Activities of ICP Forests

Report to the joint Task Force Meeting of ICP Waters and ICP IM

Joint 34th TFM ICP Waters and 26th TFM ICP IM

Walter Seidling, Anne-Katrin Prescher, Andreas Schmitz
Thünen Institute of Forest Ecosystems

TFM 2018, 6-9 May 2018
Warsaw/Poland

ICP Forests member states

42 participating countries
(32 sent data or national reports in 2016)

- 27 EU member states

- 8 EECCA/SEE states
  - Albania
  - Belarus
  - Macedonia
  - Moldova
  - Montenegro
  - Russian Federation
  - Serbia
  - Ukraine

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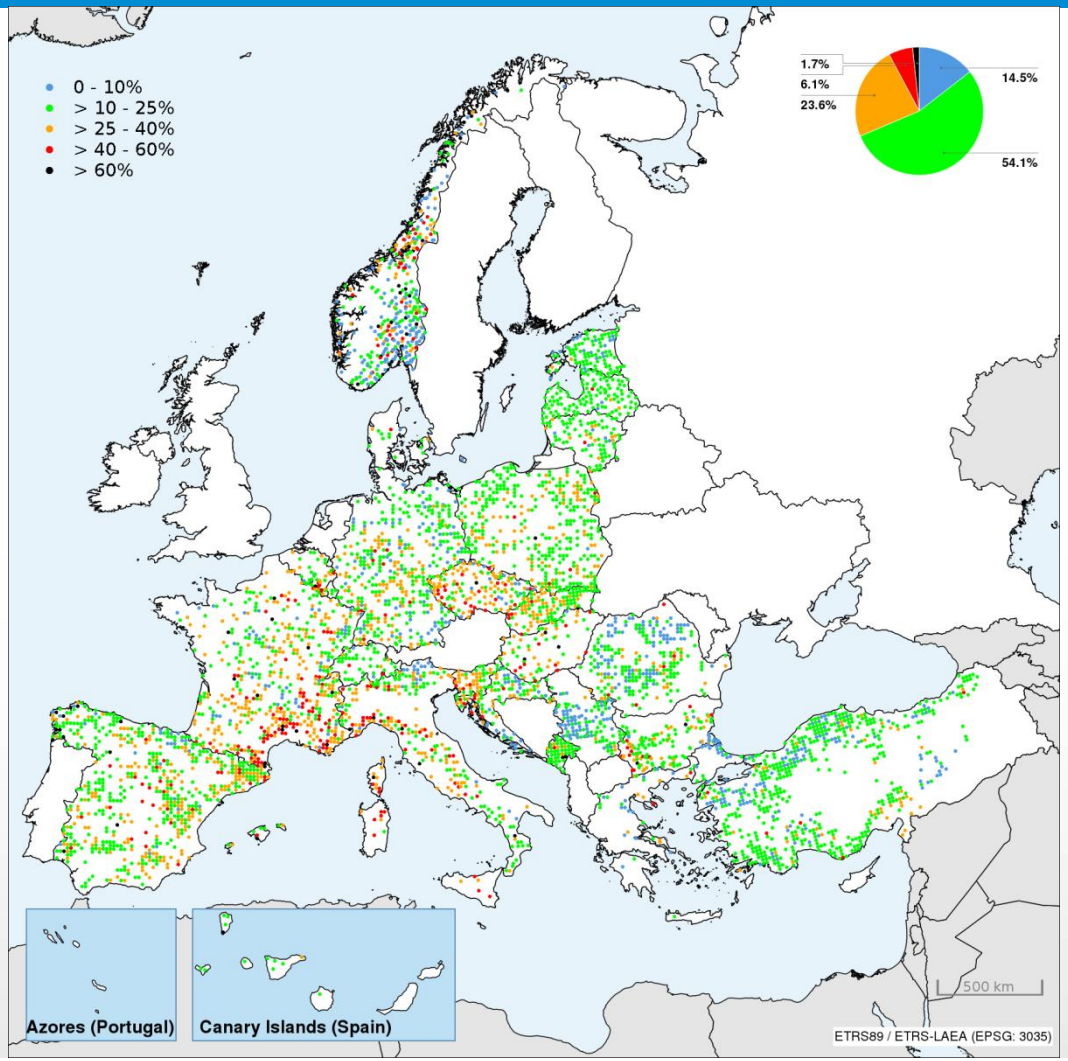
Large-scale extensive forest monitoring: Level I

- Annual survey
  - **Crown condition**
- Every 10-15 years
  - **Foliar chemistry**
  - **Soil condition solid phase**

> 5,500 plots (2016),
16 x 16 km transnational grid
or national NFI grid



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Intensive monitoring: Level II

Intensive Forest Ecosystem Monitoring (Level II)

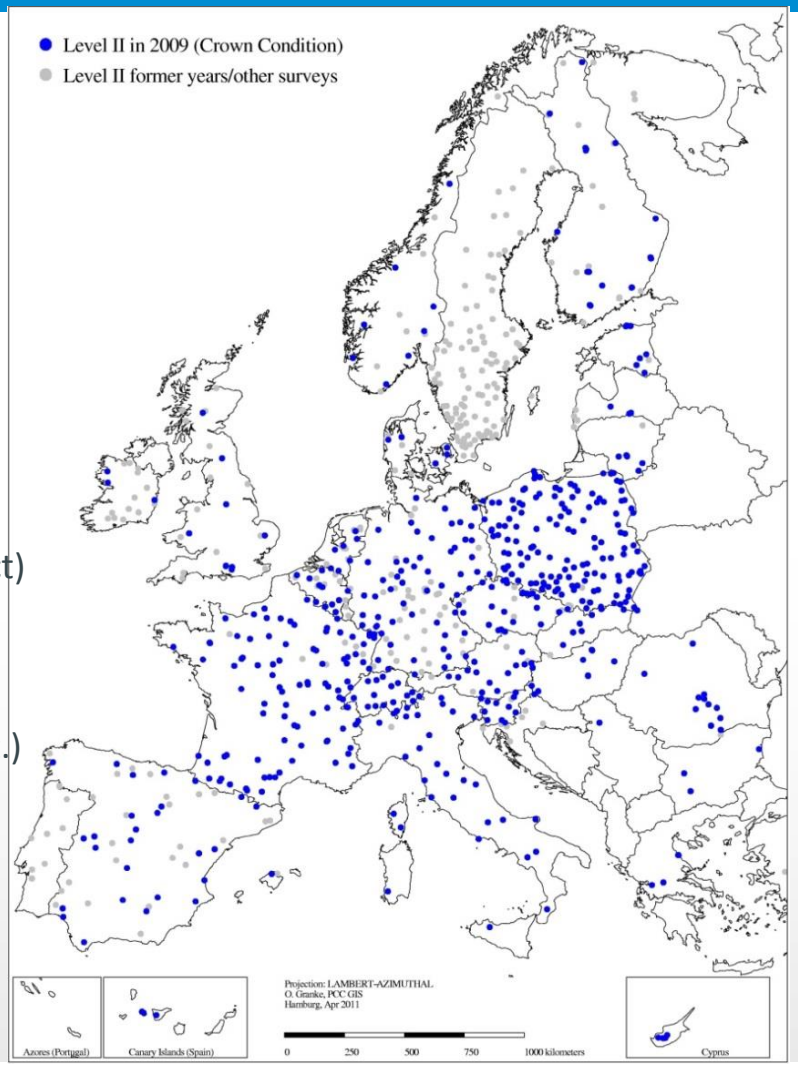
- Cause-effect relationships between the condition of forest ecosystems and anthropogenic and natural stress factors

Standard plots

- **Crown condition** (ann.)
- **Deposition** (cont.)
- **Foliar chemistry** (2 yrs.)
- **Ground vegetation** (5 yrs.)
- **Meteorology** (cont.)
- **Soil condition** (10-15 yrs.)
- **Tree growth** (5 yrs.)

