Trends of nitrogen and sulphur deposition

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Atmospheric deposition of acidifying compounds (e.g. S), nitrogen (N) as a nutrient and base cations (e.g. Ca) to forests is a major driver for many processes in forests. In Europe, various measures have been taken to reduce S and N deposition since the late 1980ties. Trend analyses are regularly performed based on measurement in open field by EMEP and in forests by ICPForests. However, various trend analyses techniques are in use.

In this study the trends of bulk and throughfall N and S deposition on ICP-Forests level II sites have been investigated. Sulphur deposition showed a decreasing trend from 2001 to 2010 that has been identified to be significant for the majority of the about 50 sites with continuous data (linear regression, 95% sign. Level). The mean thoughfall of these sites decreased from about 12 kg S $ha_{-1} a_{-1}$ in 2001 to about 6 kg S $ha_{-1} a_{-1}$ (about 6% a_{-1}). For N this value decreased from about 15 kg N $ha_{-1} a_{-1}$ to about 12 kg N $ha_{-1} a_{-1}$ (about 2.5% a_{-1}), however, decreasing trends were identified to be significant for much fewer sites. In order to estimate the minimal detectable trend, p-values were plotted against the relative slope. Most p-values were in a similar bell-shaped band for time series with the same length for most ions. For time series with 10 years S deposition data, the band falls below 0.05 at relative slope larger than about 3% a_{-1}. With 6 years of data, relative slopes need to be larger to reliably attain $p<0.05$.

Further, we will compare linear regression and Seasonal Mann-Kendall techniques and discuss common patterns in the long-term and short-term evaluation of the deposition.