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Seasonal variations in CO_2 and CH_4 fluxes of four different plant compositions of a *Sphagnum*-dominated Alpine peat bog

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Peatlands are the only type of ecosystems which have the ability to accumulate significant amounts of carbon (C) under undisturbed conditions. The amount of C sequestered in peatlands depends on the balance between gross primary production, ecosystem respiration and decomposition of plant material. *Sphagnum*-dominated bogs possess the greatest peat accumulation potential of all peatlands, thus in turn, feature highest C release potentials. Many studies report about the C balances of undisturbed northern peat bogs, however, little is known about the effects of peatland degradation on the C balance between different plant compositions within peat bog ecosystems. Particularly in the Alpine region, where temperature increase during the last century has been almost twice as high as the global mean.

The investigated peat bog is located in the inner Alpine Enns valley in the Eastern Alps, Austria (N 47°34.873' E 14°20.810'). It is a pine peat bog covered by *Sphagnum* mosses and a present extent of about 62 ha. Due to increasing differences in surface height of the peatland compared to the surrounding areas and related lowered water retention capacity attributed to the subsidence of the adjacent intensively managed meadows on deeply drained peat soils, the function of the peatland as a carbon sink is strongly endangered. Hence, the current mean water table depth of the central peat bog area is about -12 cm.

To reveal differences in peatland-atmosphere C exchanges within the peatland ecosystem, we investigated CO_2 and CH_4 fluxes of four different vegetation compositions (PM1-PM4) at the treeless central peat bog area. PM1 is dominated by the graminoids *Rhynchospora alba* and *Eriophorum vaginatum*. PM2 is inhabited by small individuals (< 35 cm) of the conifer *Pinus mugo*, whereas PM3 is dominated by the ericaceous plant *Calluna vulgaris*. PM4 again is populated by *Pinus mugo*, but higher growing (35 - 60 cm) and with corresponding higher amount of biomass. Fluxes were measured for at least 120 seconds with the closed dynamic chamber method using infrared gas analysers (UGGA, Los Gatos Research and LI-802, LI-COR Biosciences) at four study sites with three replicates each. Net ecosystem exchange was measured using transparent chambers, whereas soil respiration was revealed using opaque chambers. Measurements were conducted seasonally during the last two years with eight sampling periods.

Here, we demonstrate the seasonal variations in CO_2 and CH_4 fluxes, evaluate the underlying factors being responsible for these variations, examine the differences in diurnal pattern during the seasons and compute the global warming potentials of the released greenhouse gases. Moreover, we estimate the annual C balance per site and revise the seasonal C fluxes by comparing the results with fluxes derived by eddy covariance method.