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Continuous field measurements of ^{13}C in CO_2 and ^{15}N in N_2O in soil chambers by FTIR spectroscopy

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Exchanges of carbon dioxide and nitrous oxide between soils, plants and the atmosphere are major contributors to biogeochemical cycling of carbon and nitrogen. Isotopic tracers allow insights into the processes controlling carbon and nitrogen exchange. In this work we combine a multi-isotope and trace gas Fourier Transform analyser with automated soil chambers to make continuous, simultaneous 1-minute measurements of CO_2 and N_2O and their ^{13}C and ^{15}N isotopologues. The analyser cycled through a set of five chambers over a two month campaign on a coastal floodplain in SE Australia managed for grazing and silage production. ^{15}N-enriched nitrate or urea was added to the soil plots and in previous reports of this work we described the evolution of all ^{15}N isotopologues and isotopomers and the implications for N-processing in the soil plant system (Phillips et al., 2013). The ^{13}C in CO_2 results have not previously been reported, and in this paper we describe the fractionation of ^{13}C in CO_2 respiration over the entire campaign. We find that $\delta^{13}C$ of respired CO_2 varies on short timescales (during dark chamber closures) and diurnally.

Phillips, R., Griffith, D. W. T., Dijkstra, F., Lugg, G., Lawrie, R., and Macdonald, B.: Tracking short-term effects of ^{15}N addition on N_2O fluxes using FTIR spectroscopy, J. Environ. Qual., 42, 1327-1340, 2013.