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

Laura Rubriante[1,2*], *Damiano Gianelle*[1], *Dario Papale*[3], *Davide Andreatta*[1], *Luca Belelli Marchesini*[1]

- [1]Forest Ecology Unit, Research and Innovation Centre, Edmund Mach Foundation (FEM), San Michele all'Adige (Italy)
- [2]Department of Innovation in Biological, Agri-Food and Forestry Systems (DIBAF), University of Study of Tuscia, Viterbo (Italy)
- [3]Iret–Cnr (Institute of Research on Terrestrial Ecosystems of the National Research Council), Montelibretti (Italy)

∗laura.rubriante@fmach.it

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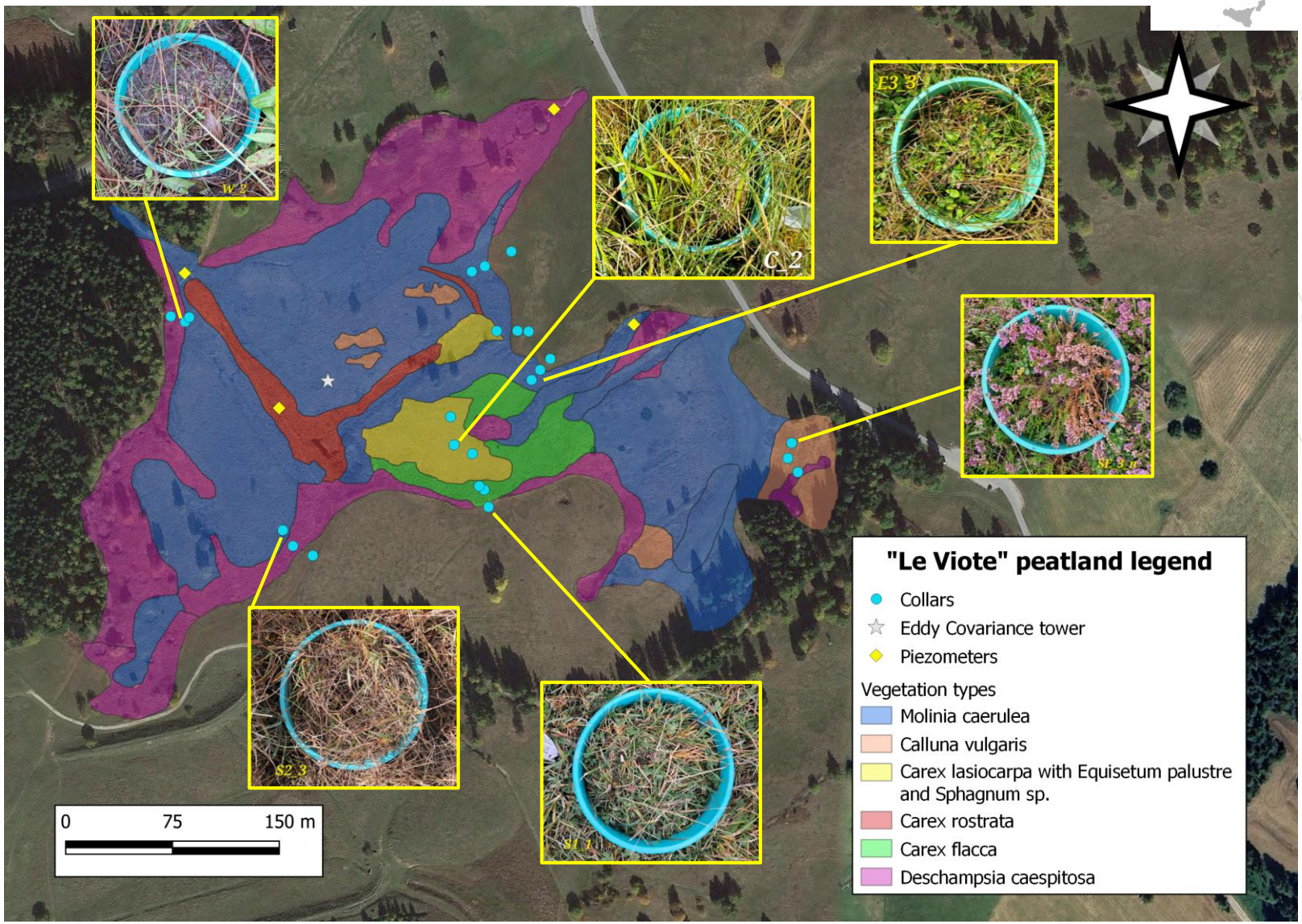
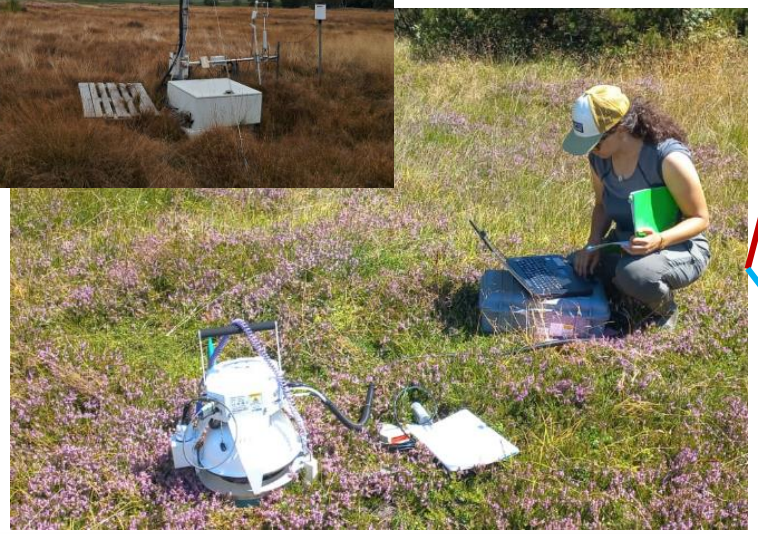
Introduction