Core plots (additional surveys)

- **Air quality** (cont.)
- **Ground veg. biomass** (project)
- **Litterfall** (cont.)
- **Ozone induced injury** (cont.)
- **Phenology** (several per year)
- **Soil solution chemistry** (cont.)
- **Soil water** (cont.)
- **Tree growth** (annually)



- Max. 590 plots (2015), selected for their relevance

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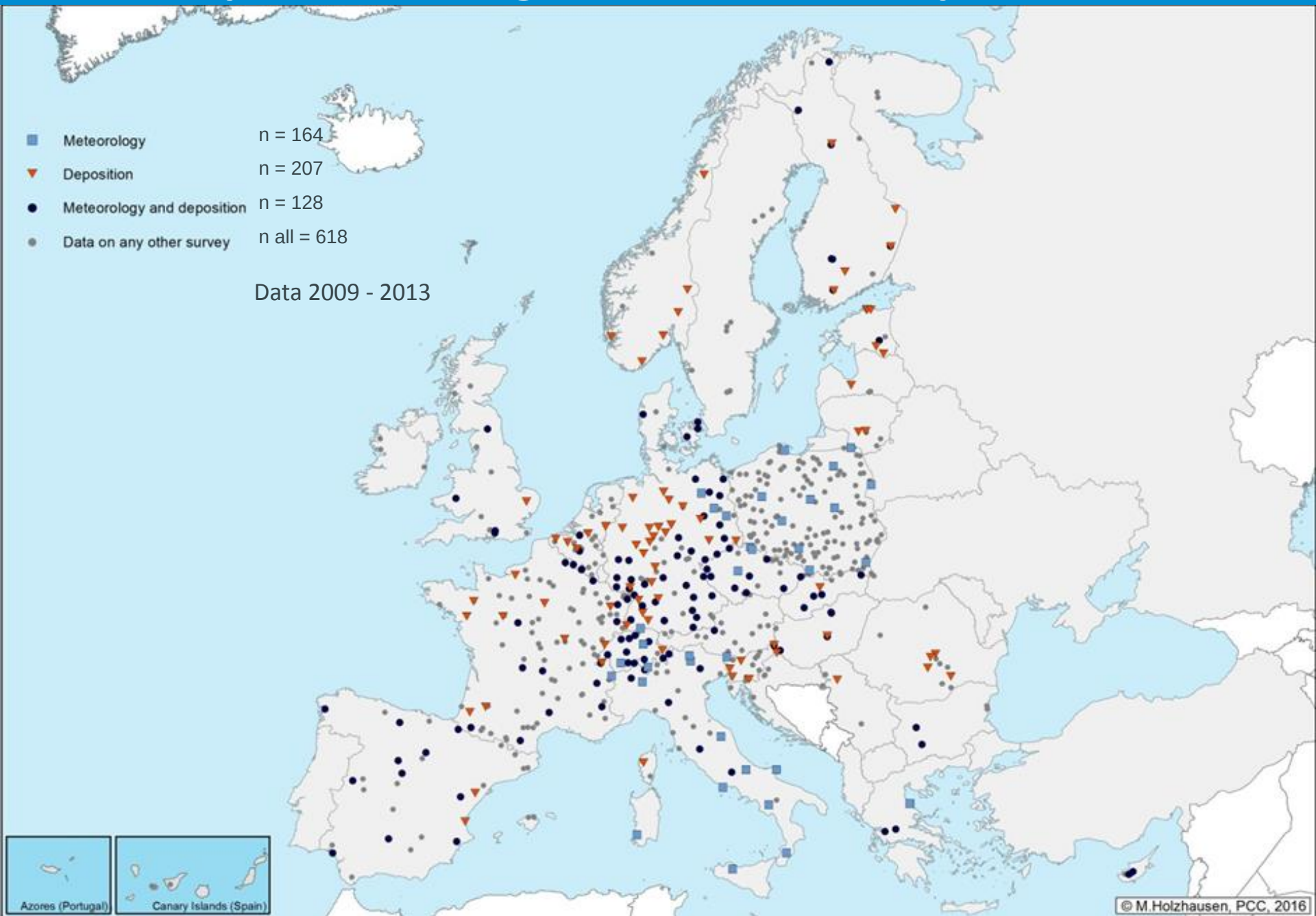
Level II plots focusing on meteo and deposition data



Co-location with activities of other ICPs at Level II sites: mutual benefits can be expected

ICP IM	ICP Vegetation: moss survey	ICP Waters	LTER / E-LTER	LTER / E-LTER proposed
42 (11.7%)	69 (19.2%)	37 (10.3%)	81 (22.6%)	9 (2.5%)

Tab. 2.4: Co-location or co-operation with infrastructure of other ICPs of 358 active Level II plots; information according to an inquiry among NFCs of ICP Forests in autumn 2015, with a response rate of 57%.

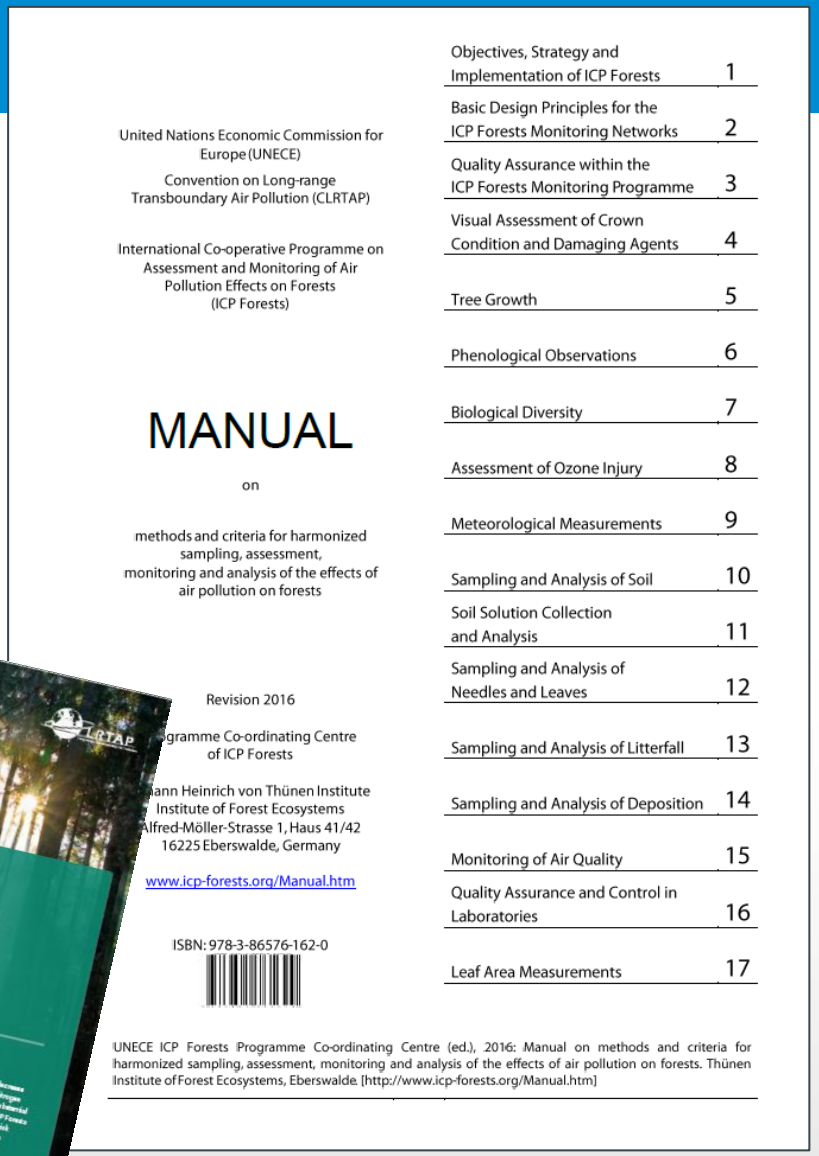
> Workplan 2018/19 for all WGE members: Analyse effects monitoring network within WGE to improve integrated working and reporting

ICP Forests Manual – update 2016/17 / Reporting

The Manual has been revised 2016/17

http://icp-forests.net/page/icp-forests-manual

ICP Forests Reporting



United Nations Economic Commission for Europe (UNECE)

Convention on Long-range Transboundary Air Pollution (CLRTAP)

International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests)

MANUAL

on

methods and criteria for harmonized sampling, assessment, monitoring and analysis of the effects of air pollution on forests

Revision 2016

...gramme Co-ordinating Centre
of ICP Forests

...ann Heinrich von Thünen Institute
Institute of Forest Ecosystems
...lfred-Möller-Strasse 1, Haus 41/42
16225 Eberswalde, Germany

www.icp-forests.org/Manual.htm

ISBN: 978-3-86576-162-0

UNECE ICP Forests Programme Co-ordinating Centre (ed.), 2016: Manual on methods and criteria for harmonized sampling, assessment, monitoring and analysis of the effects of air pollution on forests. Thünen Institute of Forest Ecosystems, Eberswalde. [http://www.icp-forests.org/Manual.htm]

Objectives, Strategy and Implementation of ICP Forests 1
Basic Design Principles for the ICP Forests Monitoring Networks 2
Quality Assurance within the ICP Forests Monitoring Programme 3
Visual Assessment of Crown Condition and Damaging Agents 4
Tree Growth 5
Phenological Observations 6
Biological Diversity 7
Assessment of Ozone Injury 8
Meteorological Measurements 9
Sampling and Analysis of Soil 10
Soil Solution Collection and Analysis 11
Sampling and Analysis of Needles and Leaves 12
Sampling and Analysis of Litterfall 13
Sampling and Analysis of Deposition 14
Monitoring of Air Quality 15
Quality Assurance and Control in Laboratories 16
Leaf Area Measurements 17

