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Effects of geometrid moth attacks on belowground processes in sub-arctic birch forests

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Large amounts of carbon are stored in the soil of subarctic regions as decomposition is slow due to low temperature and relative recalcitrant litter. Disturbances such as wind throw has been shown to drastically affect Soil CO_2 effluxes in boreal and temperate forests but little is known about how the subarctic forests are affected. In sub artic forests a major disturbance events are moth outbreaks – defoliating and often killing stands of mountain birch (Betula pubescens). In this study we measured and modelled the effect on soil carbon fluxes by different level of disturbance caused by birch moth across northern Scandinavia. Several years after tree death due to birch moth attacks the soil CO_2 flux is still more than 40% lower than in undisturbed stands. The drop is mainly caused by a decrease in wood root biomass but also the heterotopic respiration in the soil decreases. Due to a decrease N-uptake by the vegetation after disturbance the N-availability in the soil increases. The high N-availability makes the soil microbes less N-limited; decreasing the potential phenol oxidase enzyme activity in the soil, which is reflected in a lower decomposition rate. Also a decrease in ectomycorrhiza seems to decrease potential phenol oxidase- as well as chitanase-activity, of which the later has been found to be strongly correlated to fungal biomass. Or findings suggests that heterotrophic respiration in the subarctic is not likely to increase after disturbance by birch moth, which is often the case after disturbance in boreal and temperate forests.