Geophysical Research Abstracts
Vol. 14, EGU2012-8819, 2012
EGU General Assembly 2012

The contribution of nitrogen deposition to the photosynthetic capacity of forests

K. Fleischer (1), K.T. Rebel (2), M.K. van der Molen (3), J.W. Erisman (4,1), M.J. Wassen (2), E.E. van Loon (5), L. Montagnani (6), C.M. Gough (7), M. Herbst (8), I.A. Janssens (9), D. Gianelle (10), and A.J. Dolman (1)

(1) Vrije Universiteit Amsterdam, Hydrology and Geo-Environmental Sciences, Netherlands (k.fleischer@vu.nl), (2) Utrecht University, Envrionmental Sciences Group, The Netherlands, (3) Wageningen University, Meteorology and Air Quality Group, The Netherlands, (4) Louis Bolk Instituut, The Netherlands, (5) University of Amsterdam, Computational Geo-Ecology, The Netherlands, (6) Free University of Bozen, Italy, (7) Virginia Commonwealth University, USA, (8) Georg-August University Goettingen, Germany, (9) University of Antwerp, Belgium, (10) IASMA Research and Innovation Centre, Italy

The drivers of terrestrial carbon sequestration, as well as the geographical spread and magnitude of this land sink are currently debated. Nitrogen deposition is one potential driver for enhancements in carbon sequestration. We studied the influence of nitrogen (N) deposition on photosynthetic capacity using eddy covariance measurements of net exchange of carbon. From the provided estimates of gross primary production we derived the photosynthetic capacity (Amax) of forests. We used Amax to study the impact of N deposition, while accounting for climate and stand characteristics of forest canopies for a global dataset of 80 forest FLUXNET sites. Canopy Amax related positively to N deposition below an observed critical load for evergreen needleleaf forests and leveled off for higher N deposition rates. The determination of a pure N deposition effect was prevented by correlations between climate and N deposition. Without considering climate effects we identified an upper limit of the Amax – N deposition relationship for evergreen needleleaf forests; 2.0 $\pm$ 0.4 (S.E.) μmol CO_2 m-2 s-1 per 1 kg N ha-1 yr-1. For deciduous broadleaf forests, as well as for temperate evergreen needleleaf forests, Amax appeared insensitive to N deposition. However, in N limited evergreen needleleaf forests, we conclude that N deposition plays an essential role in determining canopy physiology and carbon cycling by increasing Amax.