluxes.

O-4.4

Enrichment Plantation Does Not Increase Carbon Sequestration in The Exclosures in The Highlands of Ethiopia

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In order to foster the potential of exclosures to sequester carbon, they are increasingly assisted through enrichment planting in Tigray, north Ethiopia. To study the impact of the enrichment planting on carbon sequestration, five exclosures with enrichment planting and five pure naturally regenerated exclosures were selected. Along parallel transects, all woody vegetations were counted and measured for their diameter and total height on 20m X 20m plots. Soil samples were collected at depth of 0-0.2m on five subplots, one at the center and four at each corner of the plots. To test significant differences of carbon stored, general linear model, multivariate analysis was run in SPSS20. Significant differences in organic soil carbon, above ground and total carbon between naturally regenerated and enriched exclosures ($p=0.00001$) were found. Lower altitudes had significantly higher soil organic carbon ($P<0.05$) than the higher altitudes. However, insignificant effect was found from slope on carbon distribution. Enriched exclosures performed more poorly in carbon sequestration, against the expectation. This was possibly due to the disturbances caused by mass plantation and poor post plantation follow up, as an improved performance ($P < 0.05$) in one enriched exclosure against its natural regenerated counterpart was confirmed to receive better management practices. This suggests that differences in management practice affect the success rate of enrichment plantation. In dryland areas where growing conditions are limiting and post planting management is poor, success and efficiency of enrichment planting is low. Costs incurred for enrichment planting schemes are then not well justified both in terms of growth success and accumulation of carbon in exclosures.

O-4.5

GPP estimation using UAVs and field methods

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