- "Le Viote" alpine peatland (46°01'07" N, 11°02'34" E) is located in the middle of a **plateau** in the **Mt. Bondone** area (eastern Alps, Italy), at a mean altitude of **1560 m a.s.l.**.
- The aim of the study is to analyze the response of "Le Viote" alpine peatland to ongoing **climate change**, in relation to the main **climatic and ecological drivers** of greenhouse gases **(GHG) fluxes** and their **variability** in **space** and **time**.
- "Le Viote" peatland is characterized by **various micro-topographic** and **soil moisture levels** and **high biodiversity** in **vegetation coverages** (from the alpine grassland to sedges in the wettest areas).

Materials and Methods

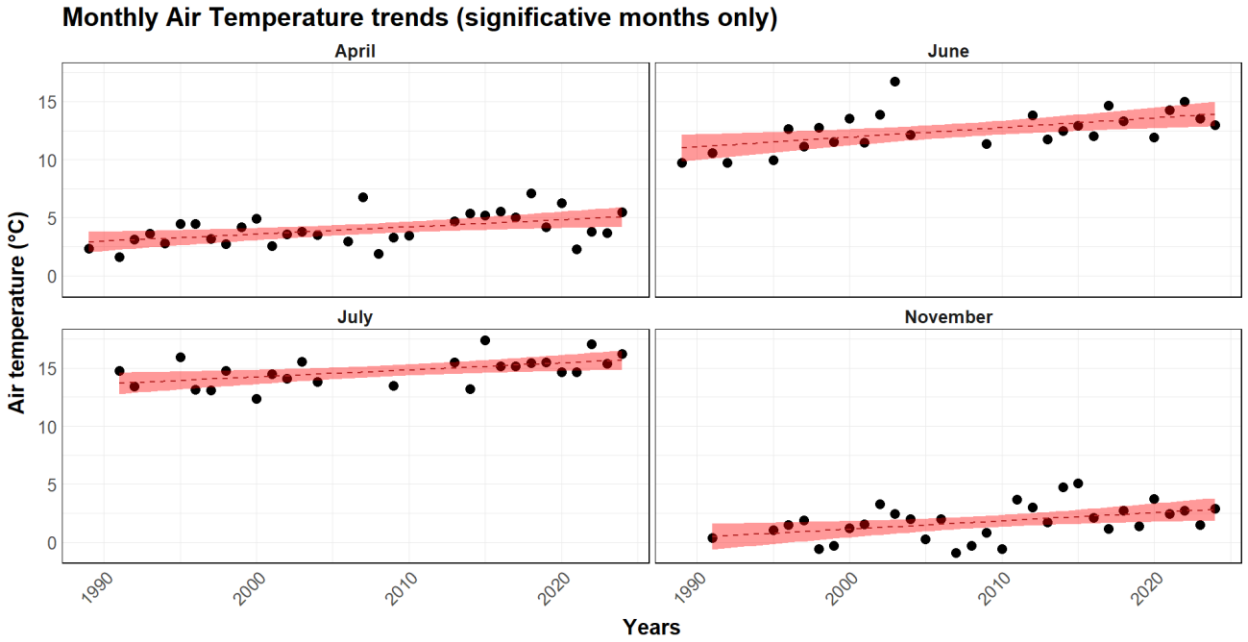


DRY

WET

- Sensors used: a portable **LiCor Smart Chamber**, a **LiCor 7810 $CH_4/CO_2/H_2O$ Trace Gas Analyzer**, a 6000-09TC **Soil Thermocouple Probe**, a **ML2 Theta Soil Moisture Probe** (Soil Moisture % **manually** measured at **four points** near each collar).
