Understanding seasonal oxygen isotope signals of photosynthesis and respiration at the ecosystem scale using a chamber TDL system

Jérôme Ogée, Lisa Wingate, Alexandre Bosc, Marion Devaux, Denis Loustau, Michel Sartore, John Grace

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J. Ogée[2*], L. Wingate[1*], A. Bosc[2], R. Burlett[2], M. Devaux[2], D. Loustau[2], M. Sartore[2], J. Grace[1].

[1]School of GeoSciences, University of Edinburgh, UK, EH9 3JN
[2]INRA, EPHYSE, BP81, 33883, Villenave d'Ornon, France
*Authors to whom correspondence should be addressed at l.wingate@ed.ac.uk and ogee@pierroton.inra.fr

Studying the carbon and oxygen stable isotope signals from plants and soils can help us gain insight on mechanistic processes responsible for the net exchange of CO_2 and water cycled between terrestrial ecosystems and the atmosphere. Chamber field measurements of component fluxes and their isotopic composition have revealed that oxygen isotope signals of CO_2 are dynamic over relatively short time scales (hrs and days) for both branches and soils. Furthermore, precipitation inputs and prolonged dry periods can result in considerable intra- and inter-annual variability in the oxygen isotope signals of CO_2 exchanged with the atmosphere. In this study, we coupled automated chambers with tunable diode laser spectroscopy techniques in the field to continuously capture the oxygen isotope signals from the most important component fluxes (branch, stem and soil) contributing to the net ecosystem exchange of CO_2 in a *Pinus pinaster* forest in south-west France during a 6-month period in 2007. We present the diurnal and seasonal patterns from each component and investigate how each of these signals impact the oxygen isotope signal of CO_2 observed by the atmosphere over the season.