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Scientific Conference and Task Force Meeting Bucharest/Romania 2017

We thank for the kind invitation by the Romanian Ministry of Environment, Waters and Forests to host the

33rd Task Force Meeting and **6th Scientific Conference**

Bucharest, 15-19 May 2017

Workplan 2018/2019

United Nations ECE/EB.AIR/2017/1

Economic and Social Council

Distr.: General
2 October 2017

Original: English

Economic Commission for Europe

Executive Body for the Convention on Long-range Transboundary Air Pollution

Thirty-seventh session
Geneva, 11-14 December 2017
Item 7 of the provisional agenda
Draft 2018-2019 workplan for the implementation of the Convention

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2018/2019 Workplan for the implementation of the Convention (Table 1)

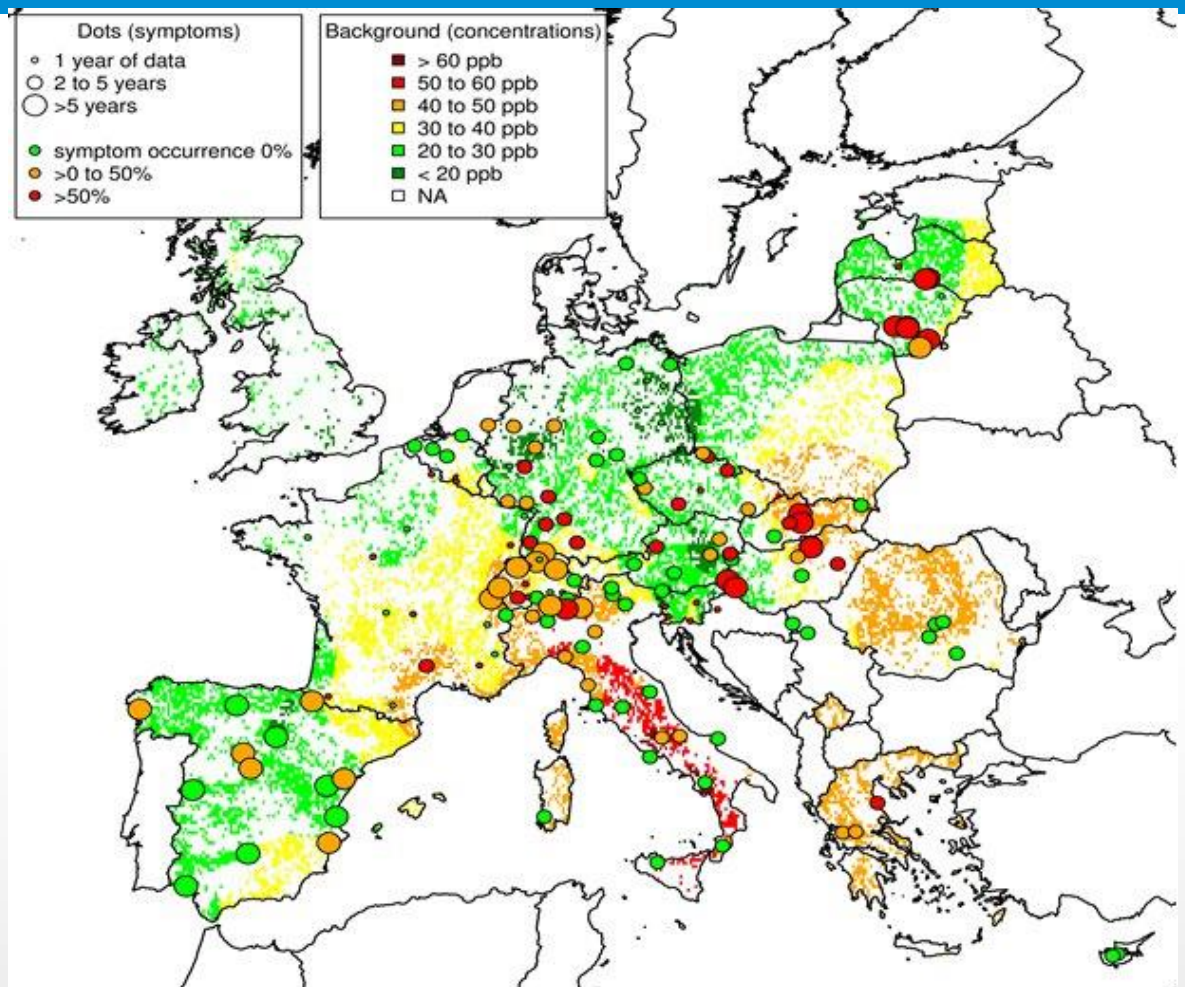
15. Work on science-policy messages and recommendations will be in the form of assessment and synthesis reports of the work by the scientific subsidiary groups prepared to identify trends and highlight policy-relevant scientific findings.

16. Science project activities in the 2018-2019 period are presented in table 1.[2]

Table 1
Science ICP Forests related selection

Workplan item	*Activity description/objective*	*Expected outcome/deliverable*	*Lead body(ies)*	*Resource requirements and/or funding source*
1.1 Improving tools to assess air pollution and its effects in the ECE region				
1.1.1 Monitoring and modelling tools				
1.1.1.19	Levels and effects of ground-level ozone in forests (continuation of monitoring ozone concentration and visible foliar injury at Level II plots according to the ICP Forests Manual)	Reports about status and trends of ozone levels and visible injury on forest trees and other forest plants at light-exposed sites	ICP Forests	Covered by recommended contributions
1.1.1.20	Integrated studies on effects of ground-level ozone on tree growth, carbon sequestration and forest health, including estimates of ozone fluxes, at least for the most important tree species	As above	ICP Forests	Funding needed

Ozone concentrations and 0_3 induced injuries



- **Seasonal mean ozone concentrations** (coloured forested areas)
- **Available survey years (size of dots)**
- **Frequency of years when species on the plot were found symptomatic (colour of dots)** during 2002-2014

Visible injury 2002-2014

- 285 woody species (26% with symptoms)
- 169 plots (55% symptomatic)
- concentrations reveal decreasing trend, but exposure remains high.

Abb. 47: Äußerlich sichtbarer Ozonschaden an einem Buchenzweig

ICP Forests activities in the field of ozone

*Vib*EuroNet

A bio-indicator approach to assess ozone impact on vegetation using *Viburnum lantana*

Elena Gottardini (Fondazione Edmund Mach, Italy),
Marcus Schaub, Marco Ferretti (WSL, Switzerland)

***Viburnum lantana* meets bioindicator requirements**

- Wide distribution
- High and documented sensitivity to the pollutant and specificity of the response
- Consistency between ozone levels and visible foliar symptoms

→ **Does it work also at larger (European) scale?**

ICP Forests Activities in the Field of Ozone

PRO3FILE

Predicting Ozone Fluxes, Impacts and Critical Levels on European Forests

Schaub M[1], Haeni M[1], Etzold S[1], Waldner P[1], Delpierre N[2], Dufrêne E[2], Christophe C[2], Ferretti M[1], Gottardini E[3], Thürig E[1], Mina M[1], *ICP Forests Experts* & NFCs[x], Gessler A[1], Rigling A[1], Cailleret M[1]

[1] Swiss Federal Research Institute WSL; [2] CASTANEA experts at CNRS, AgroParisTech, Université Paris-Saclay; [3] Fondazione Edmund Mach FEM, Italy;
[x] contributing ICPF Experts & NFCs

→ ozone related effects and critical levels on selected endpoints (e.g. tree growth)

→ by quantifying ozone fluxes, and by applying multiple and various statistical techniques

→ outputs will be validated and up-scaled in space and time

→ data sources from various networks for model calibration, validation, and application

2018/2019 Workplan for the implementation of the Convention. Table 1

continued

1.1.1.21	N deposition and its effects on forest vegetation (monitoring activities according to the ICP Forests Manual)	Reports about status and trends of N deposition in Europe, and comparison between measured and modelled N deposition rates	ICP Forests	Covered by recommended contributions
1.1.1.22	Integrated studies on N deposition effects on tree growth, carbon sequestration, biodiversity, soil and foliar chemistry or mycorrhizas	As above	ICP Forests	Funding needed
1.1.1.23	HMs in forest ecosystems: evaluation of available data to achieve an estimation of HM deposition and accumulation in soils, foliage and litterfall	Reports about status and trends of HM levels in European forests	ICP Forests	Covered by recommended contributions
1.1.1.24	Integrated studies on HMs in forests	Report on relationships of HMs in forests	ICP Forests	Funding needed