- **24 collars** (plots) fixed into the soil to create a **gradient** from the **dry** soil (grassland) to the **wet** soil (sedges).
- **8 transects** with **3 collars** each.
- GHG fluxes measures from **May 2025**, at least four times per month (**2025 measurement campaign**).
- Only **good data** selected (**R^2≥0.8** --> R^2>0.98 = 89% of data for CH_4, 95% for CO_2) for **GHG fluxes**.
- GHG fluxes divided per **vegetation type**.
- Only **good daily data** selected and **gapless** months, seasons and years analyzed for **climatic variables** (**Meteotrentino** database).

Meteo Data

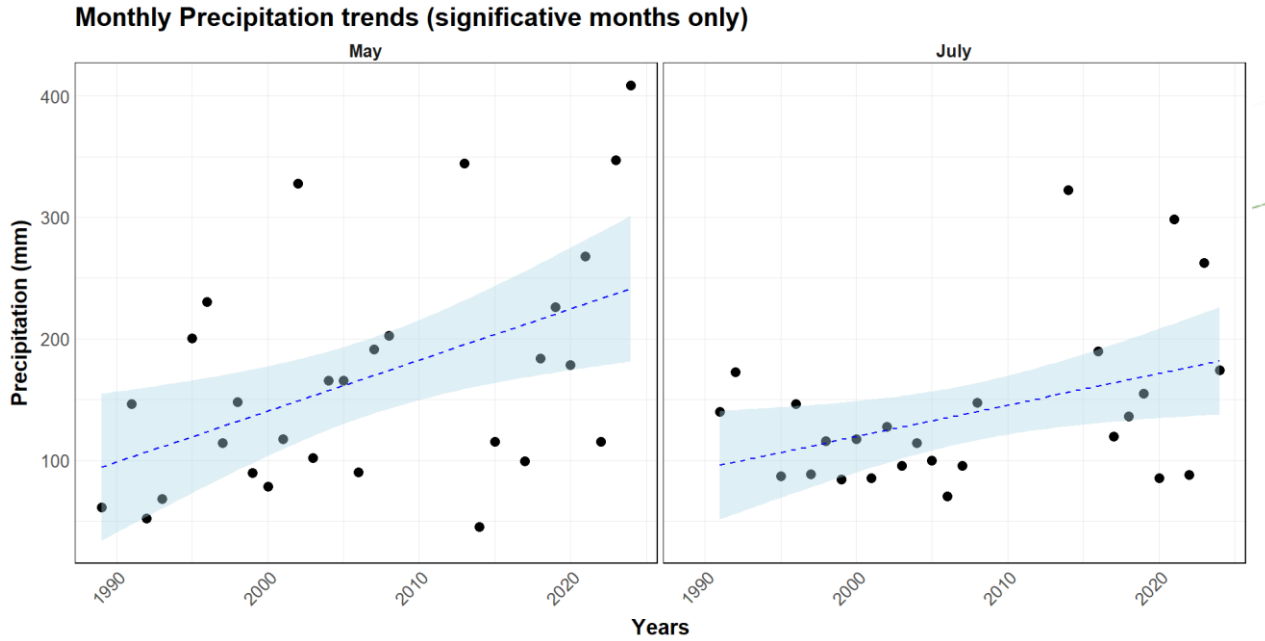


Mean Annual Temperature (MAT)

- **MAT** --> 6.16 °C ± 0.72.
- **MAT increasing trend** --> 0.06 °C/year.

