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Report of the Programme Co-ordinating Centre

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WSL

wge Working Group on Effects of the Convention on Long-range Transboundary Air Pollution

THÜNEN

Outline

1. Key deliverables of the programme
   - Meetings
   - Reporting
   - Cooperations and projects
   - Outreach activities
2. Workplan of the convention
   - Contribution to the current workplan
   - Intended contribution to 2024-2025 workplan

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Key Deliverables

Meetings/events of the ICP Forests community in the period between November 2022 and June 2023

- 10th Scientific Conference of ICP Forests ‚Forest Monitoring in the Anthropocene - Results, Approaches, and perspectives', 6 June 2023, held by video
- 39th Task Force Meeting, 7-8 June 2023, held by video

- Joint Expert Panel Meeting (Ambient Air Quality, Biodiversity, Deposition, Foliar & Litterfall, Soil & Soil Solution), 27-31 March 2023, Vienna, hybrid meeting
- Programme Co-ordinating Group Meeting, 23-24 Nov 2022, Berlin, hybrid meeting

http://icp-forests.net/events

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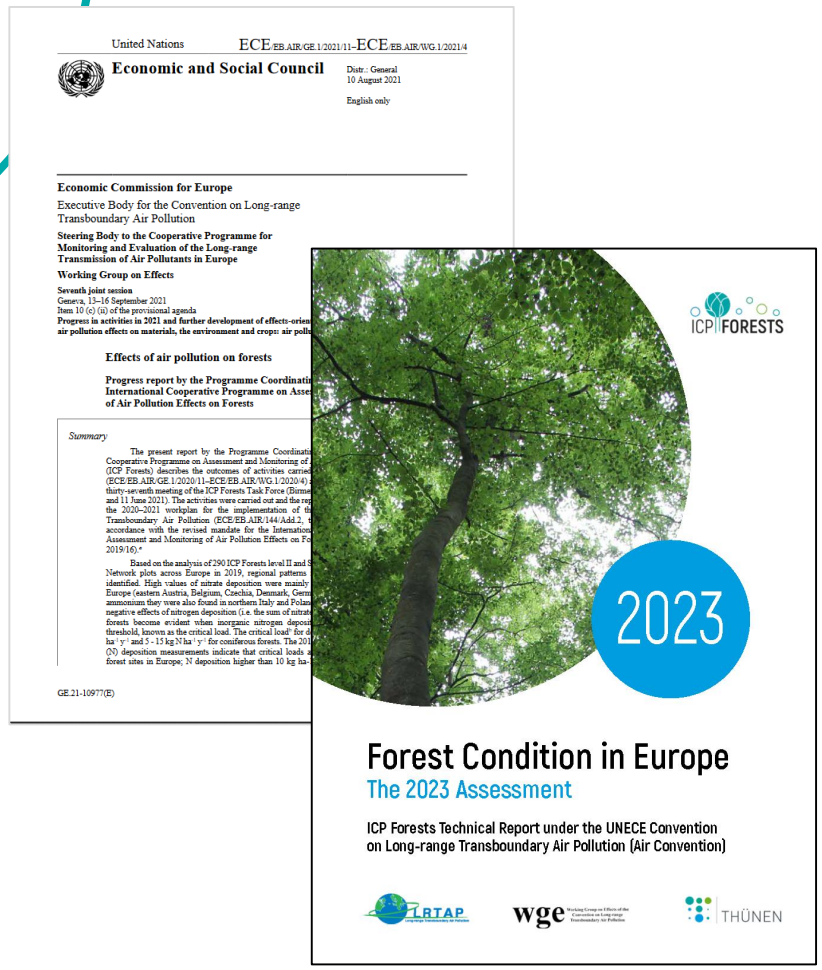
Latest ICP Forests reports and publications

All publications can be found under: http://icp-forests.net/

General Reports



Ringtest Reports

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- Literature review by chairs of the Expert Panels on new findings in their respective field
- National reports
- Chapters on
  - Tree crown condition in 2022
  - Atmospheric throughfall deposition in European forests in 2021
  - Meteorological conditions in European forests in 2021
  - Report on member states' view on current ICP Forests Strategy and future activities (based on a questionnaire developed by the PCC)
- Revised ICP Forests Strategy for the period 2024 to 2030

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Revised ICP Forests Strategy for the period 2024 to 2030

- needs and ideas of ICP Forests member states were considered via survey

Objectives and actions	High priority
Broaden the scope of monitoring (e.g. water purification, carbon sequestration, heavy metals as additional pollutants)	84%
Increase the visibility of ICPF	92%
Enhance cooperation with sister ICPs	88%
Feed information into other bodies/programms (e.g. FAO, Forest Europe)	92%

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Cooperation within the bodies of the Air Convention: ICP Forests and EMEP

The Programme Co-ordinating Centre (PCC) of ICP Forests organized a meeting of scientists from ICP Forests and EMEP, held by video in January 2023.

