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Ecosystem-scale carbon monoxide exchange and partitioning across major biomes in Europe

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With an average mole fraction of 100 ppb carbon monoxide (CO) plays a critical role in atmospheric chemistry and has an indirect global warming potential. While sources/sinks of CO on land at least partially cancel out each other and their magnitude is very likely lower compared to other sinks and sources, the magnitude of CO sources and sinks is highly uncertain. Thus 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.

Here we present data on continuous eddy covariance measurements of CO-fluxes above different biomes in Europe in combination with soil-chamber flux measurements. Eddy covariance and soil-chamber measurements were conducted during the vegetation periods in 2015 and 2016 at a temperate grassland (AUT), a Mediterranean savanna (ESP), a temperate mixed deciduous (DEN) and a hemi-boreal forest (EST).

While a clear diel pattern in ecosystem-scale CO-fluxes could be observed at the two grassland sites, with comparatively high emission rates at daytime conditions and fluxes around zero at night, no such pattern could be found for the two forest sites.

Soil-chamber measurements mimicked the ecosystem-scale fluxes with CO-emissions during the day at the grassland ecosystems and slightly negative fluxes at night. Applying different treatments the influence of radiation and the availability of litter on these fluxes could be shown. Furthermore, a two-month rainout experiment revealed hardly any differences in CO soil fluxes between rainout- and control-plots at the grassland site (AUT), unless extremely dry conditions were reached.