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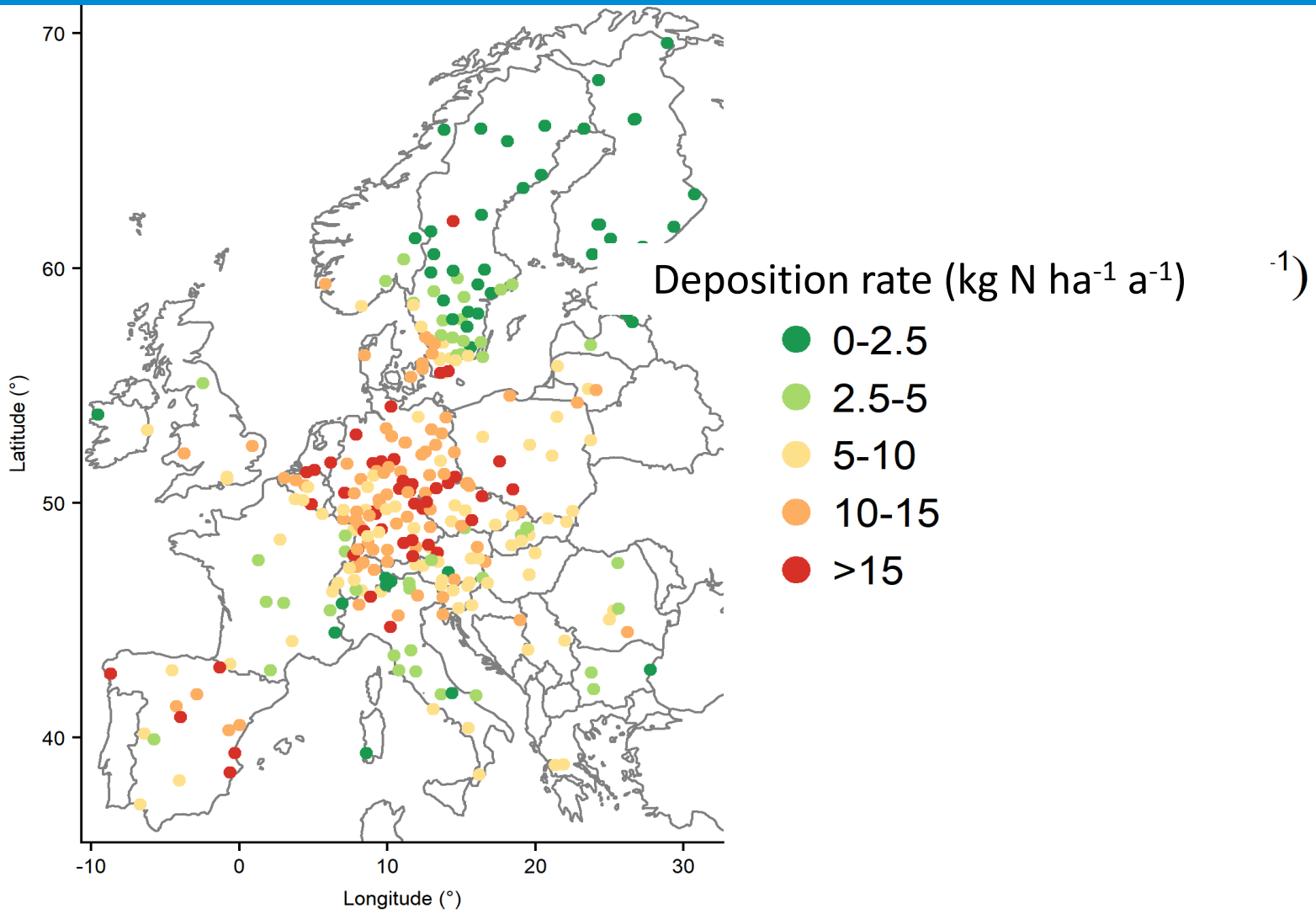
Mean N_{inorg} deposition rate 2011 – 2015: Throughfall (Draft TR2018)



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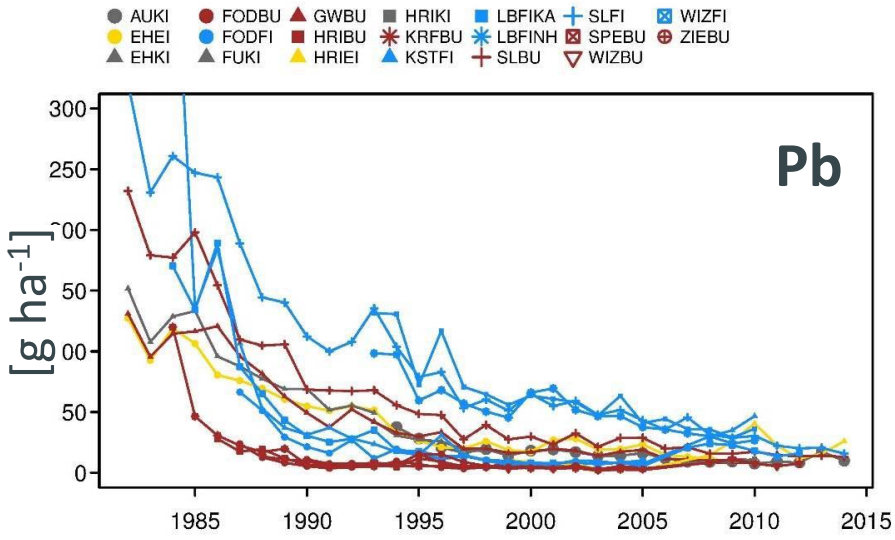
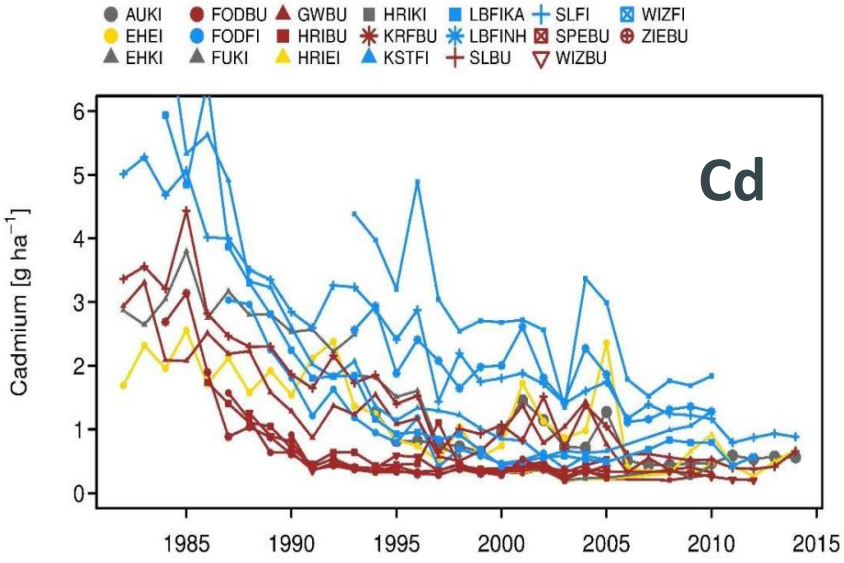
ICP Forests Activities in the Field of Heavy Metals

Long-term monitoring of heavy metal input, retention and output over the last 30 years

– Results from Lower Saxony, Hesse and North Rhine-Westphalia, Germany

Input of lead (Pb) and cadmium (Cd) with throughfall at 20 plots





from König et al. (2016)

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WGE

Geneva,

11-15 Sept. 2017

Participants from

ICP Forests:

Marco Ferretti
Walter Seidling

United Nations ECE/EB.AIR/GE.1/2017/11–ECE/EB.AIR/WG.1/2017/4

Economic and Social Council

Distr.: General
29 August 2017

English only

Economic Commission for Europe

Executive Body for the Convention on Long-range Transboundary Air Pollution

Steering Body to the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe

Working Group on Effects

Third joint session
Geneva, 11-15 September 2017
Item 3 of the provisional agenda
Progress in activities in 2017 and further development of effects-oriented activities

Effects of air pollution on forests

Progress report by the Programme Coordinating Centre of the International Cooperative Programme on Assessment and Monitoring of Air Pollution Effects on Forests

WGE Progress Report 2017: content

I	Introduction
II	Outcomes and deliverables in the reporting period
III	Expected outcomes and deliverables for the next period and in the longer term
IV	Cooperation with other groups, task forces or subsidiary bodies, notably with regard to synergies and possible joint approaches of activities
V	Strengthening the involvement of countries of Eastern and South-Eastern Europe, the Caucasus and Central Asia
VI	Scientific and technical cooperation activities with relevant international bodies
VII	Highlights of the scientific findings: policy-relevant issues
VIII	Publications

Highlights 2016/17 of the scientific findings: policy-relevant issues

1) Sánchez-Salguero et al. 2017: Analysing atmospheric processes and climatic drivers of tree defoliation to determine forest vulnerability to climate warming. Forests 8 (13), 17 p.:

- Both high foliar N and relative low foliar P concentrations are significantly fostered by N deposition;

2) Sawicka et al. 2016: Fine-scale temporal characterization of trends in soil water dissolved organic carbon and potential drivers. Ecol Indic 68: 36–51.