Cooperation in the following subject areas was agreed and started:

- ICPF will use EMEP Nitrogen and Sulphur depo data for gap filling
- EMEP will use ICP Forests depo data for evaluation of their EMEP models

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Intended cooperation with bodies outside of the convention

ICP Forests is currently discussing cooperation opportunities with

- the Commission and JRC in the frame of the new EU Framework for Forest Monitoring and Strategic Plans
- the European National Forest Inventory Network“ (ENFIN)

Strong involvement of ICP Forests in the research programme of the Commission: Horizon Europe

1. Pathfinder – Towards an Integrated Consistent European LULUC Monitoring and Policy Pathway Assessment Framework (Sep22-Aug26)

   coordinated by NIBIO (Johannes Breidenbach),
   https://www.nibio.no/en/projects/pathfinder

2. ForWards - The ForestWard Observatory to secure resilience of European forests (Nov22-Oct27)

   coordinated by SLU (Ruben Valbuena)
   https://forwards-project.eu/

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ForWards - The ForestWard Observatory to secure resilience of European forests (Nov22-Oct27)

Grants for the establishment of measurements and training

EFI

Call for Grants G-04-2023

- Grants
- Network Fund
- Short term mobility grants
- Young Leadership Programme

Grants and training / Grants /

published 31.07.2023

G-04-2023 Establishing Climate-Smart Forestry and forest restoration pilots in Europe

1. Call for grants

Outreach activities

EU forests – new EU Framework for Forest Monitoring and Strategic Plans

ICPF replied to the Commission's questionnaire

Acid Rain - The Future Environment and Role of Multiple Air Pollutants

International Conference on Acid Rain, Several contributions from the ICP Forests community

ICP Forests will organize a session at the 26th World Congress of IUFRO in Stockholm in 2024.

Session title is: Nitrogen Depositions in Forests in a changing climate: Trends and Implications on Forest Ecosystems Services

Contributions to the Workplan of the Convention

ICP Forests' contribution to the implementation the workplan of the Convention

Workplan Items	Examples
(1) Nitrogen deposition and its effects on forest ecosystem functions and services	- Report about status and trends of Nitrogen levels in European forests (2022, 2023) - Scientific papers (e.g. Ahrends et al., 2022 in Soil Systems; Vanguelova et al., 2022 in Applied Science)
(2) Air pollution-related cause-effect relationships in forests in a changing climate	- Scientific papers (e.g. Salomon et al., 2022 in Nature Communication, De Marco et al. 2022, and Meusburger et al., 2022 in Global Change Biology; Eghdami et al., 2022 in Forests)
(3) Status & trends of heavy metals	- Scientific papers (e.g. Chen et al., 2022 in Environmental Pollution; Michopolous et al., 2022 in Global Nest Journal) - ICP Forests Brief to heavy metal concentrations in Level I plots across Europe (in preparation)
(4) Ambient Ozone its effects on forest ecosystem functions and services	- Scientific papers (e.g. Paoletti et al., 2022 in Sustainable Horizon; Eghdami et al., 2022 in Environmental Research)

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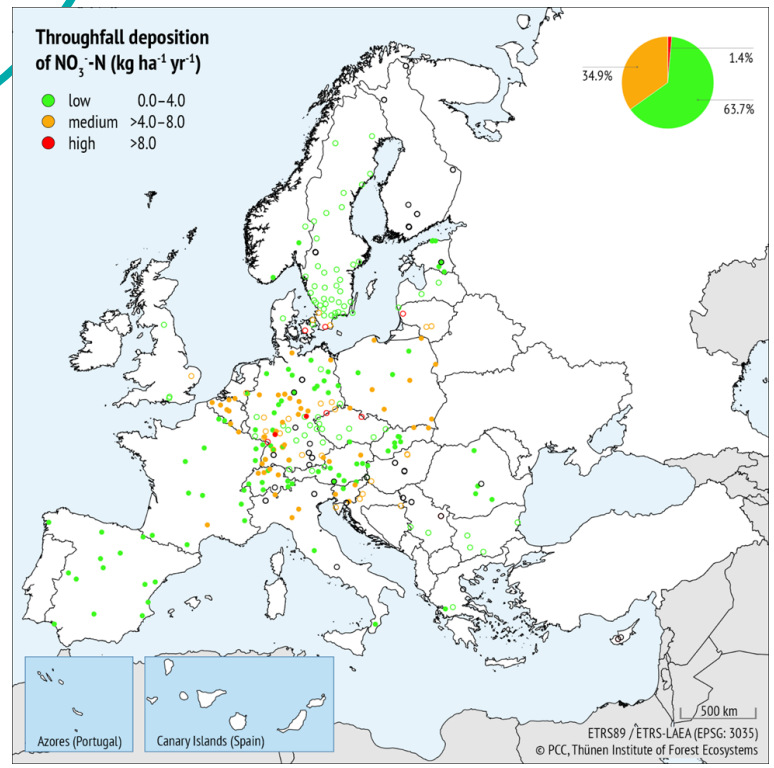
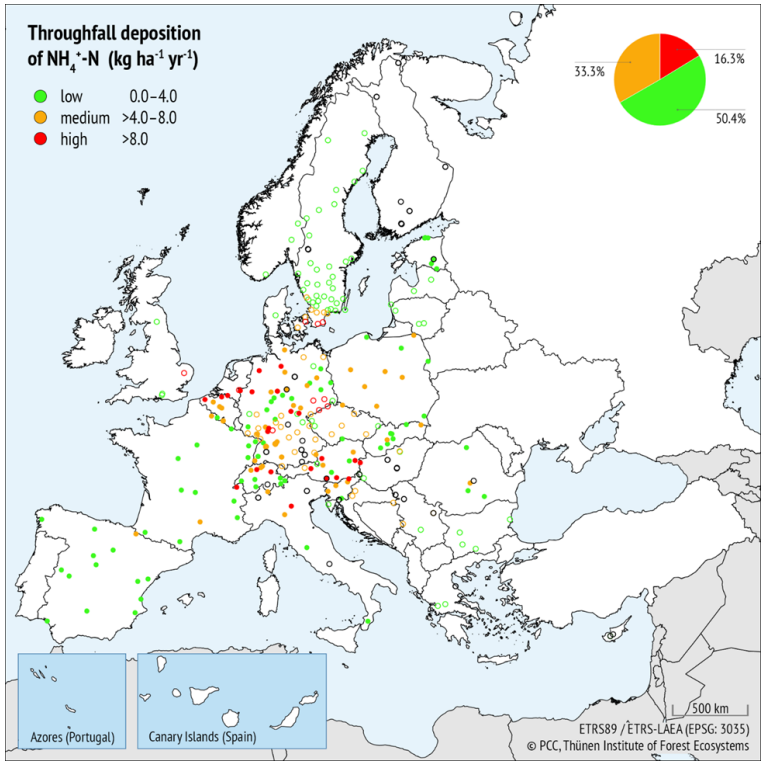
TR 2023 - Atmospheric deposition in European forests in 2021

