



**HAL**  
open science

# Oxygen isotope signatures of transpired water vapor – the role of isotopic non-steady-state transpiration of Mediterranean cork-oaks (*Quercus suber* L.) under natural conditions

Maren Dubbert, Arndt Piayda, Matthias Cuntz, Christiane Werner

## ► To cite this version:

Maren Dubbert, Arndt Piayda, Matthias Cuntz, Christiane Werner. Oxygen isotope signatures of transpired water vapor – the role of isotopic non-steady-state transpiration of Mediterranean cork-oaks (*Quercus suber* L.) under natural conditions. EGU 2014, European Geosciences Union General Assembly 2014, Apr 2014, Vienne, Austria. 2014. hal-02741380

**HAL Id: hal-02741380**

**<https://hal.inrae.fr/hal-02741380>**

Submitted on 3 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.



Distributed under a Creative Commons Attribution 4.0 International License



## **Oxygen isotope signatures of transpired water vapor – the role of isotopic non-steady-state transpiration of Mediterranean cork-oaks (*Quercus suber* L.) under natural conditions**

Maren Dubbert (1), Arndt Piayda (2,1), Matthias Cuntz (2), and Christiane Werner (1)

(1) Bayreuth, Geosciences, Agroecosystemresearch, Bayreuth, Germany (maren.dubbert@uni-bayreuth.de), (2) Computational Hydrosystems, Helmholtz Center for Environmental Research - UFZ, Leipzig

Oxygen isotope signatures of transpired water vapor ( $\delta T$ ) are a powerful tracer of water movement from plants to the global scale, but little is known on short-term variability of  $\delta T$  as direct high-frequency measurements are lacking.

A laser spectrometer was coupled to a gas-exchange chamber directly estimating branch-level fluxes and  $\delta T$  to evaluate a modeling approach and investigate the role of isotopic non-steady-state transpiration under natural conditions in distinct seasons in cork-oaks (*Quercus suber* L.).

The isotope signature of transpiration ( $\delta T$ ) always deviated from steady-state predictions ( $\Delta T$ ) throughout most of the day even when leaf water at the evaporating sites is near isotopic steady-state. Thus,  $\Delta T$  is further amplified compared to deviations of leaf water isotopes from steady-state, specifically in dry conditions. High agreement was found for direct estimates and modeled  $\Delta T$  assuming non-steady-state conditions of leaf-water at the evaporating sites.

Strong isoforcing on the atmosphere of transpiration in isotopic non-steady-state imply that short-term variations in  $\delta T$  have likely consequences for large-scale applications, e.g. partitioning of ecosystem evapotranspiration or carbon fluxes using  $C^{18}O^{16}O$ , or satellite-based applications.