



## Biogeochemistry of Irish forests

### PROJECT TEAM

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### BACKGROUND

The Irish landscape has undergone a unique transition from being virtually treeless to supporting a highly productive, intensively managed forestry sector over the last six decades. These plantations are distinctly different from the naturally regenerated and long-established managed forests of most of Europe and North America. Understanding ecosystem processes in plantation forests is a key to sustainable forest management. In recent

decades, we have become more aware of the interaction of the forest with the atmosphere, the soil and surface waters. The need now is to understand the long-term implications of these interactions.

### OBJECTIVES

- Quantify major nutrient pools and fluxes at Irish forest monitoring plots.
- Develop tools supporting sustainable forest management assessment.
- Quantify concentrations and long-term trends of atmospheric ammonia and solutes in deposition, throughfall and soil water.
- Model soil-water percolation, nutrient nitrogen and mineral weathering rates.

### PROGRESS

Final field equipment was installed during January 2009, for monitoring of deposition chemistry, persistent organic pollutants and soil nutrient contents. Additional soil and vegetation samples were collected during June 2009. Ambient trace-gas monitoring stations has been ongoing for  $\text{NH}_3$ ,  $\text{SO}_2$  and  $\text{NO}_x$  at the three intensive forest

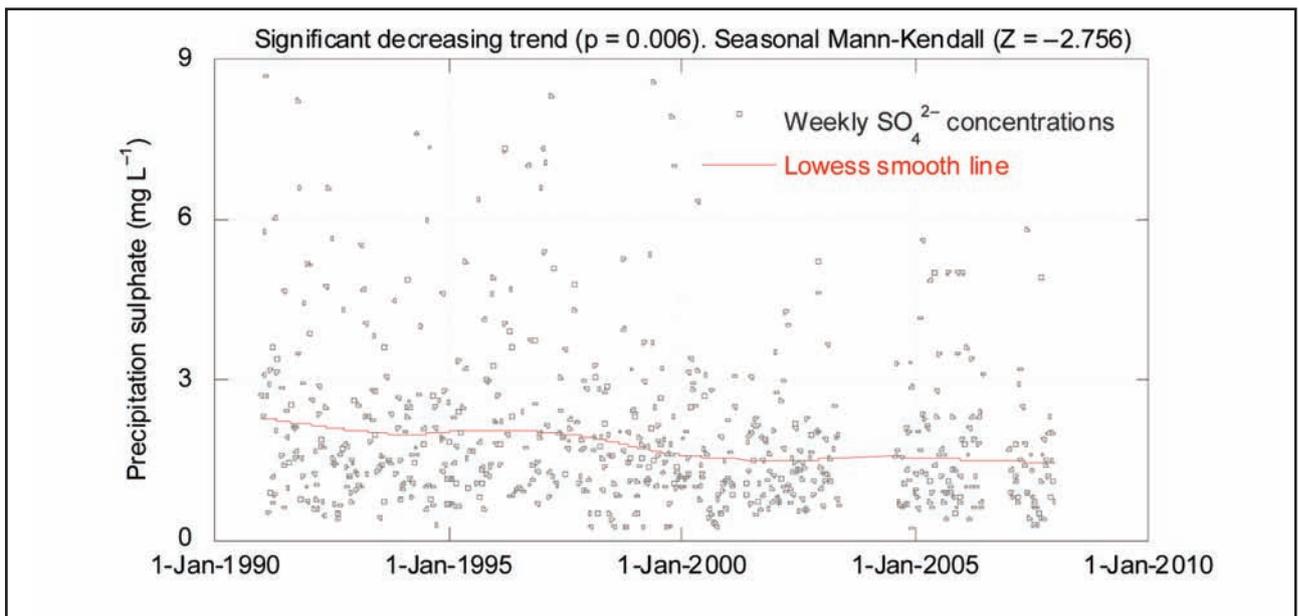


Figure 1: Weekly observations of sulphate ( $\text{mg L}^{-1}$ ) in precipitation at Roundwood and Ballinastoe from 1991 to 2007 (Ballinastoe since 2004 after felling of Roundwood). A Lowess smooth line for the observations is also shown. The seasonal Mann-Kendall test indicates a significant decreasing trend of sulphate.

monitoring plots, and the sampler in use has been part of an international intercomparison. Innovative ion-exchange-resin samplers for throughfall and soil solution are being tested, and may lead to a low cost, long-term sampling approach that could facilitate deposition and soil-solution monitoring at remote sites to be visited only once per year, while greatly increasing the spatial resolution of deposition data. Database development is ongoing, and a data quality review has been initiated. Analysis of long-term trends in monitoring data is underway, using the non-parametric Mann-Kendall test. Indications are that significant long-term trends are present, notably in sulphur, which shows a decrease consistent with known reduced emissions from coal across Europe.

During July 2009, the second meeting of the project advisory group was held. The PhD work at Trent University is ongoing. Research presentations were given at the BIOGEOMON, LSW and EFI conferences.

#### **ACTIVITIES PLANNED**

- Final Advisory Group Meeting, July 2010.
- Write-up of PhD thesis.
- Forest Ecosystem Monitoring Network Workshop, 4–5 March 2010.

#### **OUTPUTS**

Input to curriculum development and teaching: case study on forest biogeochemistry for new UCD course Soil Science Applications, utilising Level 2 site Ballinastoe. Manuscripts submitted to *Soil Science and Biogeochemistry*.