by Aldo Marchetto, Char Hilgers, Alexa Michel, Till Kirchner, Andreas Schmitz, Arne Verstraeten, Peter Waldner





Maps of throughfall deposition (kg ha^{-1} yr^{-1}) in 2021

- two thirds of the plots have low NO_3^-, depositions
- only 50% of the plots have low NH_4^+ depositions
- NH_4^+ higher than NO_3^-
- Highest deposition of NO_3^-, NH_4^+ primarily in central Europe

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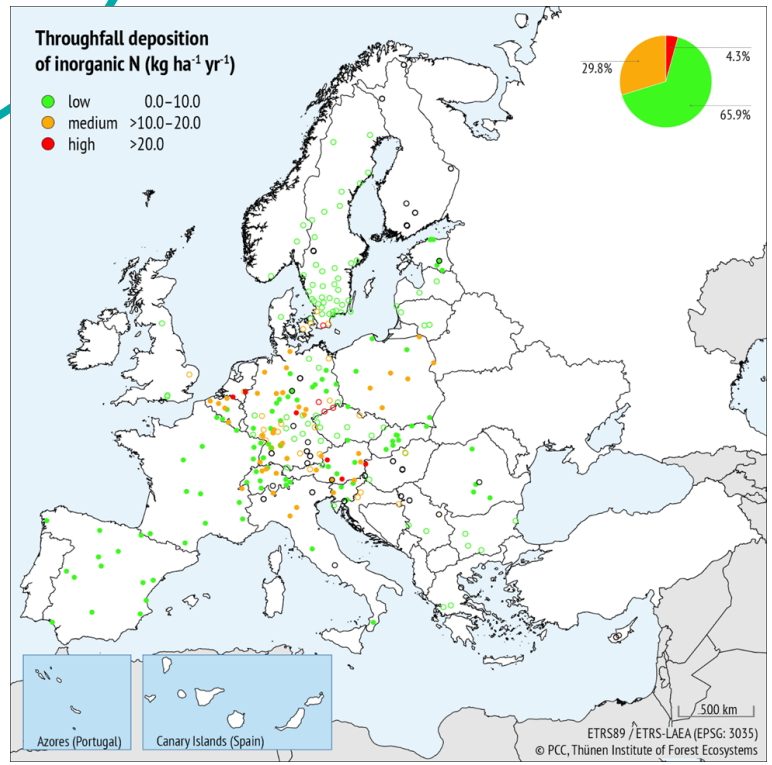

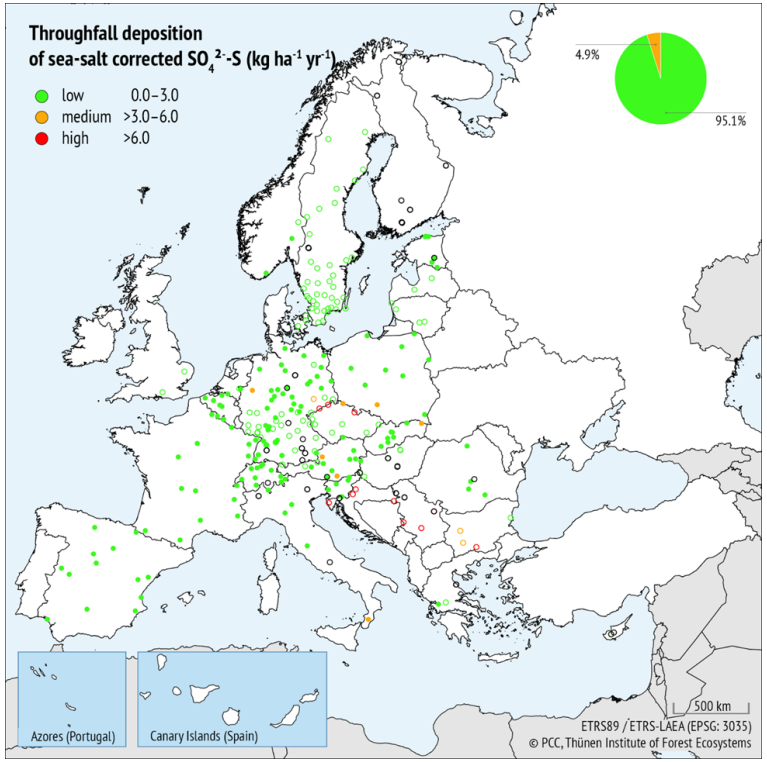

Maps of throughfall deposition ($kg\ ha^{-1}\ yr^{-1}$) in 2021

- The total inorganic N deposition exceeded the critical load at one thirds of the plots
- 5% of the plots received more than 20 kg N per $ha^{-1}\ yr^{-1}$; this sites are mainly located in Germany, Belgium, southern Sweden and Austria
- Nutrient imbalances in trees will continue to increase
- High and moderate values of sea-salt corrected $SO4^{2-}$ close to point sources all across Europe