Sawicka et al. 2017: Modelling impacts of atmospheric deposition and temperature on long-term DOC trends. Sci Total Environ 578: 323–336.

- (Strong) influence of soil acidity status (decreasing S input) on DOC formation in soil solution (increasing) was measured and modelled

Highlights 2016/17 of the scientific findings: policy-relevant issues

3) Camino-Serrano et al. 2016: Trends in soil solution dissolved organic carbon (DOC) concentrations across European forests. Biogeosciences 13: 5567–5585

- ... coincidence between increasing DOC trends and decreasing sulphate especially in low N deposition areas

4) Jonard et al. 2017: Forest soils in France are sequestering substantial amounts of carbon. Sci Total Environ 574: 616–628.

- ... overall increase of 0.35 Mg C $ha^{-1}yr^{-1}$ was found ... 14% of this rate could be statistically explained, mainly with stand structural features

5) Meesenburg et al. 2016: Long-term changes of ecosystem services at Solling, Germany: Recovery from acidification, but increasing nitrogen saturation? Ecol Indic 65: 103–112.

- reduction of sulphur and to a lesser extent nitrogen deposition reflects efforts of international clean air policy under CLRTAP

Highlights 2016/17 of the scientific findings: policy-relevant issues

6) Van Dobben & De Vries, 2016: The contribution of nitrogen deposition to the eutrophication signal in understorey plant communities of European forests. Ecology and Evolution 7: 214–227.

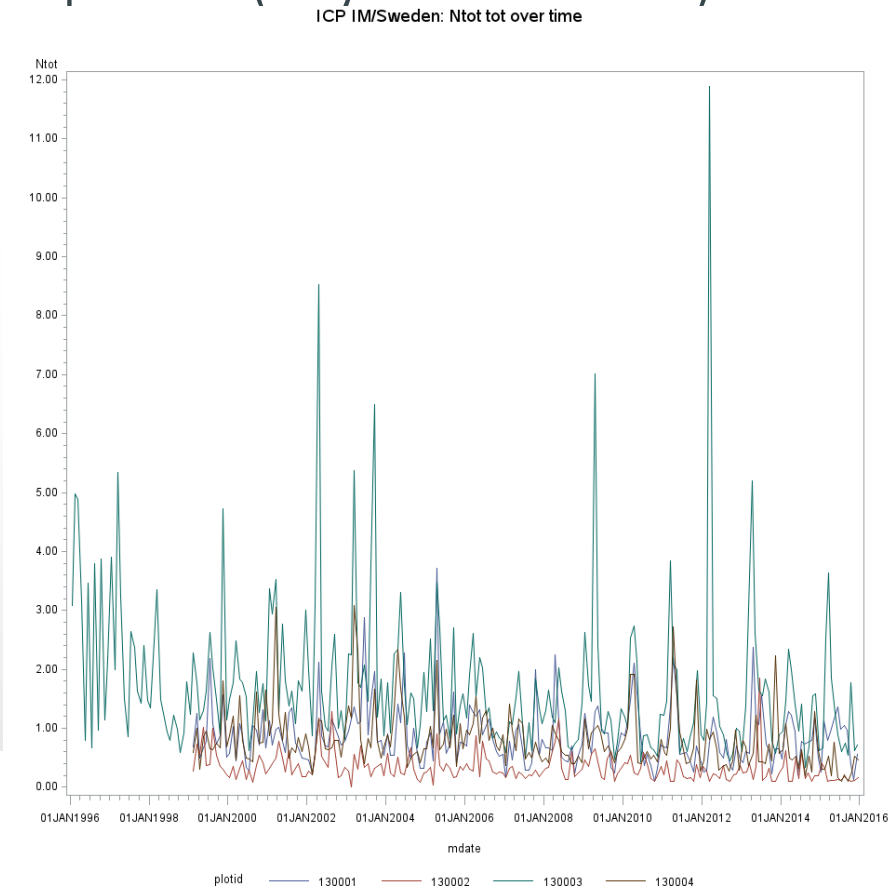
Novotný et al. 2016: Nitrogen deposition and its impact on forest ecosystems in the Czech Republic - change in soil chemistry and ground vegetation. iForest 10: 48–54

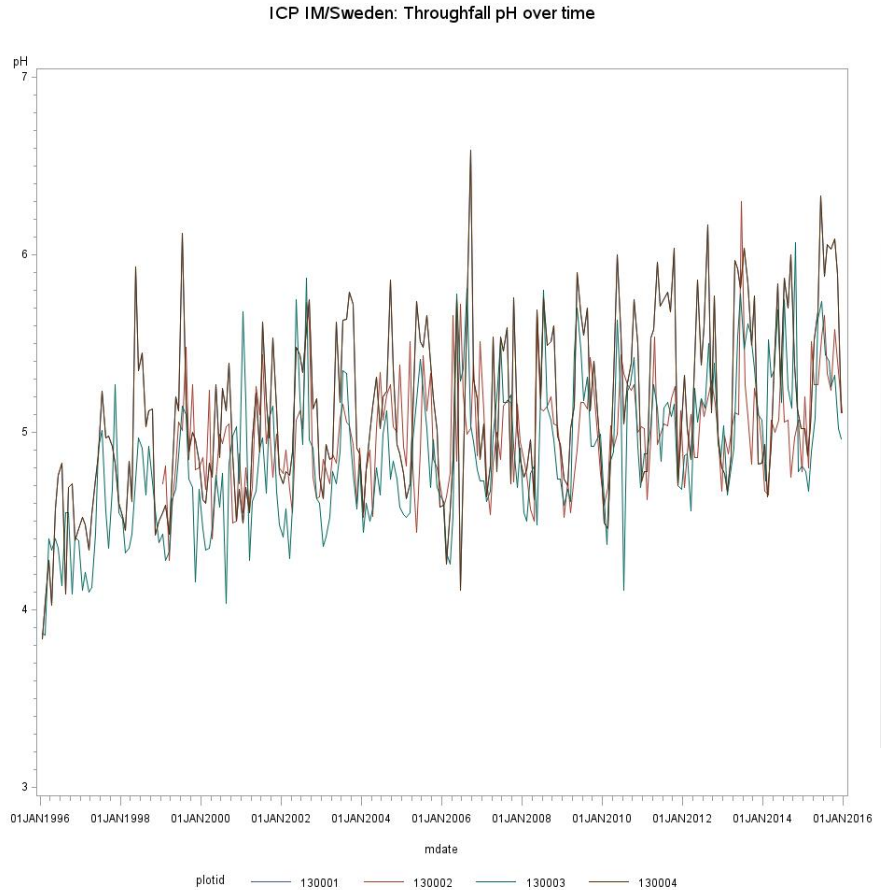
- variation is mainly determined by the 'traditional' factors related to soil type and climate, however, a significant part of the floristic composition could be ascribed to atmospheric nitrate deposition. ... selected nitrophilous species and mainly the C/N ratio (coincide).

