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Exchange of atmospheric NO_2 between trees and the atmosphere in relation to physiological and environmental parameters

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Reactive nitrogen oxides play a central role in controlling the oxidative chemistry of the lower atmosphere. NO_2 exchange between the atmosphere and the vegetation is described as bi-directional and discussed to be governed by a compensation point. However, the magnitude of the compensation point is a matter of debate. The objective of this study is to contribute to our understanding of the uptake of atmospheric NO_2 by trees in relation to atmospheric NO_2 concentrations..

The uptake of NO_2 by beech (*Fagus sylvatica*) at ppb levels was carried out in the field in summer of 2003 as well in the laboratory under controlled conditions at ppt/ppb levels. Both measurements were performed using the branch enclosure technique in a dynamic chamber. NO_2 exchange measurements were accompanied by simultaneous determination of physiological activities, such as CO_2 exchange and transpiration, the latter giving access to calculate stomatal conductance.

In the field, NO_2 deposition increased with increasing light intensity, stomatal opening and atmospheric NO_2 concentrations. Under ambient field conditions with photosynthetic photon flux density (PPFD) around 1000 μmol m^{-2} $s^{-1}$and wellabove the saturation point, we calculated a compensation point around 2.85 ppb. In the laboratory, under constant temperature and light with a PPFD around 400 μmol m^{-2} s^{-1}exposures to increasing NO_2 concentrations resulted in a linear increase of NO_2deposition. However, calculations of a compensation point resulted in values near or at zero. These results may be explained by the lower light intensity used in the laboratory experiments. Hence, we do not exclude an increase of a (virtual) compensation point under higher light intensities. The rate of uptake was also closely related to the

stomatal conductance. Laboratory measurements with *Quercus ilex*, *Quercus robur* und *Betula pendula* were consistent with the results reported for *Fagus sylvatica.*