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Assessing the carbon fluxes in perennial and annual grass systems using both automatic and manual chamber methods

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Abstract: Assessment of carbon (C) flux dynamics are critical for advancing the understanding of the biogeochemical cycle in agricultural soils. Conventional agricultural systems have been intensified during the last century to feed the increasing world population at the expense of terrestrial C loss. Perennial cropping systems may shift agricultural crop production from C-source to C-sink. However, large uncertainties and difficulties are related to C flux measurement. This study aims to quantify the C fluxes in a replicated field experiment established with annual grain crop and perennial grass systems in 2012 using both automated and manual chamber methods. Both methods combine the net ecosystem exchange and ecosystem respiration for calculating the gross primary productivity. Moreover, we also deployed automated and survey soil respiration chambers in order to separate soil respiration into autotrophic and heterotrophic components. The automated chambers secured data with high temporal resolution in one of the field replicates while the manual chamber was able to cover the field variation, represented by the four field replicates, with low temporal resolution. Annual estimates of net carbon balances and below-ground biomass production of the different cropping systems will be presented.