Joint ICP Forests/ICP Integrated Monitoring project

Working title: “ICP Forests and ICP Integrated Monitoring provide detailed information enabling analyses of environmental and ecosystem changes in time and aggregations in space”

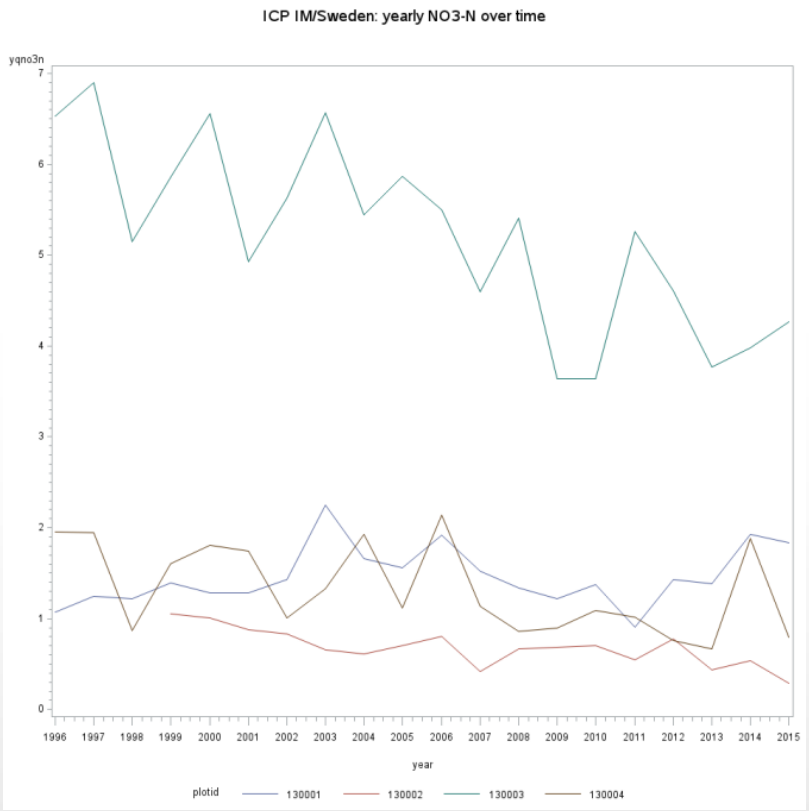
Deposition (only ICP IM Sweden)

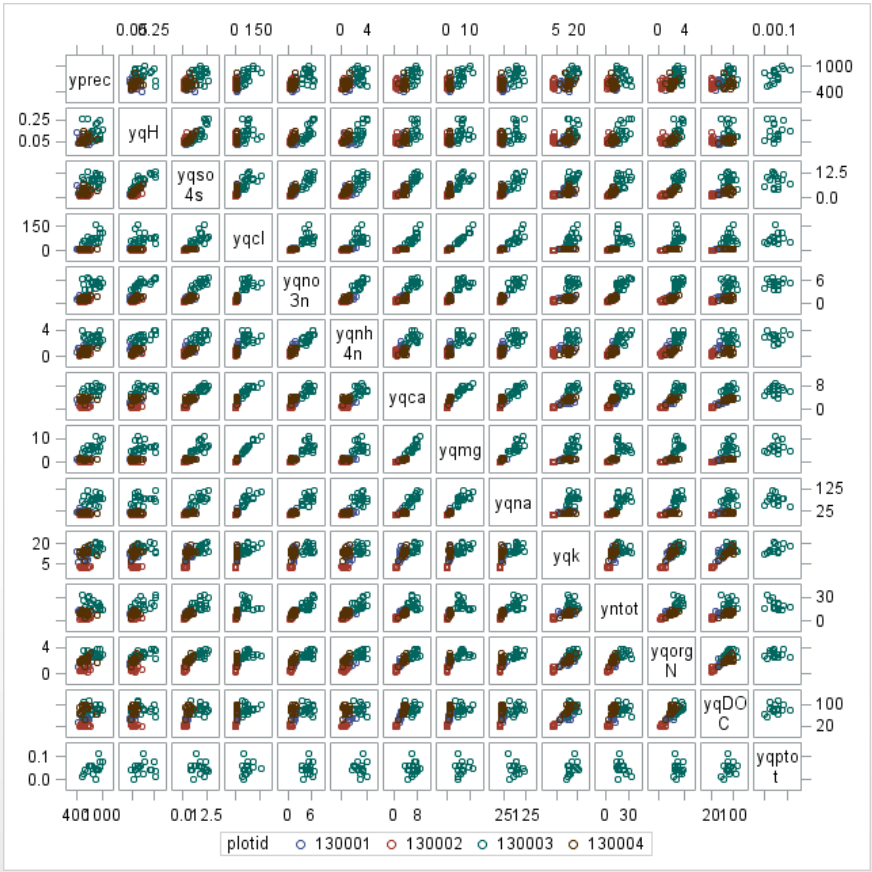




Joint ICP Forests/
ICP Integrated Monitoring project

Deposition (only ICP IM, Sweden)





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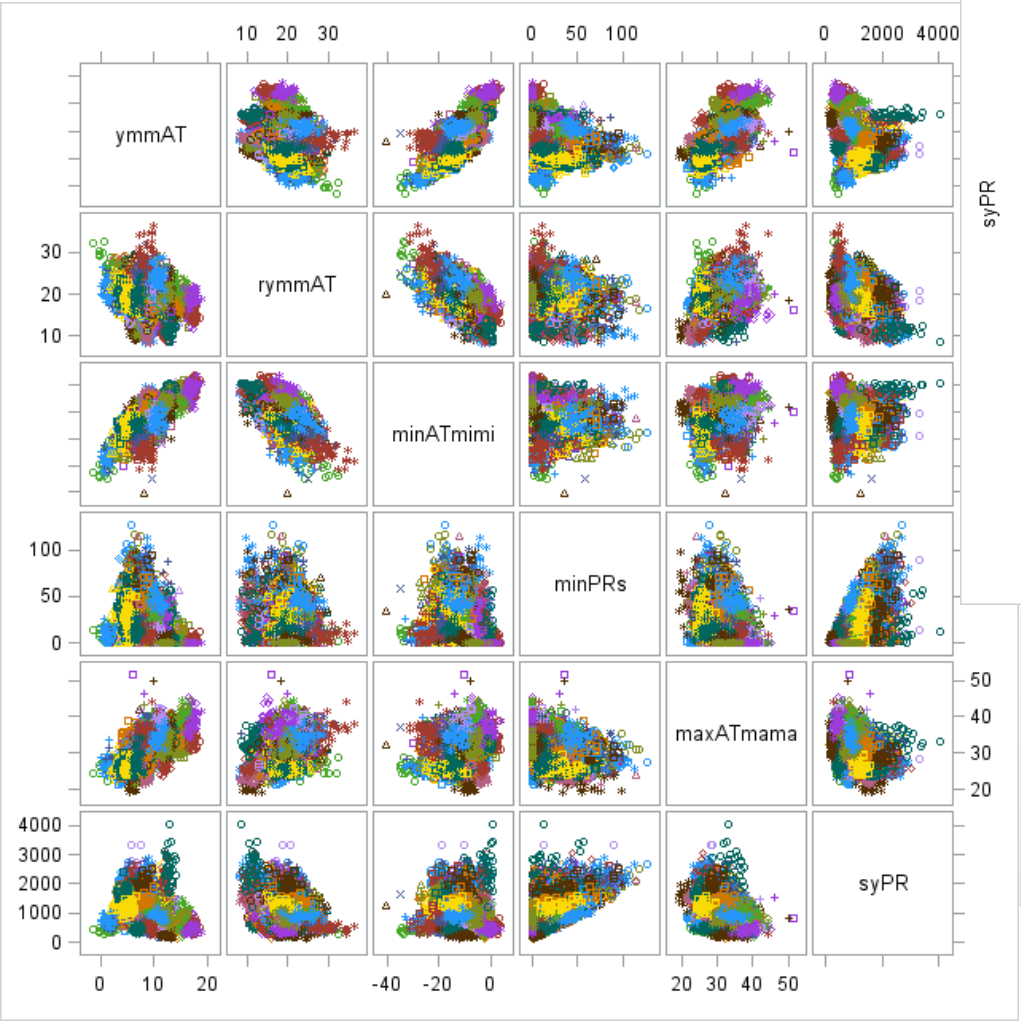
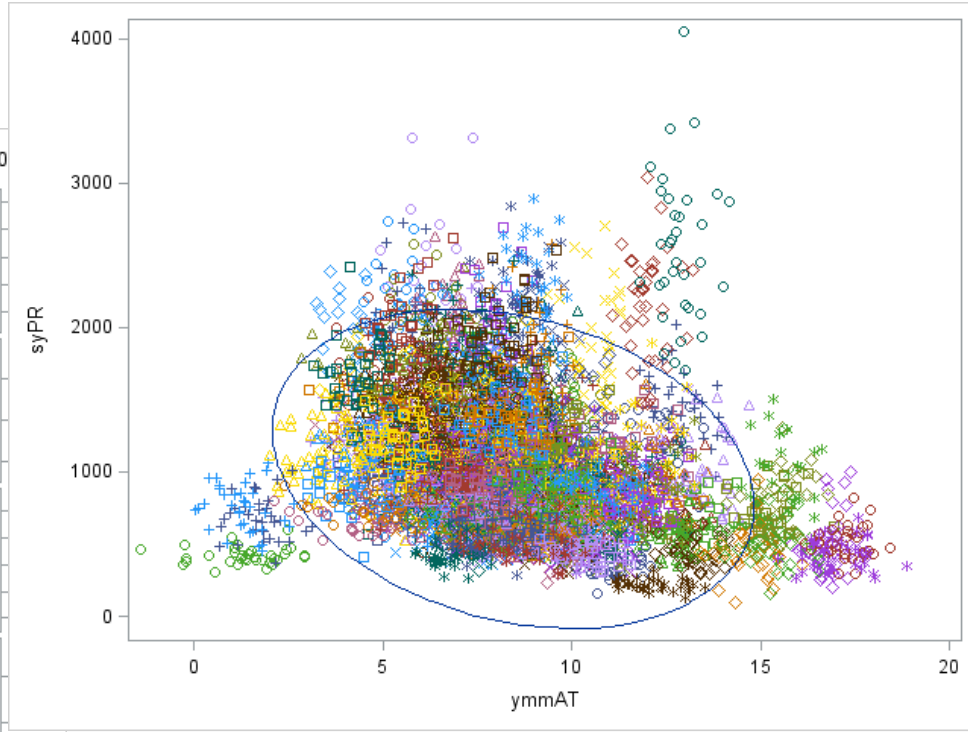
Joint ICP Forests/ICP Integrated Monitoring project