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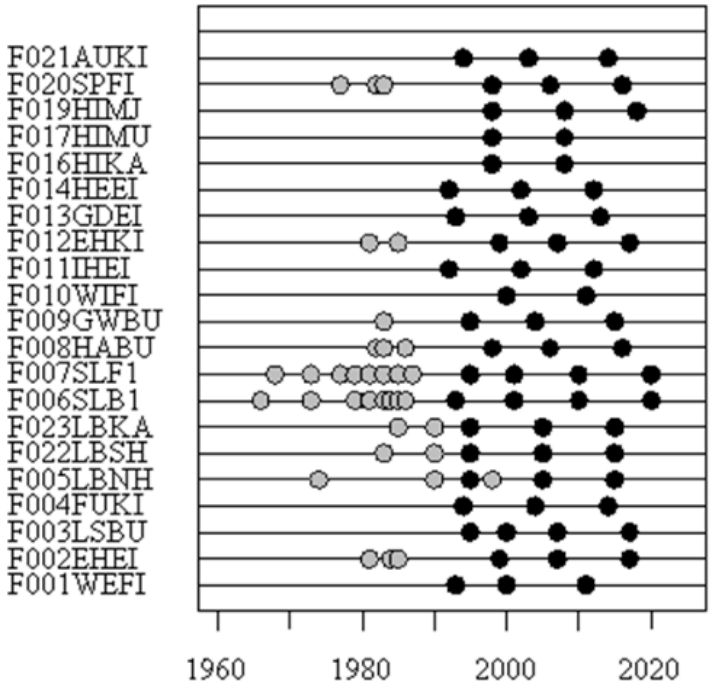
soil systems

MDPI

Article

The Influence of Tree Species on the Recovery of Forest Soils from Acidification in Lower Saxony, Germany

Bernd Ahrends *, Heike Fortmann and Henning Meesenburg



Sampling years of soil inventories at 21 study sites

- Soil resampling data from 21 Level II sites in Lower Saxony were analyzed.
- During the past 30 to 50 years, most plots were sampled at least 3 times.
- Indicators for the acid-base status of forest soils were soil pH and base saturation.

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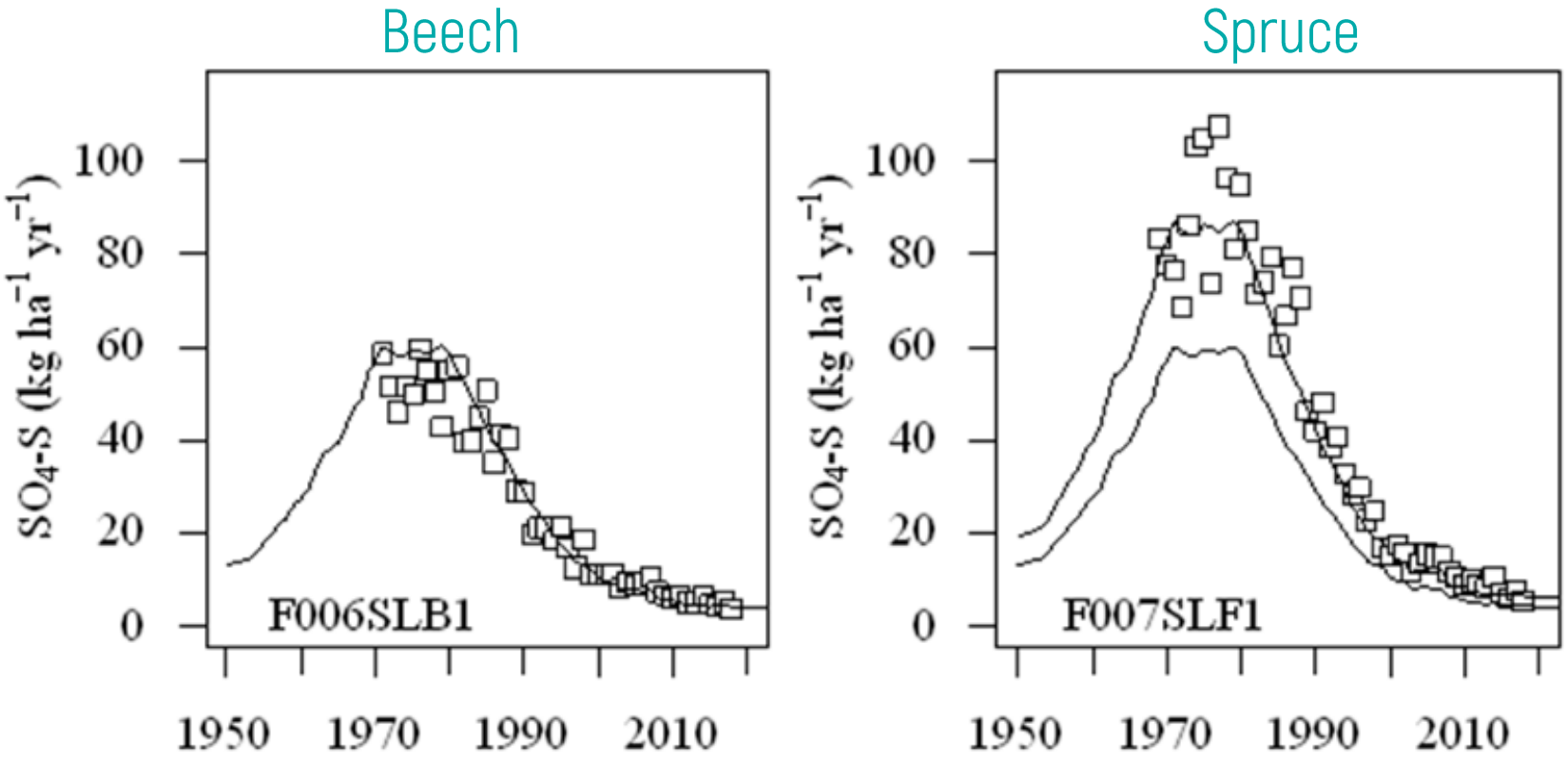
Time-series of observed (squares) total sulphur deposition from throughfall measurements

