Geophysical Research Abstracts
Vol. 20, EGU2018-7627, 2018
EGU General Assembly 2018

N/P changes in tree foliage and the impact of N deposition across Europe

Tanja Sanders (1), Anne-Katrin Prescher (1), Andreas Schmitz (1), and Pasi Rautio (2)

(1) Thuenen Institute, Forest Ecosystems, Eberswalde, Germany (tanja.sanders@thuenen.de), (2) Natural Resources Institute Finland (Luke), Finland

Even though emission reduction efforts have reduced air pollution and concentrations of nitrogen (N) compounds in the atmosphere, the deposition of nitrogen is still ongoing. This N input can significantly affect the nutrient cycles of forest ecosystems and related tree nutrition. The nutritional state of forest trees can be derived by the chemical analysis of leaves and needles. When done repeatedly over time, this information can be used to describe spatial and temporal trends. In addition, at a specific site this information can be used to detect nutrient limitations and surpluses. Here we use the extensive data provided by ICP Forests (International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests). Across Europe and beyond, this programme is monitoring foliar concentrations, deposition and other variables in forest ecosystems. Foliar analyses are conducted at least biannually and N deposition is measured at least every four weeks. This study reports on trends in foliar N and P concentrations and the influence of N deposition in European beech (Fagus sylvatica), Norway spruce (Picea abies) and Scots pine (Pinus sylvestris) on more than 180 plots. Within the period 1993 to 2015 foliar nitrogen concentration in beech and spruce decreased, but slightly increased in pine. Foliar phosphorus in beech and spruce also showed a decreasing trend, whereas it remained relatively stable in pine. Following the critical ranges for foliar element ratios defined in the literature, the comparison of foliar nitrogen concentrations between the periods 2000 - 2005 and 2010 - 2015 revealed a decreasing number of plots within the deficiency range for spruce and pine but an increasing one for beech. During the same time, the number of plots in the surplus range decreased (beech, pine) and slightly increased for spruce. In the case of phosphorus, smaller differences between the two time periods were found. In beech the number of plots within the surplus range decreased, in spruce it stayed the same and in pine the number slightly increased. The number of plots in the deficiency range only changed in spruce showing an increased number of plots. The measurements in N deposition over the period 2000 - 2015 revealed substantial reductions, however, most ICP Forests plots are still at risk of eutrophication effects since N deposition levels are above critical values. It was found that depending on site conditions and tree species, N deposition can have an increasing or decreasing effect on foliar nutrient concentrations depending on N deposition levels. Thus, reductions in air pollution can have diverse implications for tree nutrition status.