B51A-0403 Carbon monoxide exchange and partitioning of a managed mountain meadow

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With an average mole fraction of 100 ppb carbon monoxide (CO) plays a critical role in atmospheric chemistry and thus has an indirect global warming potential. While sources/sinks of CO on land at least partially cancel out each other, the magnitude of CO sources and sinks is highly uncertain.
One major reason for the large uncertainty is a general scarcity of empirical data.

Here we …

(I) present continuous eddy covariance measurements of CO-fluxes above a managed mountain grassland, …

(II) … their relation to radiation input, and

(III) … associated soil chamber flux measurements.

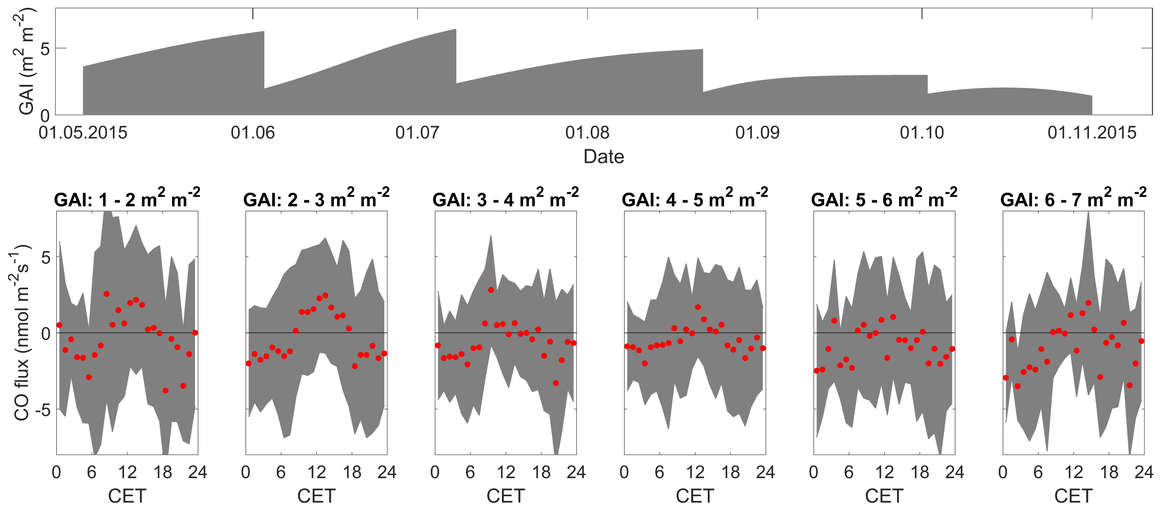
Methods used:

Eddy covariance:

Gill R3 Sonic and Aerodyne quantum cascade laser (QCL)

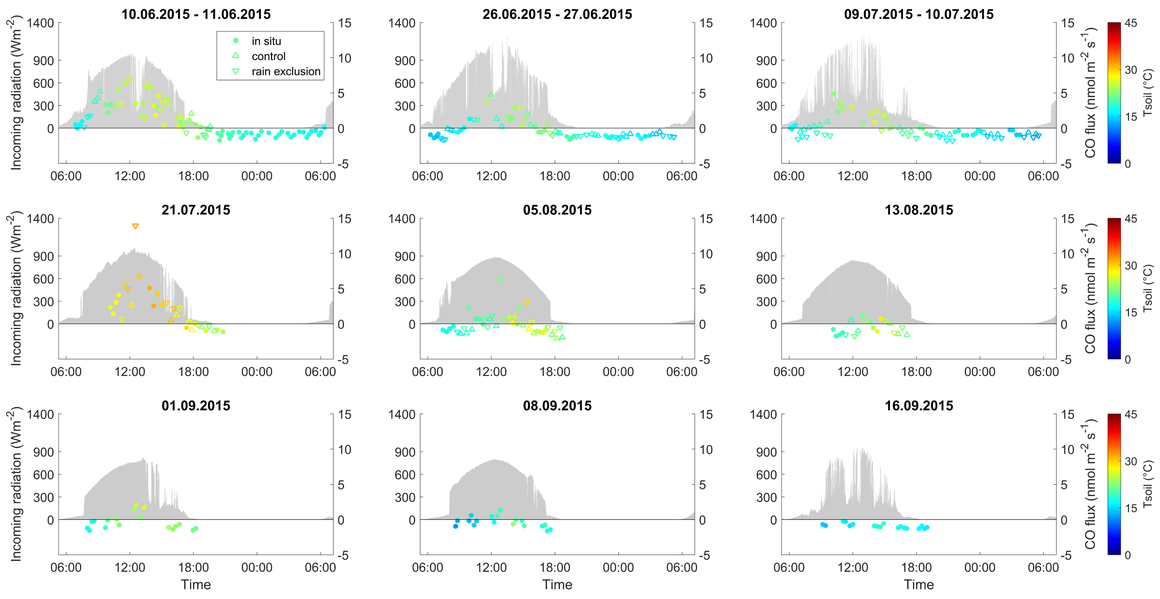
Soil chambers:

House made steady-state flow-through chamber system (borosilicate- or quartz-glass) in combination with QCL



(I) **Upper panel:** Green area index (GAI) of the managed grassland site during the measurement campaign 2015. Step changes are due to the four cutting events.

Lower panel: Mean diel variation of the net ecosystem CO-fluxes grouped by different GAI classes. Shaded areas refer to ± 1 stdv. Positive fluxes represent fluxes from the ecosystem to the atmosphere, negative ones the opposite.



(III) Soil CO exchange based on episodic measurements with UV-transparent chambers. Shaded areas show incoming solar radiation above the canopy.

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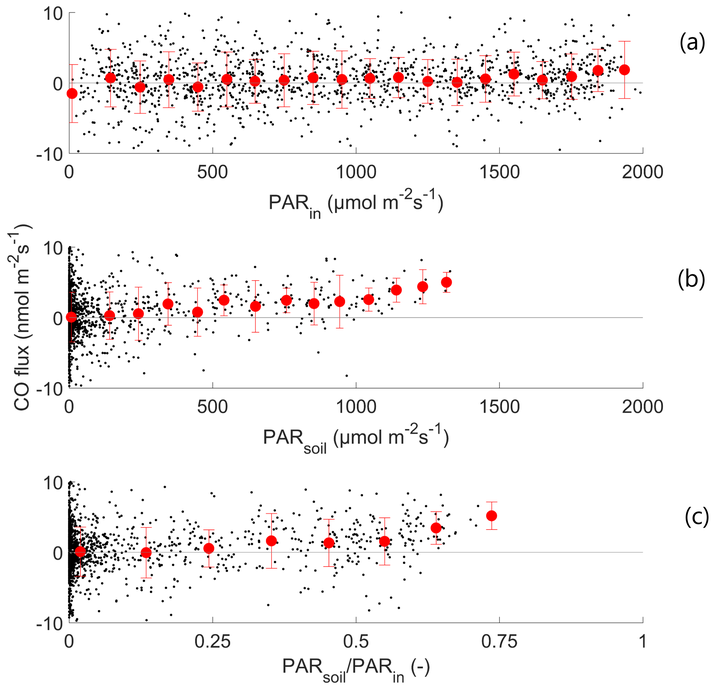

(II) Net ecosystem CO-fluxes versus …

(a) … incoming photosynthetically active radiation above the canopy (PAR_{in}) - (b) … PAR at soil surface (PAR_{soil}) - (c) … ratio PAR_{soil}/PAR_{in}. Black: raw data; red: bin averaged data ± 1 stdv

Results so far show, that ecosystem scale fluxes of CO are positive during daylight hours and negative throughout the night. Especially pronounced at times with low GAI – associated with high radiation input at the soil surface (I-II).
Soil chamber measurements show the soil to be a source for CO during the day and a minor sink at night, with a secondary influence of temperature (III).

While more ecosystems will be investigated in 2016, post processing and quality management of EC data are demanding and will be further refined.

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So far solar radiation reaching litter layer and soil surface appears to be the dominating factor for CO fluxes at the managed grassland investigated.