Example from Solling



From: Ahrends et al., 2022

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soil systems

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Article

The Influence of Tree Species on the Recovery of Forest Soils from Acidification in Lower Saxony, Germany

Bernd Ahrends *, Heike Fortmann and Henning Meesenburg

- Recovery is slow; most recent inventories show a trend reversal or a stabilization at low level.
- Recovery is faster under broadleaf trees than under conifers. This could be related to the higher atmospheric input of sulphur in the coniferous forests.
- Based on their data, Ahrends et al. concluded that the acceleration of the regeneration process through liming still seems to be necessary.
- Ahrends et al. also note that the still high nitrogen deposition in Lower Saxony's forests increases the risk of leaching of base cations and nitrates into surface waters.

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forests

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Article

Influence of Ozone and Drought on Tree Growth under Field Conditions in a 22 Year Time Series

Hanieh Eghdami [1,*], Willy Werner [1], Alessandra De Marco [2] and Pierre Sicard [3]

- Influence of ozone and soil water availability on basal area increment (BAI), and fructification of beech and spruce was investigated.
- Soil water content and daytime O3 mean concentrations were the best predictors of BAI.
- Combined effects of drought and O3 pollution influenced tree growth decline in beech and spruce the most.

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applied sciences

MDPI

Article

Long Term Trends of Base Cation Budgets of Forests in the UK to Inform Sustainable Harvesting Practices

Elena Vanguelova *, Sue Benham and Tom Nisbet

Location of the ICP Forests Level II sites in the UK

- Ca, Mg and K budgets and their change over time were calculated for oak, Scots pine and Sitka spruce on each Level II plots in the UK
  - Input: atmospheric deposition, weathering, release from decomposition of pre-forest vegetation, inputs from fertilization
  - Output: tree uptake and harvesting, leaching
- Impact of different harvesting scenarios on the long-term sustainability of nutrient supply were investigated

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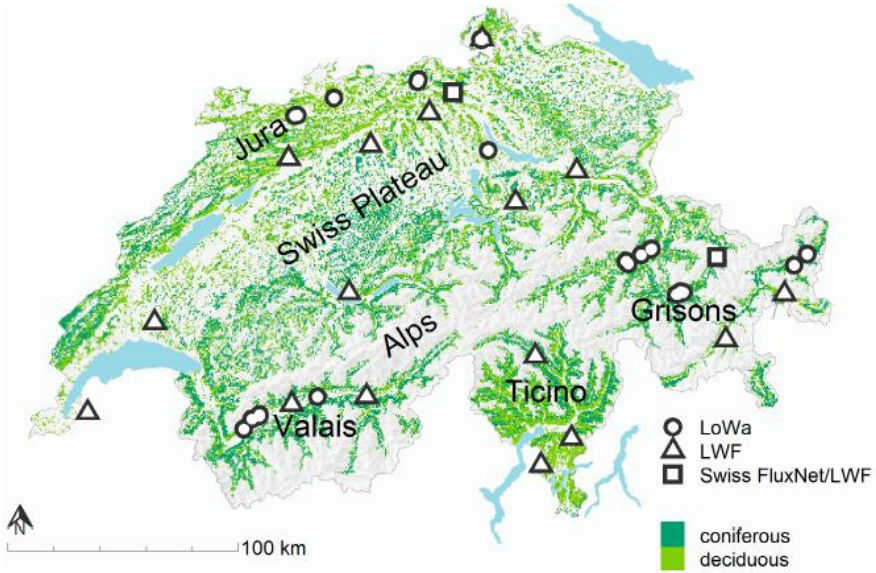
RESEARCH ARTICLE

Global Change Biology WILEY

Soil–plant interactions modulated water availability of Swiss forests during the 2015 and 2018 droughts

Katrin Meusburger[1] | Volodymyr Trotsiuk[1] | Paul Schmidt-Walter[2] | Andri Baltensweiler[1] | Philipp Brun[1] | Fabian Bernhard[1] | Mana Gharun[3,4] | Raphael Habel[5] | Frank Hagedorn[1] | Roger Köchli[1] | Achilleas Psomas[1] | Heike Puhlmann[5] | Anne Thimonier[1] | Peter Waldner[1] | Stephan Zimmermann[1] | Lorenz Walthert[1]



Location of the sites in Switzerland: Sites for model calibration and plausibility checks.

