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Patterns of below ground carbon cycling in contrasting pristine bogs in southern Patagonia (Tierra del Fuego, Argentina)

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South Patagonian peatlands cover a wide range of the southern terrestrial area and have been accumulating organic material since the last deglaciation. These ecosystems are – in contrast to many northern hemisphere bogs – virtually unaffected by human activities. Therefore, they provide excellent examples to study the functioning of undisturbed bog ecosystems. So far, little attention has been given to these great carbon reservoirs. We aimed to investigate the below ground carbon cycling patterns in two contrasting bog ecosystems in southern Patagonia, Tierra del Fuego.

Sphagnum-dominated bog ecosystems in Tierra del Fuego are similar to those on the northern hemisphere, while cushion plant-dominated (e.g. *Astelia pumila*, *Donatia fascicularis*) bogs are unique features of southern Patagonia. These cushion plant-dominated bogs are predominantly located close to the coast while with increasing distance from the coast peatlands gradually change into Sphagnum-dominated bogs. On the basis of 14C dates, up to 10,000-year records from different microsites in each bog type are presented. In order to understand the temporal and spatial variations in carbon cycling, we determined peat and carbon accumulation rates by age-depth modelling and reconstructed the local vegetation development from analyzed plant macrofossils. Further peat properties such as humification indices obtained from FTIR spectra as well as carbon and nitrogen isotopic signals were evaluated.

While long-term peat accumulation rates were highly different between both bog types, overall carbon accumulation rates were similar due to higher peat density and C contents under cushion forming vegetation. When peat development started, the cushion bog accumulated peat in similar rates compared to the Sphagnum bog, but accumulation rates dropped when the vegetation composition changed about 3000 years ago from Sphagnum-dominated to cushion-dominated. Accordingly, the cushion peat was much more decomposed and humification indices were higher compared to the Sphagnum peat. Changes in peat accumulation rates might be explained by more labile litter and a dense, deep and aerenchymatic root biomass of *A. pumila* enhancing (secondary) decomposition even in deeper Sphagnum peat layers. We demonstrate that aerenchymatic roots of cushion plants can have a strong effect on peat degradation and peat quality down to 2 m. Vegetation composition can strongly control carbon cycling not only of current surface peat layers, but can also mask past dynamics in buried peat layers composed of a different vegetation type.