



HAL
open science

The coupling of reducing power and stomatal conductance could improve the effective ozone uptake concept in a risk assessment model

Didier Le Thiec, Yves Y. Jolivet, Marie-Paule Hasenfratz-Sauder, Joelle Gérard, Mathieu Bagard, Pierre P. Dizengremel

► To cite this version:

Didier Le Thiec, Yves Y. Jolivet, Marie-Paule Hasenfratz-Sauder, Joelle Gérard, Mathieu Bagard, et al.. The coupling of reducing power and stomatal conductance could improve the effective ozone uptake concept in a risk assessment model. APGC Symposium. Plant Metabolism, Air Pollution and Global Change: Plant Functioning in a Changing Global Environment, Dec 2008, Melbourne, Australia. 1 p. hal-02816524

HAL Id: hal-02816524

<https://hal.inrae.fr/hal-02816524>

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.

The coupling of reducing power and stomatal conductance could improve the effective ozone uptake concept in a risk assessment model

Didier Le Thiec*, Yves Jolivet, Marie-Paule Hasenfrazz-Sauder, Matthieu Bagard and Pierre Dizengremel

UMR 1137 Forest Ecology and Ecophysiology, INRA/Université Henri Poincaré Nancy 1, France

The tropospheric level of the phytotoxic air pollutant ozone has considerably increased during the last century and is expected to continue to rise. Long-term exposures of higher plants to low ozone concentrations affect biochemical processes prior to any detectable symptoms of visible injury. On the other hand, the current critical level of ozone used to determine the threshold for damaging plants (biomass loss) is still based on the seasonal sum of the external concentrations of the pollutant above 40 nl l^{-1} (AOT40). Taking into account the stomatal conductance, a more relevant concept is based upon the actual ozone flux in the leaf through the stomata (cumulative uptake of ozone = CUO). CUO however ignores the internal capacity of leaf defense, which led to the concept of “effective ozone flux”, balance between stomatal flux and the intensity of cellular detoxification, with the aim to propose an improved threshold for ozone risk. Although the direct detoxification of ozone (and ROS issued from its decomposition) can primarily be carried out by cell wall ascorbate, the existing level of this antioxidant is not sufficient to indicate the degree of cell sensitivity. The capacity for regeneration of the antioxidant barrier is needed, implying the knowledge of the increased production of reducing power (NAD(P)H), primary supplier for detoxifying processes. It is made possible through the increased participation of the catabolic pathways and associated shunts which can provide NAD(P)H. In addition, the large change in the rubisco/PEPcase ratio, due to a huge increase in activity of the latter enzyme, leads to changes in carbon isotopic discrimination, which could be related to water use efficiency. Some results will be presented knowing that the challenge is to integrate the possible indicators in a leaf model to be used, through an upscaling process, in a tree and forest stand model.

*(correspondence: le_thiec@nancy.inra.fr)