- A 1D forest hydrological model was calibrated using matric potential measurements from 44 ICP Forests sites.
- Throughfall measurements and SWISS FluxNet data were used for plausibility checks of the modelled results.
- The model was then implemented for the forested area of Switzerland.

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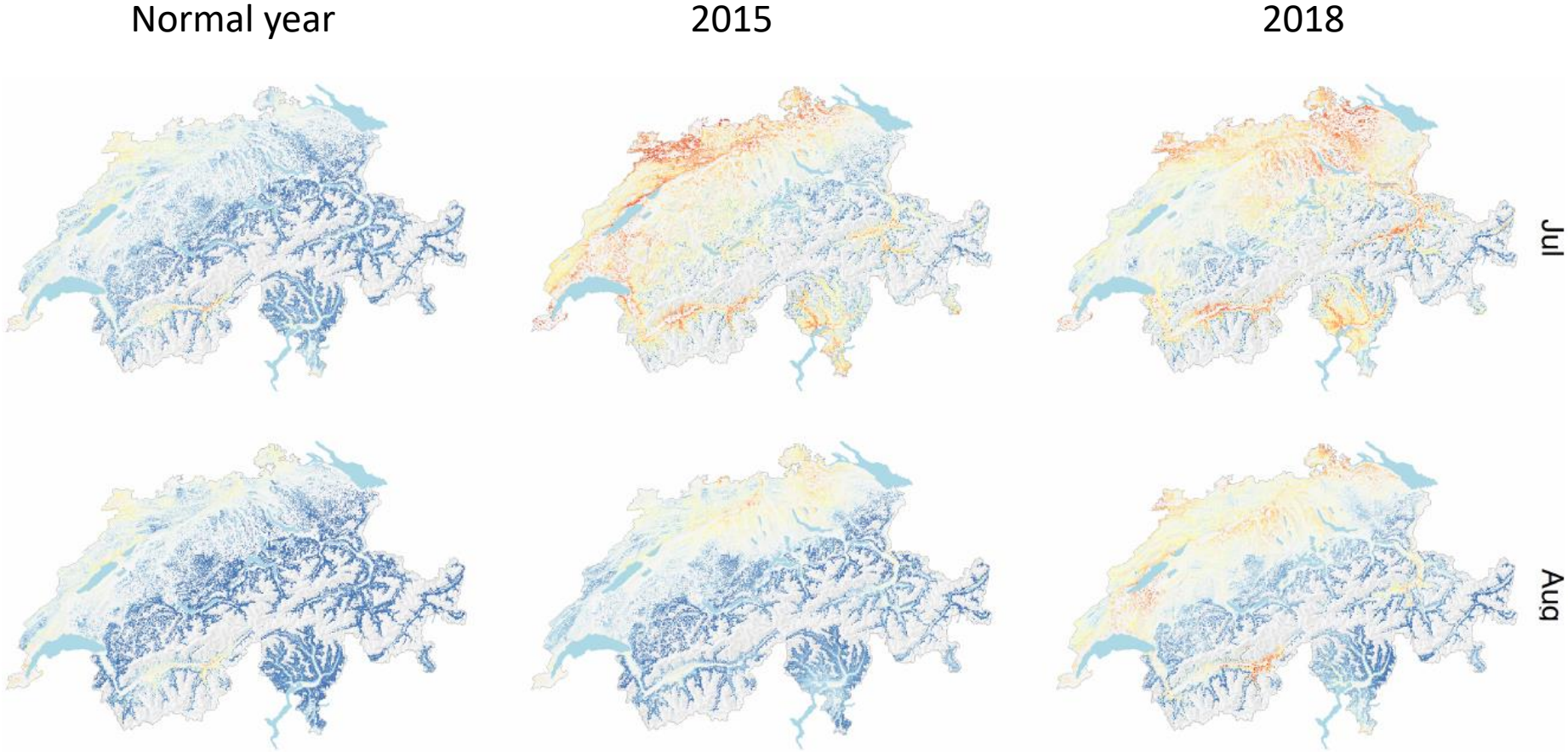
Ratio of actual (Ta) to potential (Tp) transpiration in July and August



