



**HAL**  
open science

## Strong seasonal $^{18}\text{O}$ disequilibrium between leaf and soil $\text{CO}_2$ fluxes

Lisa Wingate, Jérôme Ogée, Régis R. Burllett, Alexandre Bosc

► **To cite this version:**

Lisa Wingate, Jérôme Ogée, Régis R. Burllett, Alexandre Bosc. Strong seasonal  $^{18}\text{O}$  disequilibrium between leaf and soil  $\text{CO}_2$  fluxes. European Science Foundation Workshop "Stable Isotopes and Biogeochemical Cycles in Terrestrial Ecosystems", Mar 2010, Ascona, Switzerland. n.p. hal-02819209

**HAL Id: hal-02819209**

**<https://hal.inrae.fr/hal-02819209>**

Submitted on 6 Jun 2020

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

## **P2.09 Strong seasonal disequilibrium measured between the oxygen isotope signals of leaf and soil CO<sub>2</sub> exchange**

**Lisa Wingate, Jérôme Ogée, Régis Burlett, Alexandre Bosc**

*University of Cambridge, Department of Plant Sciences, Downing Street, CB2 3EA Cambridge*

The oxygen isotope composition of atmospheric CO<sub>2</sub> is among a very limited number of tools available to constrain estimates of the biospheric gross CO<sub>2</sub> fluxes, photosynthesis and respiration at large scales. However, the accuracy of the partitioning strongly depends on the extent of isotopic disequilibrium between the signals carried by these two gross fluxes. Chamber-based field measurements of total CO<sub>2</sub> and CO<sup>18</sup>O fluxes from foliage and soil can help evaluate and refine our models of isotopic fractionation by plants and soils and validate the extent and pattern of isotopic disequilibrium within terrestrial ecosystems. Due to sampling limitations in the past, such measurements have been very rare and covered only a few days. In this study, we coupled automated branch and soil chambers with tuneable diode laser absorption spectroscopy techniques to continuously capture the oxygen isotope signals of foliage and soil CO<sub>2</sub> exchange in a *Pinus pinaster* Ait. forest in France. Over the growing season we observed a seasonally persistent isotopic disequilibrium between the oxygen isotope signatures of net CO<sub>2</sub> fluxes from leaves and soils, except during rain events when the isotopic imbalance became temporarily weaker. Variations in the oxygen isotope composition of CO<sub>2</sub> exchanged between leaves, soil and the atmosphere were also modelled following theory describing changes in the oxygen isotope composition of ecosystem water pools in response to changes in leaf transpiration and soil evaporation. These results of this modelling and the implications for larger scale partitioning studies will be discussed in this presentation.