Meteo (only ICP Forests)





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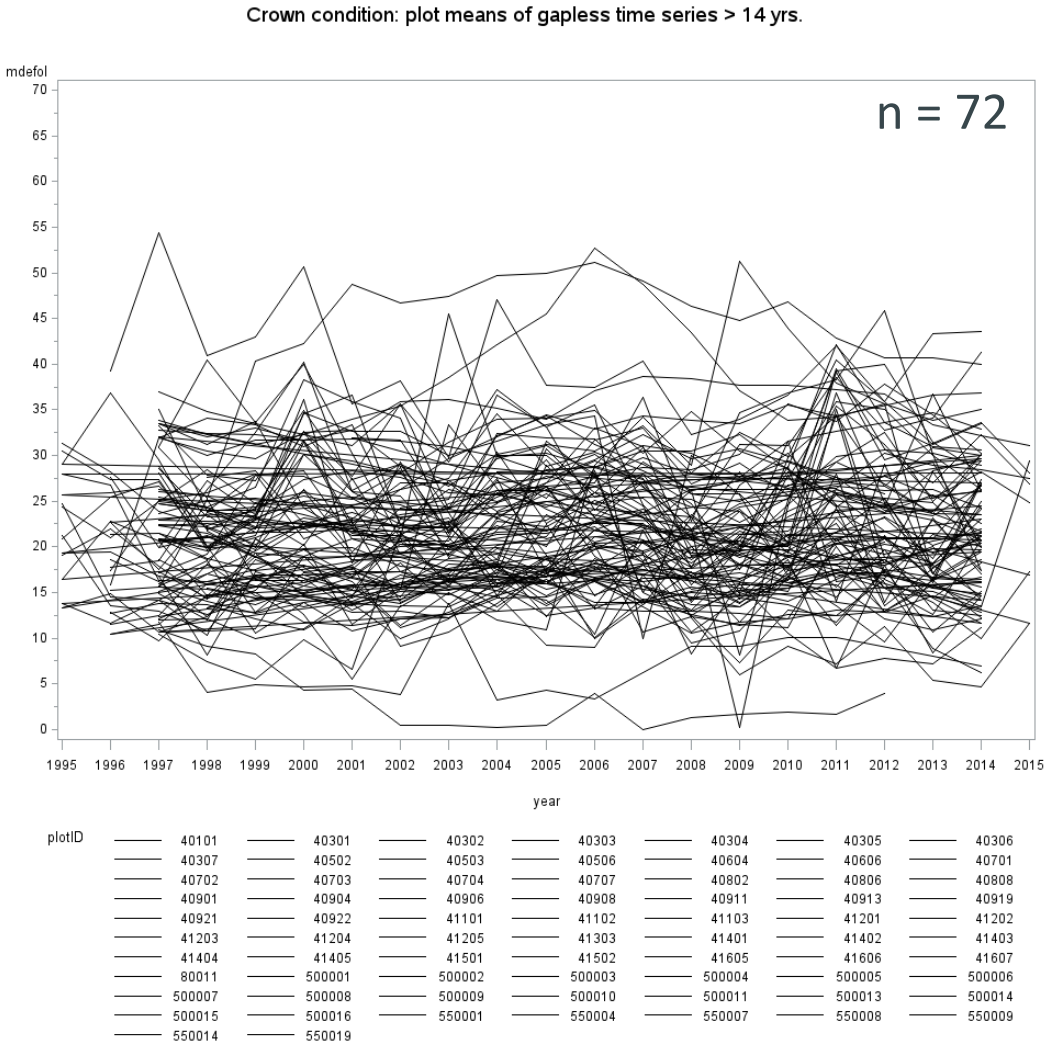
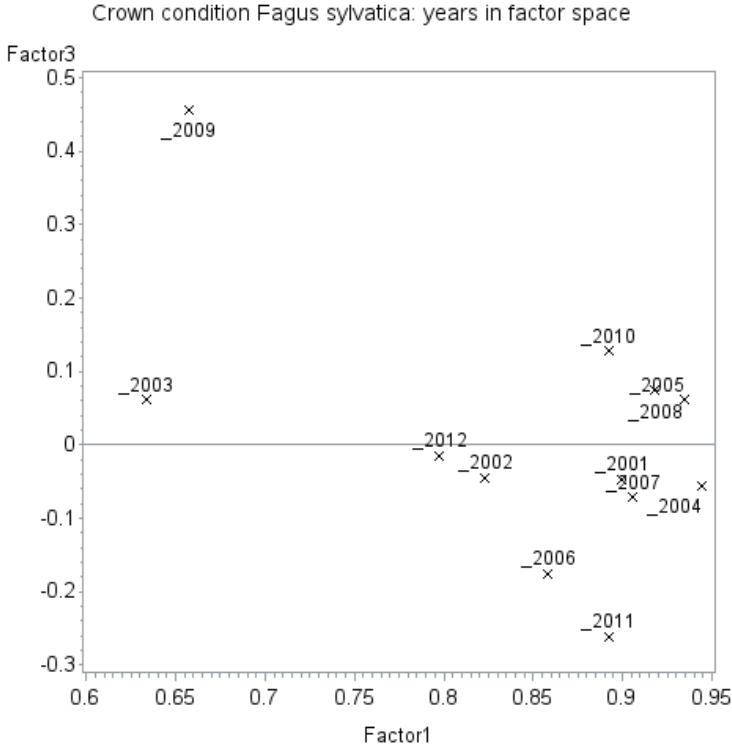
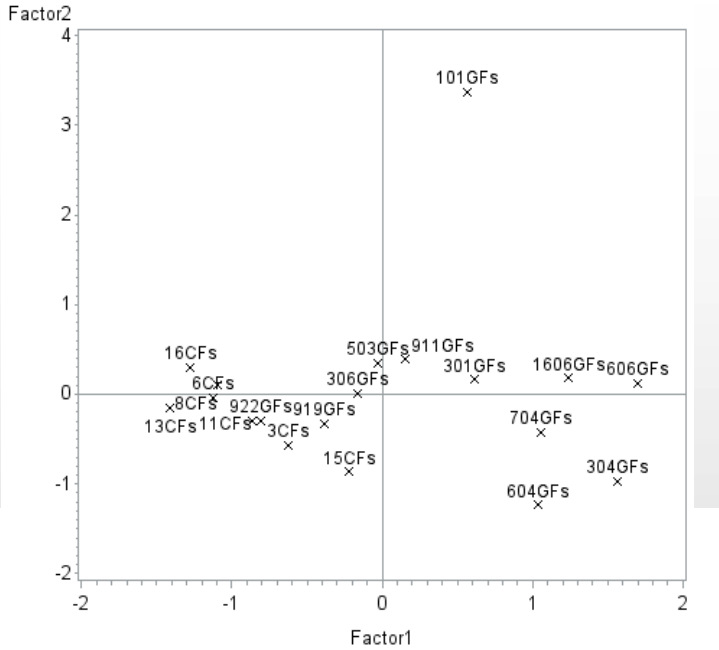
Joint ICP Forests/ ICP Integrated Monitoring project