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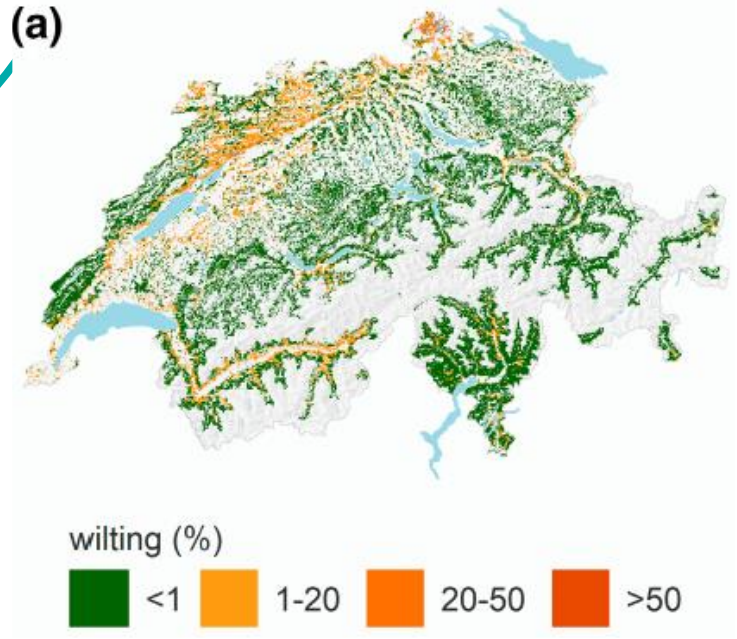
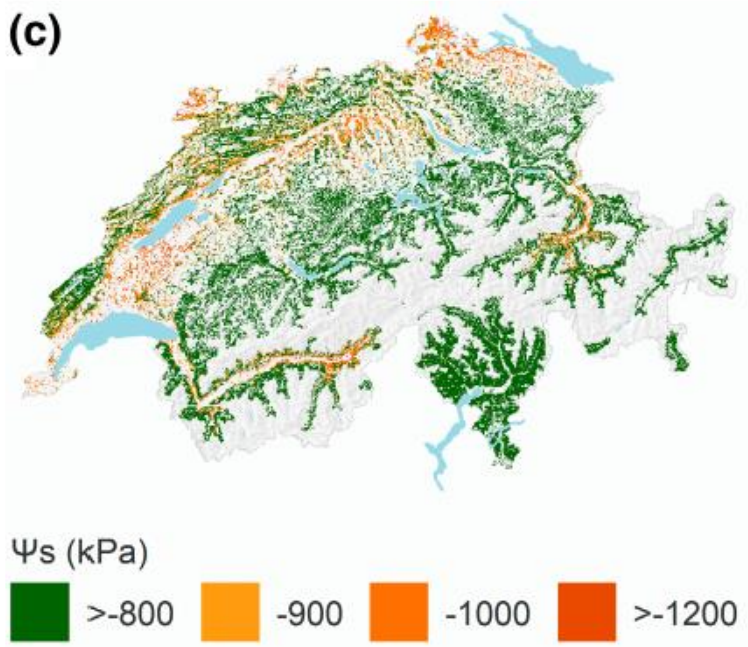
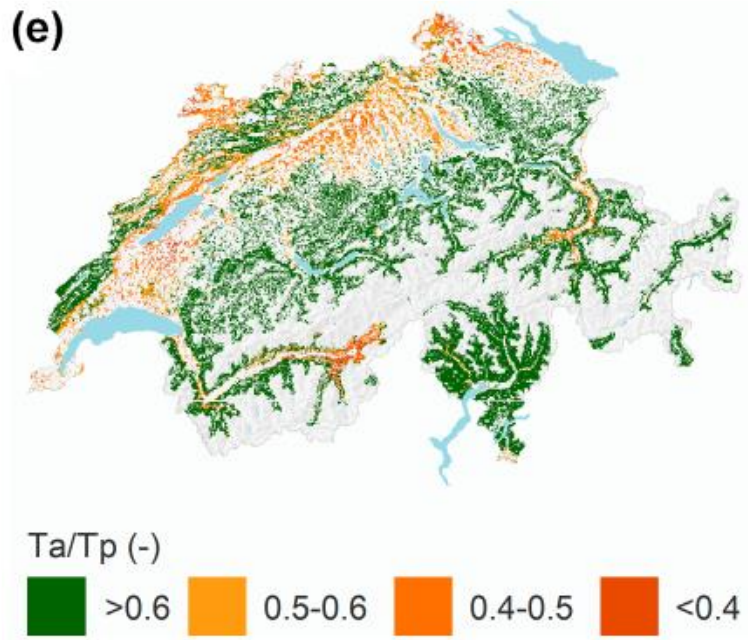
Remote sensing products and modelling results



Early-wilting occurrence in Aug 2018 (percentage occurrence in 500 m pixel)



