# Monitoring of GHGs fluxes at "Le Viote" alpine peatland (Italy) by smart chamber system in a climate change context.

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The aim of this study is to determine the temporal and spatial variation of fluxes of two greenhouse gases (GHGs), CH4 and CO2, at "Le Viote" alpine peatland (Trentino, Italy) using a closed dynamic chamber-based system consisting in a smart dark chamber (LiCor 8200-01) and gas analyser (LiCor 7800), characterizing their response to their main climatic and anthropogenic drivers. Climatic trends were retrieved from local stations of the Meteotrentino network and analysed at different scales (daily, monthly, seasonal and annual). Air temperature and precipitation showed great scale-dependent variability, with an increasing trend on an annual scale: 0.06 °C/year for air temperature (P<0.0008) and 9.68 mm/year for precipitation, yet not significative. Regarding GHG fluxes, the peatland showed a great spatial variability among the 6 examined different vegetation types, which generally correspond to differences in soil moisture and microtopography. Flux measurements were performed in August 2024 and continued since May 2025. All plots were found to act as GHG sources with great variability based on vegetation type: GHG emissions ranged from a minimum of 12.21 µgCO2eqm-2s-1, which corresponds to a tussock (*Carex fusca* and *Deschampsia caespitosa*) coverage, to a maximum of 1448.63 µgCO2eqm-2s-1 in a predominantly grassland covered (*Sieversio-Nardetum strictae*) plot. CO2 fluxes ranged from 0.27 µmolm-2s-1 in a tussock plot to 32.97 µmolm-2s-1 in a grassland plot. CH4 fluxes instead ranged from a minimum of -3.75 nmolm-2s-1 over grassland, denoting its GHG sink activity, to a maximum of 1350.48 nmolm-2s-1 in a *Caricetum rostratae* plot. This strong CH4 source is located in one of the wettest areas of the peatland, where CH4 emissions reach up to 60% of total CO2eq fluxes. Soil moisture is highly variable across plots and impacts the ratio between CH4 and CO2 fluxes with lower CO2 flux contributions to GHG emissions associated to higher soil moisture levels.

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