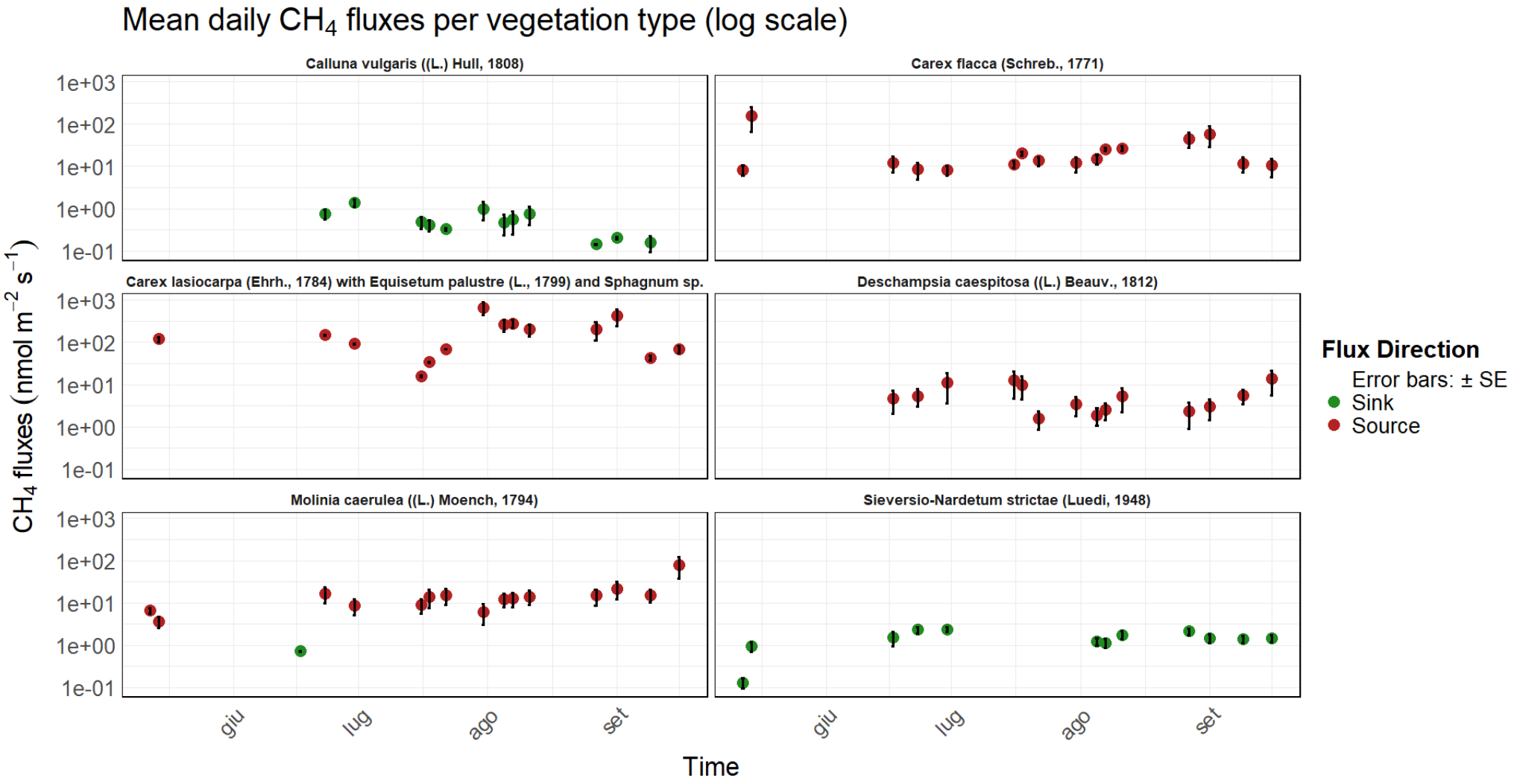
Mean Annual Precipitation (MAP)

- **MAP** --> 1473.13 mm ± 395.96
- **MAP increasing trend** --> 9.68 mm/year.
- **High variability** through years, **annual** trend **not** significative.