Mean soil matric potential in the root zone, August 2018



Ratio of actual to potential transpiration, August 2018

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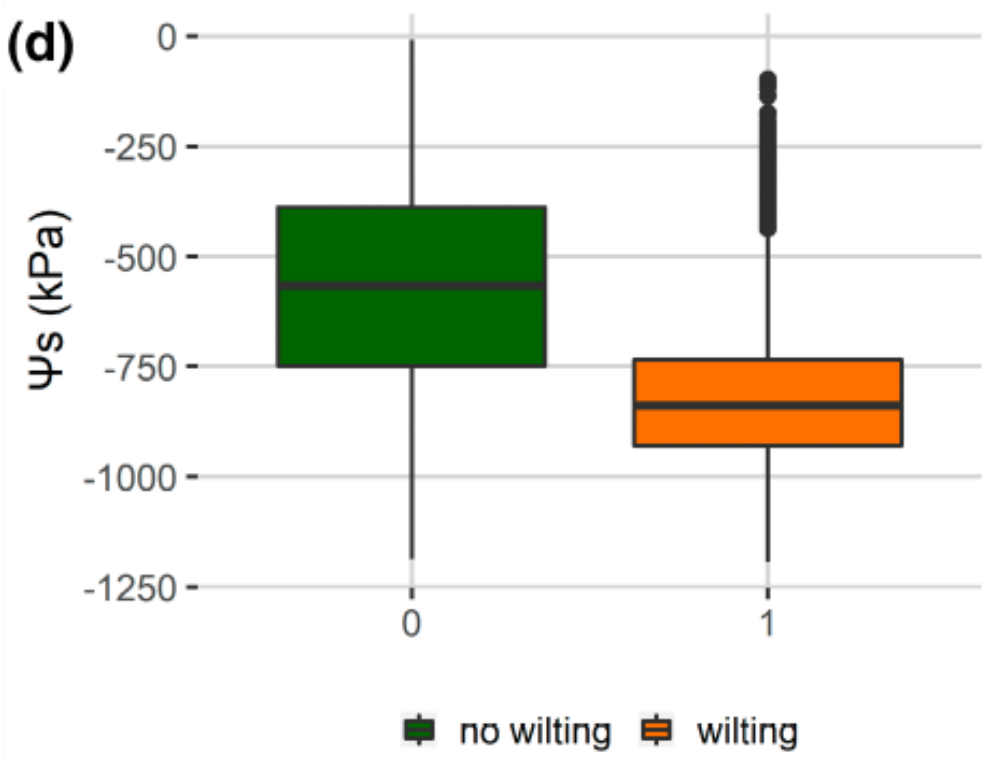
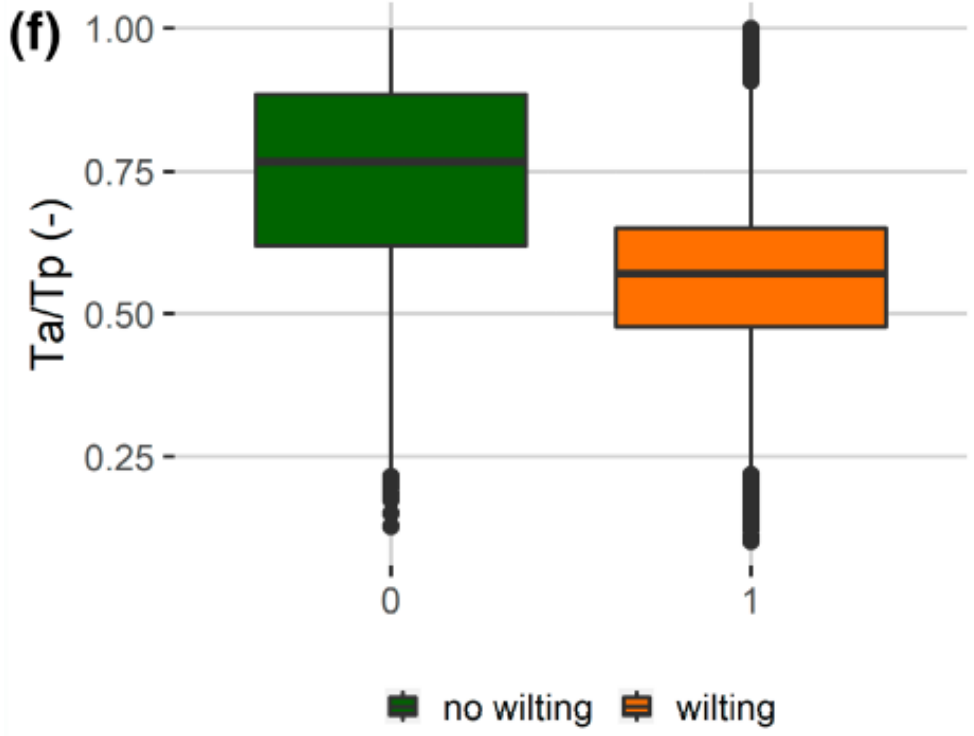
Linking drought indicators derived from water balance modelling with occurrence of early-wilting



Boxplot of soil matric potential in pixels with and without early-wilting



Boxplot of the ratio of Ta/Tp in pixels with and without early-wilting

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ICP Forests' contribution to the Air Convention work plan for the period 2024 and 2025

Activity description/objective	Expected outcome/deliverables
Quantify N deposition and its effects on forest health, productivity, C sequestration and biodiversity	Report and scientific paper about status and trends of N levels in European forests.
Analyse status and trends of HM in forest ecosystems	Scientific paper and ICP Forests Brief to heavy metal concentrations in Level I plots across Europe
Investigate air pollution-related cause-effect relationships in forests in a changing climate	Book chapter 'Long-term trends in environmental conditions and its effects on forest ecosystem functions and services'
Quantify ambient O3 levels and effects on forest health, productivity, C sequestration, and biodiversity	Book chapter 'Long-term trends in visible foliar injury induced by ozone' and a scientific paper on the fingerprint of tropospheric ozone on forests in Europe.

Conclusions (perhaps relevant to the Executive Body)

- Nitrogen deposition levels remain high in several European regions
  - It increase the risk of leaching of base cations and nitrates into surface waters
  - N deposition is becoming more ammonium-dominated
  - Natural recovery in acidified forest soils in Central Europe is very slow
- Ozone
  - Concentrations in forest sites remained high and caused frequent visible foliar symptoms.
- Climate
  - Recurring drought caused substantial stress on forest trees and may act in combination with air pollution

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Thank you for listening.