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Inorganic nitrogen deposition to forest ecosystems in Europe - spatial patterns and temporal changes in the period 2000-2015

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Emission reduction efforts and socio-economic dynamics result in ongoing changes in atmospheric compounds and inorganic nitrogen deposition loads to forest ecosystems. Atmospheric deposition of reduced and oxidized nitrogen to forests across Europe is continuously measured at the intensive forest monitoring (Level II) plots of the International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests). The standardized sampling design allows the analysis of both throughfall (under the canopy) and open field deposition at European level.

Evaluations of measurements on around 260 European plots in the period 2011-2015 showed that mean throughfall deposition rates of ammonium (NH4+) and nitrate (NO_3-) were 5.0 kg N ha-1 a-1 and 4.8 kg N ha-1 a-1, respectively, whereas mean open-field deposition amounted to 3.8 kg N ha-1 a-1 and 3.0 kg N ha-1 a-1, respectively. Trend analyses showed that the median decrease in inorganic nitrogen deposition is 21% for throughfall deposition and 28% for open field deposition in the period 2000-2015. Trend analysis revealed a clear spatial pattern with higher reductions observed in areas with higher initial deposition rates.

A potential shift toward an increasing relative importance of reduced forms of deposited nitrogen emphasizes the importance of understanding not only the effects of the total amount but also of the form (reduced vs. oxidized) of inorganic nitrogen input to forest ecosystems. We will present and discuss the magnitude and map the spatial pattern of such changes in the inorganic nitrogen deposition based on the long-term nitrogen deposition measurements of the ICP Forests Level II network across Europe.