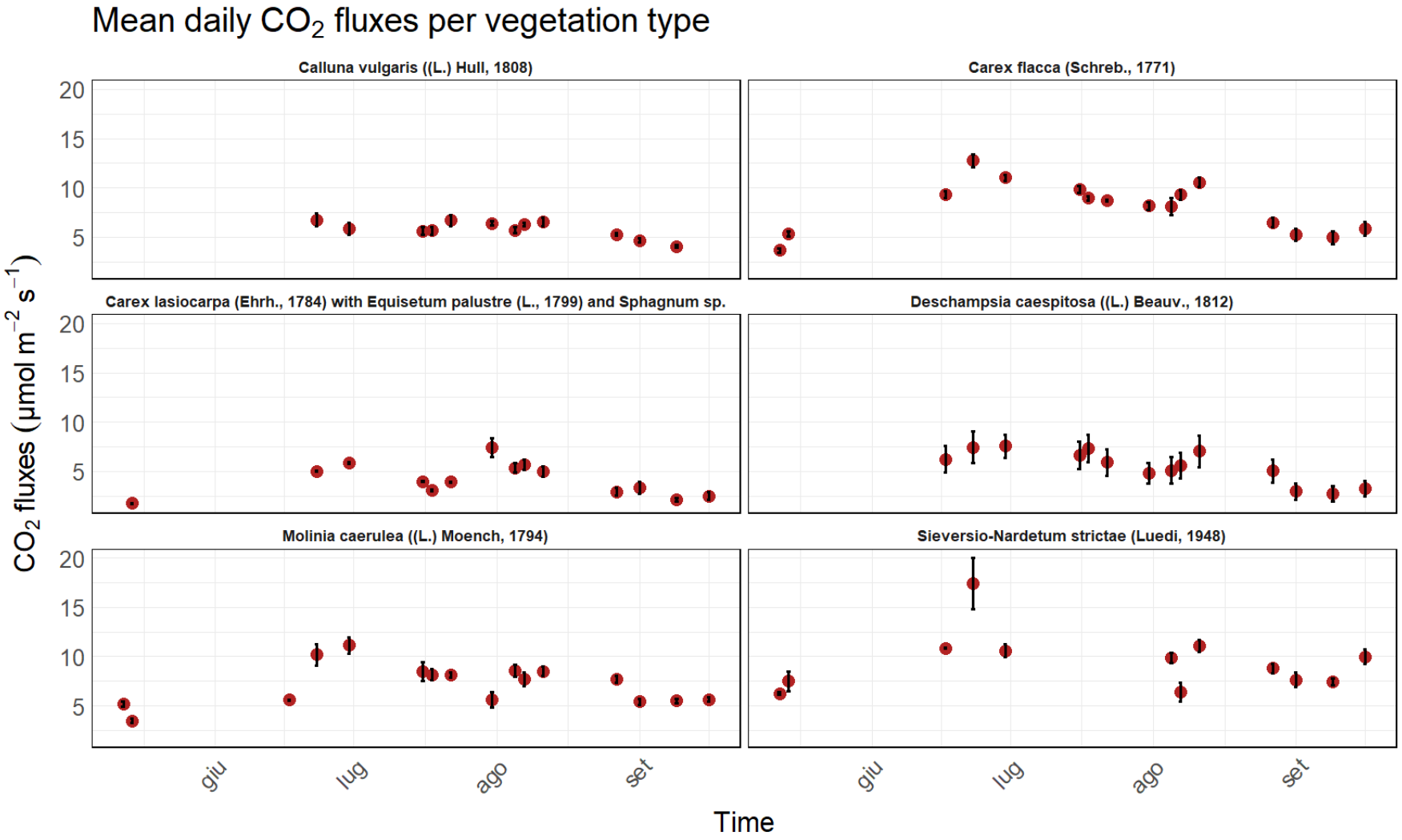
Results – GHG Fluxes

CH_4 fluxes – Time series



Results – GHG Fluxes

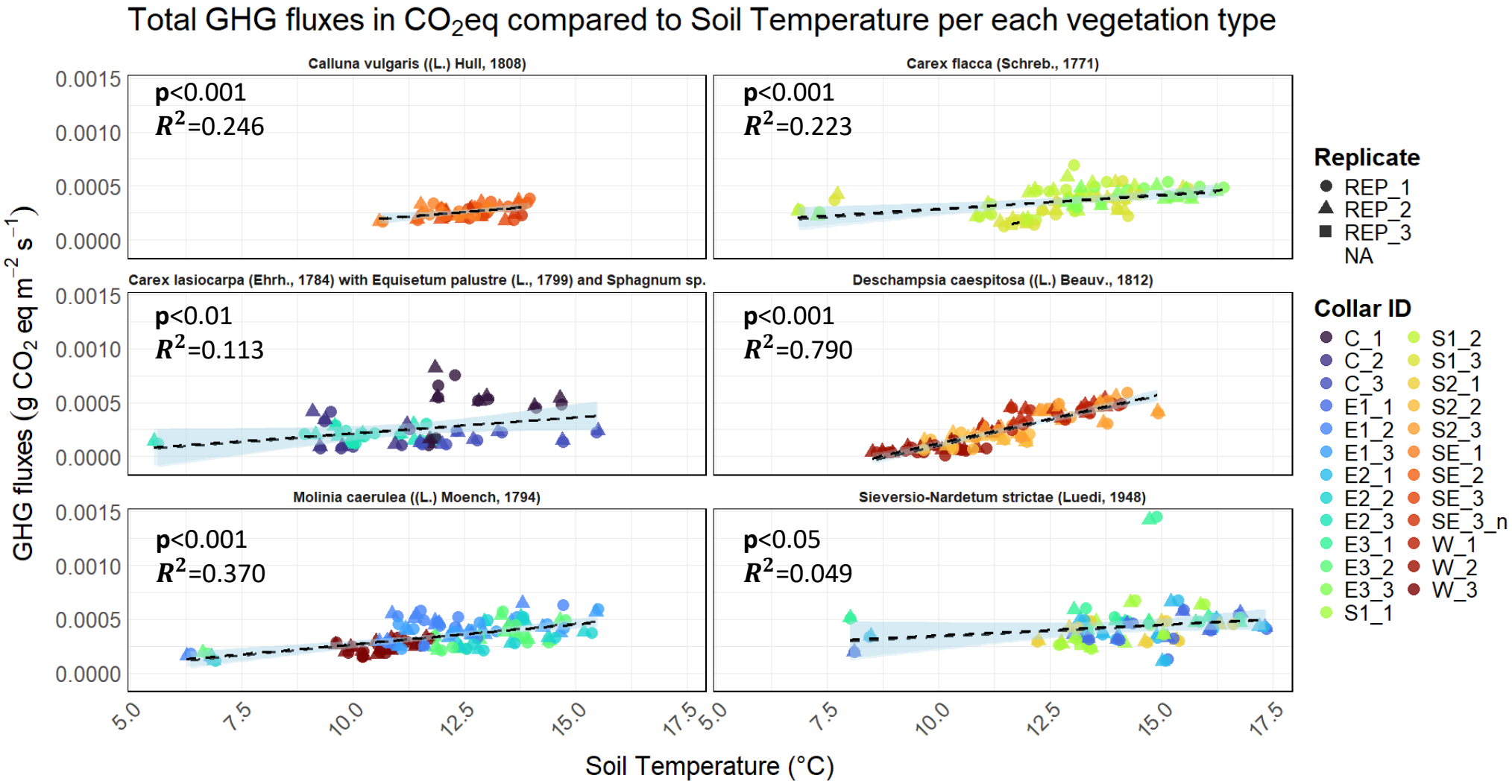
CO_2 fluxes – Time series



Error bars: ± SE

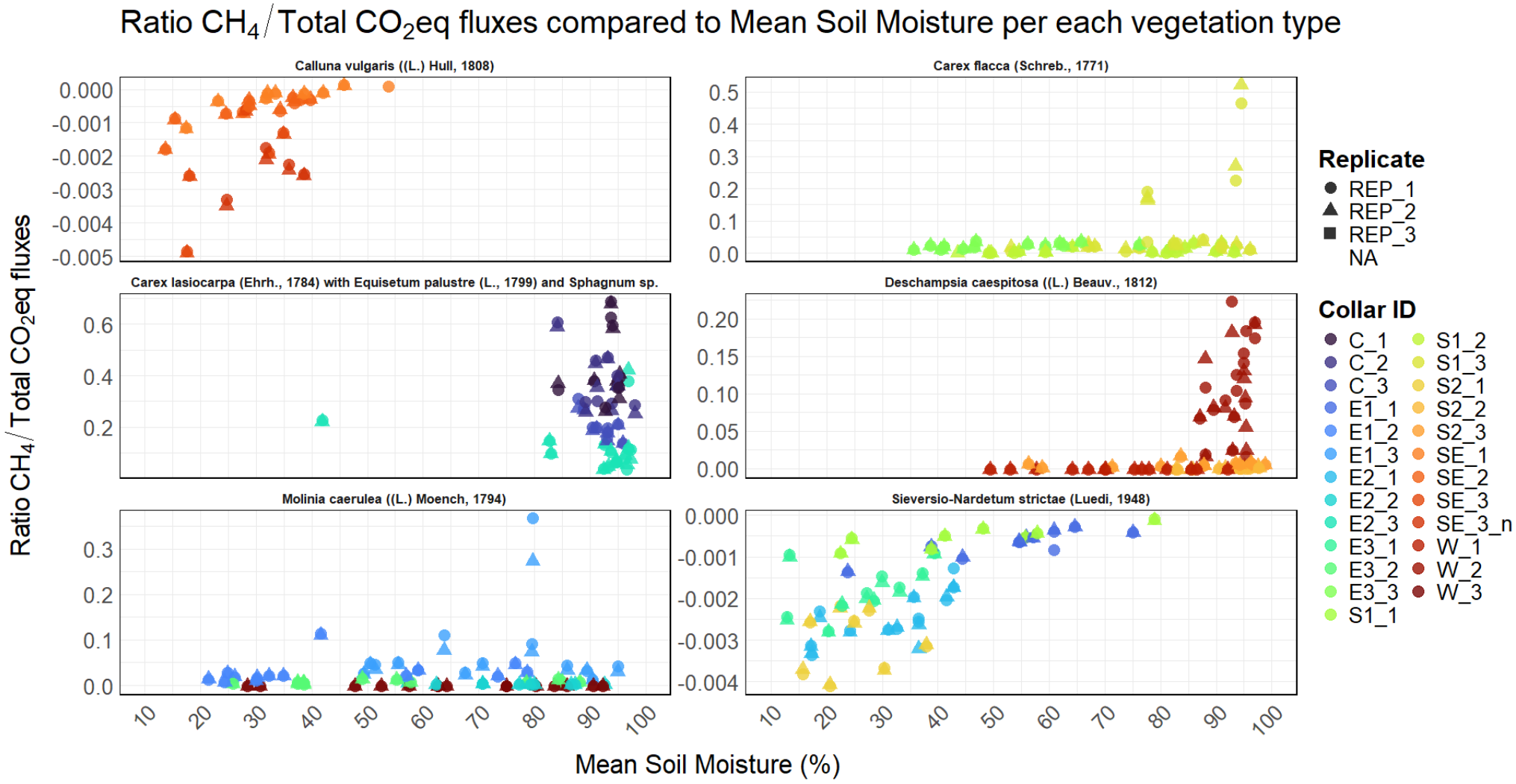
Results – GHG Fluxes

Tot GHG fluxes – Soil Temperature



Results – GHG Fluxes

CH_4 fluxes/Tot GHG fluxes – Soil Moisture



Conclusions

- **Air temperature** and **precipitation** show **increasing trends** in **specific** months (generally during **summer** season), but **precipitation** has **significative** values only on a **monthly** scale (May and July), **not** on an annual scale.
- Both $\boldsymbol{CH_4}$ and $\boldsymbol{CO_2}$ **fluxes** have **high variability** in **space** and **time** ($\boldsymbol{CH_4}$ fluxes have both **sink** and **source** direction).
- GHG fluxes **different** across **vegetation types**, despite **variability** observed **within** each type.
- Total **GHG fluxes** show a **positive** response to increasing **soil temperature**.
- The $\boldsymbol{CH_4}$ contribution to total GHG fluxes is extremely **soil moisture dependent**.

THANKS!

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