Crown Condition (Defoliation) only ICP Forests

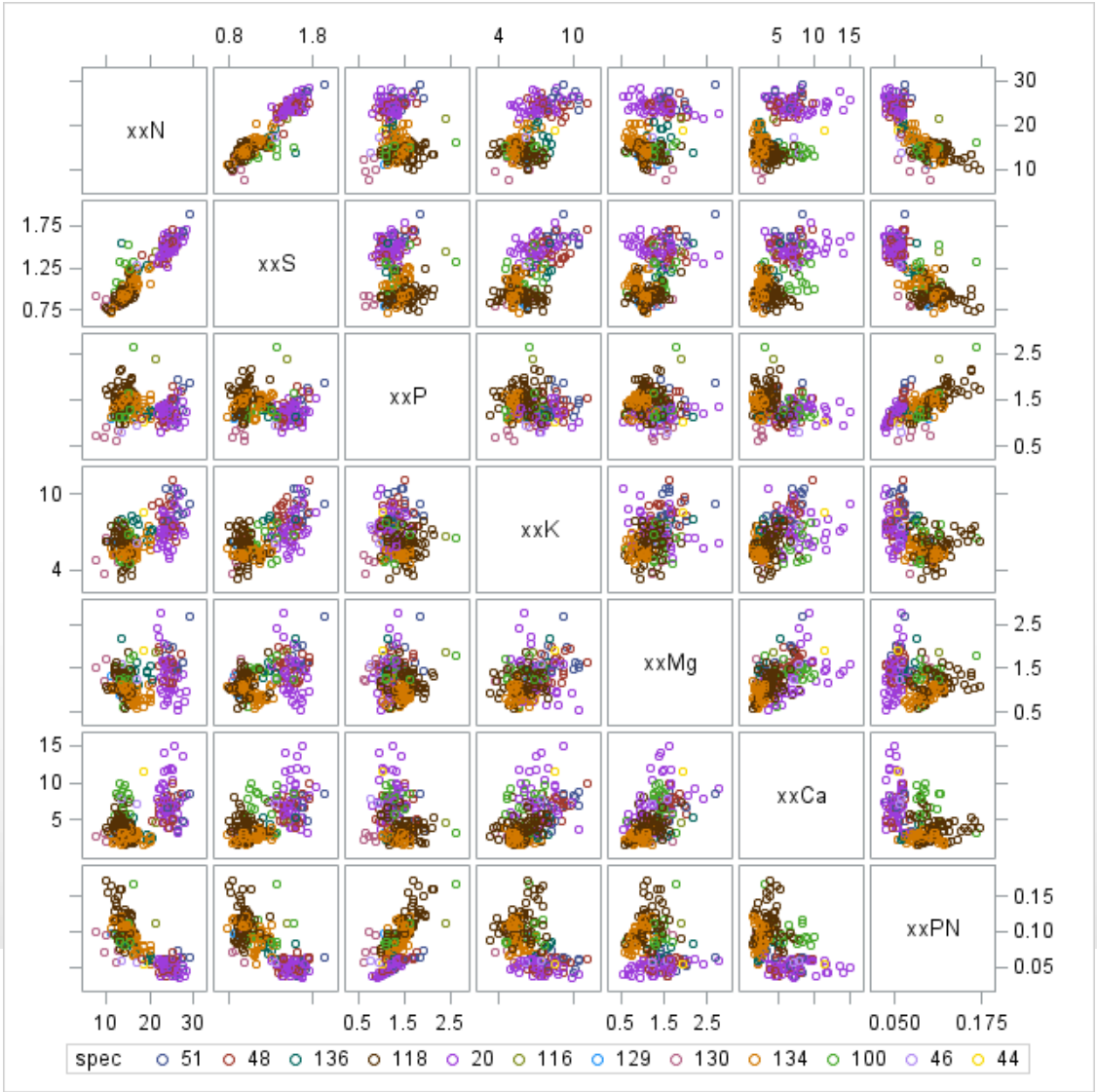


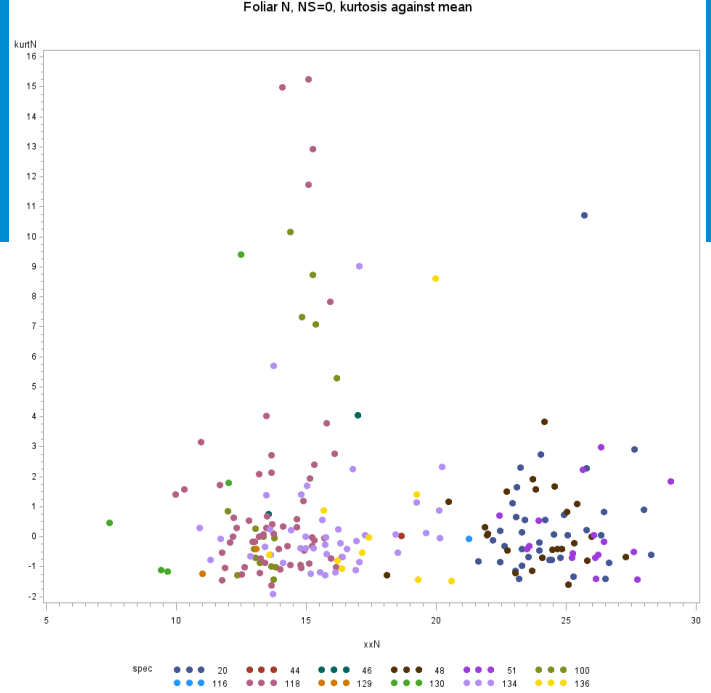


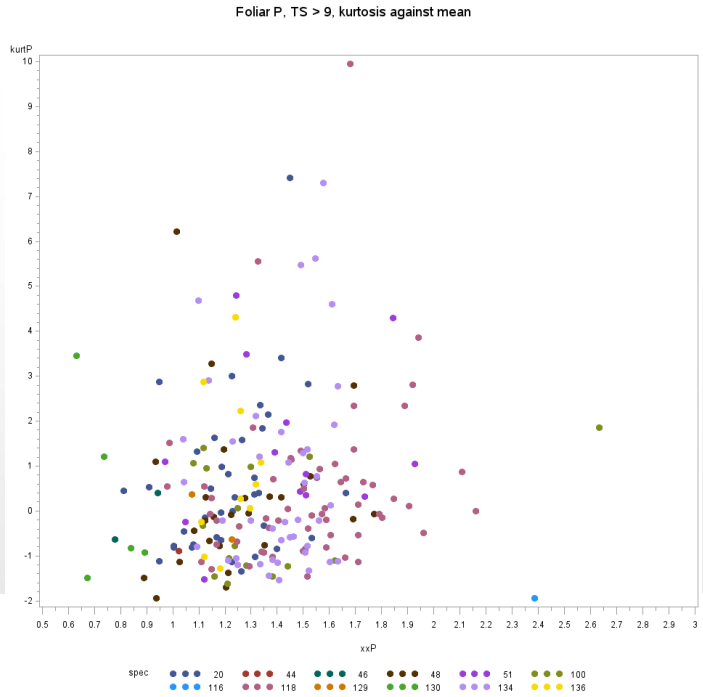


Joint ICP Forests/ ICP Integrated Monitoring project

Foliar Chemistry (ICP Forests data only)







Ongoing Activities / Coming Events

- **9th ICP Forest Soil Interlaboratory Comparison,** 1. Jan. – 1. Oct. 2018
- **7th ICP Forests Scientific Conference**, 21 -23 May 2018 in Riga/ Latvia
- **34th Task Force Meeting of ICP Forests,** 23 -25 May 2018 in Riga/Latvia
- **14th Ozone Intercalibration Course**, 10-13 Sept. 2018 in Poreč/Croatia
- **ICP Forests Joint Expert Panel Meeting** (EP Biodiversity/Ground Vegetation, EP Forest Growth, EP Meteo/Phenology/LAI, EP Ambient Air Quality), 1-5 Oct. in Zvolen/Slovakia.

For more information: http://icp-forests.net/events

EU NEC Directive: Participation of ICP Forests

(b) Terr. ecosystems element balances

Key indicators	medium	Monitoring intensity	Parameters	N of plots
Soil acidity	soil solution	Level II, monthly	pH, [sulphate], [nitrate], [base cations], [aluminum]	172-191
Soil acidity	soil solid phase	Level I+II, 10-15 yrs.	Base saturation, exchangeable aluminium, C/N ratio, total nitrogen	4180
Soil nitrate leaching	soil solution	Level II, monthly, seepage modelled	derived soil nitrate leaching	191
C/N ratio + total soil N	soil solid phase	Level I+II, 10-15 yrs.	C/N, N_{tot}	4640
Nutrient balance	foliage	Level II, every 2 yrs., (Level I every 10-15 yrs.)	N/P, N/K, N/Mg	362 (4640)

(c) Ozone damage

Key indicators	medium	Monitoring intensity	Parameters	N of plots
Ozone "damage"	vegetation	Level II, annually – every 5 yrs.	Tree diameter growth, foliar damage (symptoms) on tree species and other species at light exposed sampling sites	up to 131
Flux-based crit. levels	air	Level II, annually (vegetation period)	[O_3] active or passiv sampling, POD has to be modelled (under progress)	19 active, 109 passiv

ICP Forests contributed within WGE to the Guidance Document and recently to the Technical Specifications; a newly established NECD expert group was joint by a ICP Forests representative.

Thank you for attention

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