Project Database of ICP Forests
PROJECT DESCRIPTION

PROJECT INFORMATION

Project title: Eclaire. Empirical assessment of the impacts of ozone, nitrogen and sulphur deposition on forest growth

Project ID: 15

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PROJECT DESCRIPTION

The Project 'Empirical assessment of the impacts of ozone, nitrogen and sulphur deposition on terrestrial carbon and greenhouse gas balances' is part of the EU-Project ECLAIRE

Its Aim is to undertake an integrated analysis of existing datasets, augmented by additional measurements at experimental sites where required, to derive widely applicable quantitative relationships between N, S and O_3 exposure and ecosystem carbon balance, accounting for differences in climatic data.

The datasets to be included are key monitoring and survey datasets at European scale (ICP Forest Level II, ICP Integrated monitoring and ICP Vegetation. This implies follow up work on a previous model approach using ICP forests data for five years, including ozone and growth data for longer periods (15 year instead of 5 year) and adding data from ICP integrated monitoring and ICP vegetation.

For these empirical-based assessments two model approaches are envisioned:

1. Solberg's approach (see Solberg et al. 2009): Use stand height and stand age and yield tables to obtain the expected growth in volume (indicator of site index of the past growth conditions: requirements: +/- even-aged mono species stands). Obtain the expected growth using site index, stand age and density and model the residuals against environmental factors (deposition, air pollutants, climate): advantage are: no stand condition (for example soil nutrients etc.) variables needed as they are already included in the site index, disadvantages are: changing environmental conditions (for example N depositions) may have already affected the site index, yield tables may not be reliable.

2. Multivariate approach:
a) stand level approach: use all available variables, including site factors such as soil data etc and test for significant factors and interactions (site index would be stand height at a given

age). Advantages are: no yield tables needed, saves preparation time, disadvantages are: confounding effects between site and environmental changes not clearly distinguishable; again even-aged and more or less-mono species stands.

b) individual tree approach (Labhann et al. 2009): use mixed-effect models, include individual tree size, inter-tree competition variables, stand density and all site factors and environmental factors. Advantages are: no age needed, mixed, multi-aged stands are needed, disadvantages are: tree numbering at both time steps required, interpretation more difficult than in 1.

Data needs

In order to undertake the above evaluations we intend to use the following data of ICP Forests:

Forest Growth data of Level II plots:

- Plot data: date of assessments, growth plot size, events such as 'thinnings', mortality, fertilization etc.
- tree individual data: species, dbh, tree height, removal code
- Soil and soil solution data: nutrient contents: Mg, K, P, Ca, N, C/N ratio in top soil and in organic layer
- Foliar analysis data: nutrient concentrations: Mg, K, P, N, Ca, S
- Deposition data: bulk deposition and throughfall data to assess annual deposition of total N, Ammonium, Nitrate, Sulphur, Ca, Mg, K
- Meteorological data: monthly mean temperature, monthly precipitation sum,
- Air quality: daily NOx, Ozone concentrations