ICP Integrated Monitoring of Air Pollution Effects on Ecosystems – ICP IM

Current issues, achievements & priorities 2019-2020

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Policy

Modelling

Complexity

Validation

Application

Global m
policy rel

Catchment scale

pecific

Data requirement

Monitoring

Statistics

Assessment

Research intensity

IM

Other ICP:s

Regional monitoring

(Inter-) National monitoring

Number of sites

Complexity

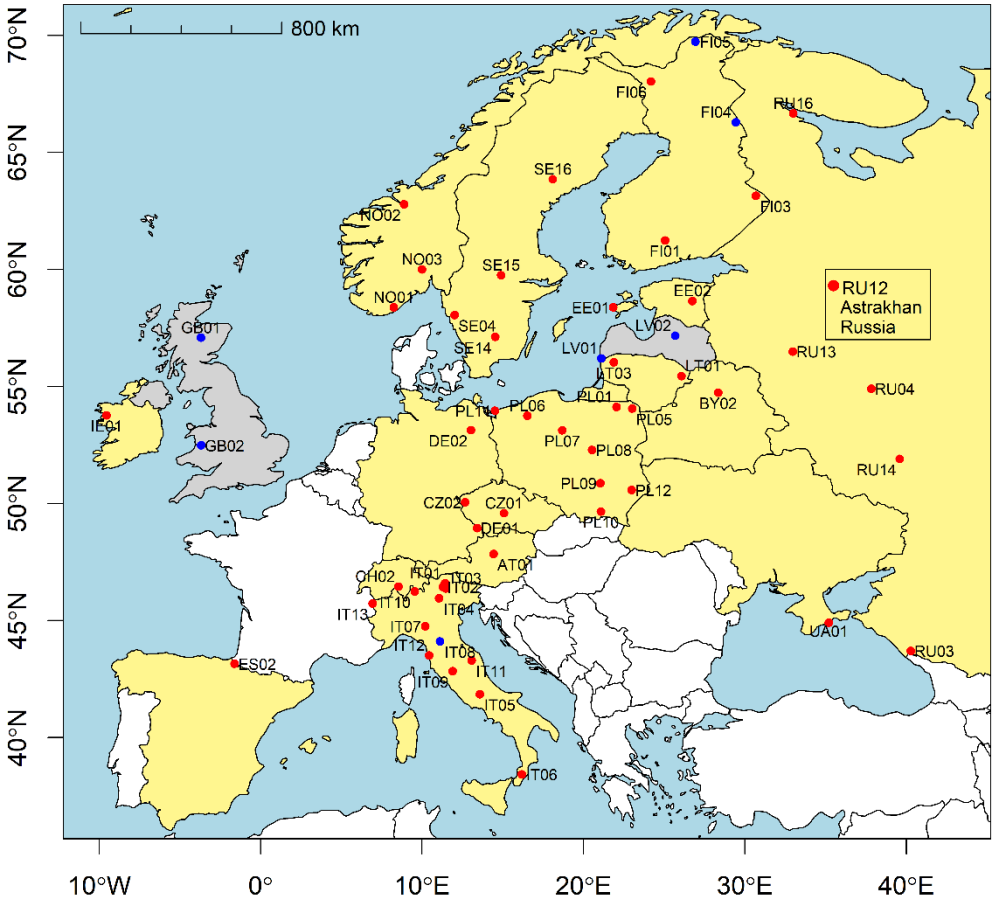
Process under-standing

Regional Temporal predictions

Momentary empirical status

Spatial coverage

Integrated monitoring sites, May 2019



16 active countries

2 inactive

49 active sites

7 inactive sites

Increase from 44 active sites in 2018!

