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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. Even if direct CO fluxes from/to land ecosystems are very much likely clearly lower in magnitude compared to anthropogenic emissions, biomass burning, emissions from chemical precursors and the OH sink, it may be premature to neglect any direct contributions of land ecosystems to the CO budget. In addition, changes in global climate and resulting changes in global productivity may require re-evaluating older data and assumptions. One major reason for the large uncertainty is a general scarcity of empirical data. An additional factor contributing to the uncertainty is the lack of ecosystem-scale CO exchange measurements, i.e. CO flux data that encompass all sources and sinks within an ecosystem. Here we present data on continuous eddy covariance measurements of CO-fluxes above a managed mountain grassland in combination with soil chamber flux measurements, within- and above-canopy concentration profiles and an inverse Lagrangian analysis to disentangle sinks and sources of CO. Results show the grassland ecosystem to be a net source for CO during daytime, with increasing flux rates at higher solar radiation. At night, if at all, the meadow is a slight sink for CO. The same holds true regarding the soil flux measurements. Additionally, a two-month rainout experiment revealed hardly any differences in CO soil fluxes between rainout- and control-plots unless extremely dry conditions were reached.