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Re-investigation of the nitrogen dioxide (NO2) uptake by tree species.

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The uptake of NO2 by vegetation represents a substantial sink for this reactive trace gas. Therefore, we re-investigated the uptake of atmospheric NO2 by trees in relation to atmospheric NO2 concentrations during two vegetation periods in 2004 and 2005. Using the dynamic chamber technique and a sensitive and specific NO-analysator (CLD 780, Eco Physics) we measured the uptake of NO2 by four different tree species (Betula pendula, Fagus sylvatica, Quercus ilex und Pinus sylvestris) under field and laboratory conditions. Simultaneous measurements of CO2 exchange and transpiration were performed to track photosynthesis and stomatal conductance. Our investigations demonstrate the dominance of stomatal conductances on NO2 exchange under controlled laboratory conditions with purified air artificially enriched with NO2. A linear correlation between the stomatal H2O conductance with NO2 uptake was observed in all experiments with all tree species. A reduction of the stomatal conductance under high light intensity was closely accompanied by a decrease of NO2 uptake in all cases. A deposition to the cuticle seemed to be of no importance under the actual experimental conditions. In addition to stomatal control the principally bi-directional exchange of NO2 is strongly influenced by the atmospheric concentrations. However, there is some debate about the magnitude of the compensation point [1]. Depending on tree species we found the exchange to be controlled by very low NO2 compensation points often reaching zero values (no emission) under laboratory conditions. Contrasting, a high compensation point for European beech (Fagus sylvatica) was observed in the field, which is understood as a result of complex atmospheric conditions.

References [1] M. Lerdau, J. W. Munger and D. J. Jacob, 2000, Science, 289, 2291-2293.