Room for further enlargement in Europe

Integrated Monitoring: Key tasks

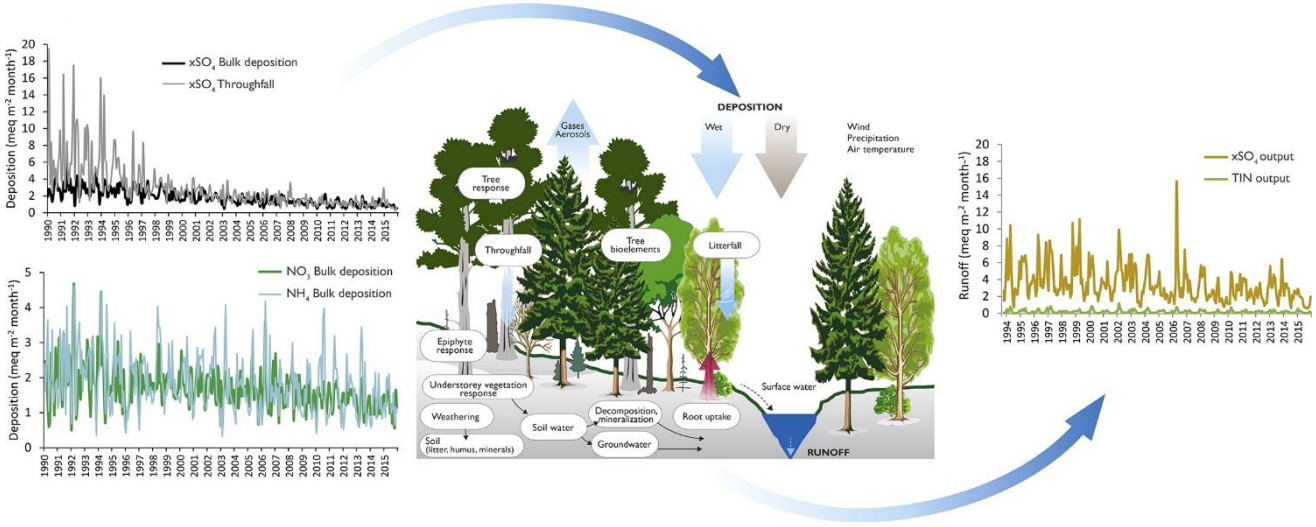
- Assessment of **concentrations, pools and fluxes** of sulphur and nitrogen compounds and heavy metals
- Trend analysis of **bulk and throughfall deposition** and runoff water chemistry
- Assessment of **ecosystem responses** using biological data
- Dynamic modelling and assessment of the **effects of emission/deposition scenarios**, including confounding effects of climate change processes
- Calculation of (site-specific) **critical loads** for sulphur, nitrogen and heavy metals
- Links between **critical load exceedance and empirical impact indicators**

Examples from recent studies

- Analysis of long-term trends
- Dynamic modelling, pH and BS
- Dynamic modelling, vegatation

Highlights, Vuorenmaa et al. 2018

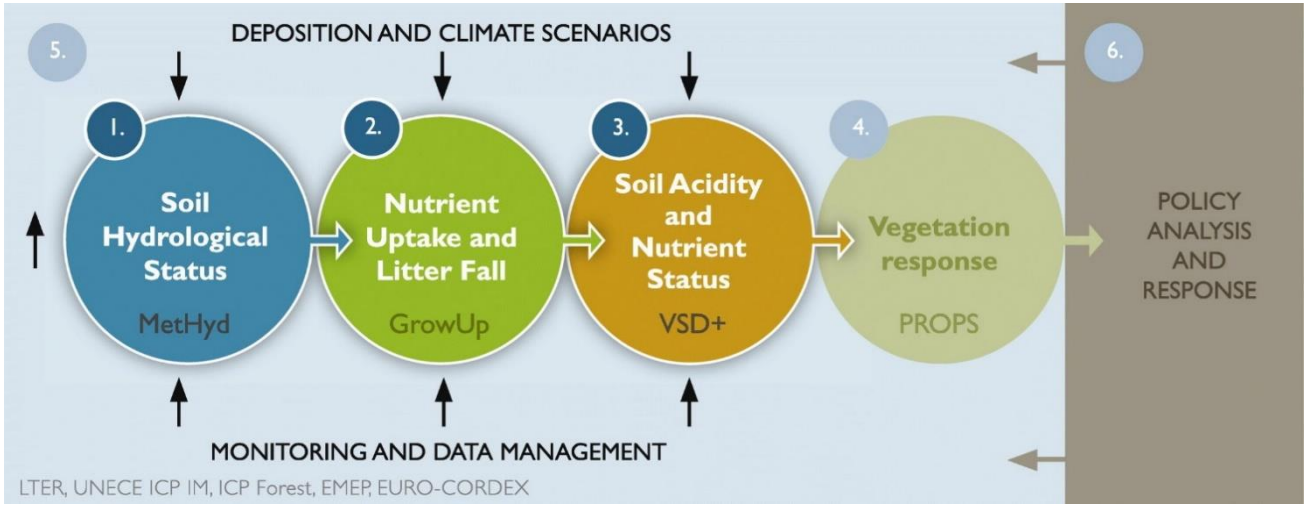
- Trends in runoff fluxes of SO_4 have increasingly responded to the decrease in S emissions.
- Trends in NO_3 concentrations in deposition and runoff are predominantly decreasing.
- Trends in inorganic N output fluxes are still highly variable.
- Variation of SO_4 in runoff was most powerfully explained by deposition pattern.
- No clear signs of a consistent climate-driven increase in inorganic N loss in forest catchments.

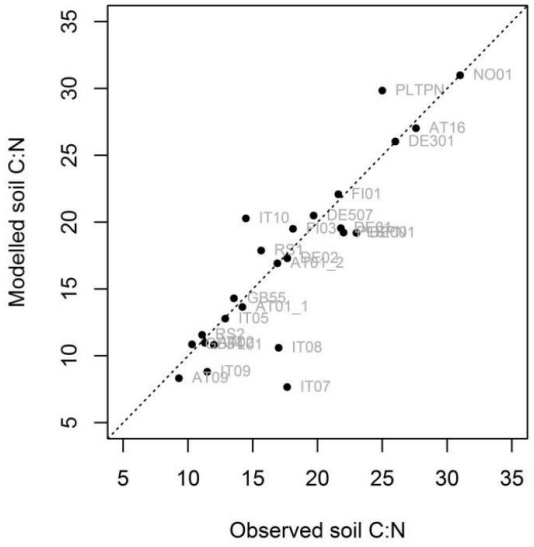


Long-term changes (1990–2015) in the atmospheric deposition and runoff water chemistry of sulphate, inorganic nitrogen and acidity for forested catchments in Europe in relation to changes in emissions and hydrometeorological conditions. STOTEN 625: 1129-1145

Highlights, Holmberg et al. 2018

- VSD+ dynamic soil model was applied at diverse LTER-Europe sites.
- Data from LTER, UNECE ICP IM and ICP Forest networks.
- Soil pH and BS were projected to increase under decrease in S, N deposition.
- Simulations with climate warming gave more variable results.
- Climate warming led to higher soil C:N at half of the sites, lower at one third.



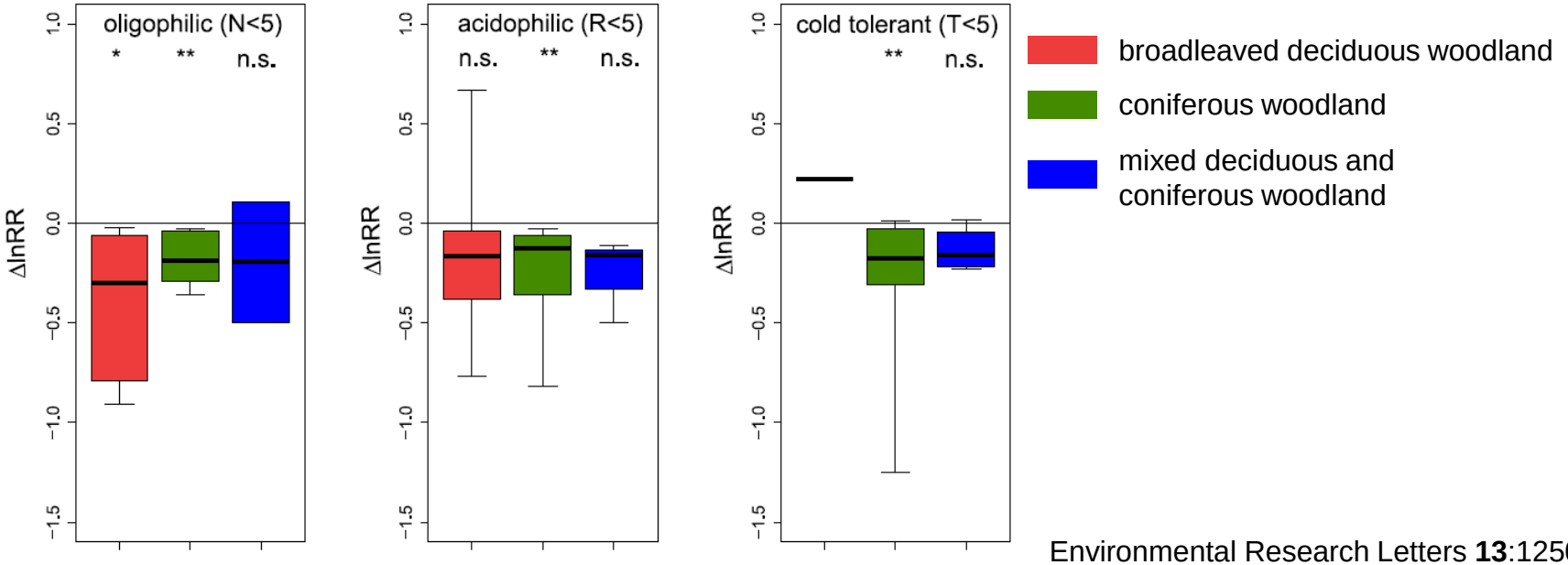


Modelling study of soil C, N and pH response to air pollution and climate change using European LTER site observations. Holmberg et al. 2018, Science of The Total Environment, 640-641:387-399

Highlights, Dirnböck et al. 2018

Currently legislated decreases in nitrogen deposition will yield only limited plant species recovery in European forests

The model indicate that oligophilic forest understory plant species will continue to decrease



Environmental Research Letters **13**:125010

Cooperation with LTER Europe

Many IM sites are also LTER sites – natural connection

- In 2018 LTER Europe was included on the ESFRI Roadmap for recognised infrastructures for important research in Europe.

- Discussions about a formal cooperation between WGE and eLTER has started

2020-2022 Work Plan

- Discussions initiated for next work plan
- On the agenda for the IM TF