

# Consequences of climate change on airborne pollen in Bavaria, Central Europe

Jesús Rojo<sup>1,2</sup>, Antonio Picornell<sup>3</sup>, Jose Oteros<sup>1,4</sup>, Matthias Werchan<sup>5</sup>, Barbora Werchan<sup>5</sup>, Karl-Christian Bergmann<sup>5</sup>, Matt Smith<sup>6</sup>, Ingrid Weichenmeier<sup>1</sup>, Carsten B. Schmidt-Weber<sup>1</sup>, Jeroen Buters<sup>1\*</sup>

<sup>1</sup> Center of Allergy & Environment (ZAUM), Member of the German Center for Lung Research (DZL), Technische Universität München/Helmholtz Center Munich, Munich, Germany

<sup>2</sup> University of Castilla-La Mancha, Institute of Environmental Sciences, Toledo, Spain

<sup>3</sup> Department of Botany and Plant Physiology, University of Malaga, Malaga, Spain

<sup>4</sup> Department of Botany, Ecology and Plant Physiology, University of Cordoba, Cordoba, Spain

<sup>5</sup> German Pollen Information Service Foundation (PID), 10117 Berlin, Germany

<sup>6</sup> School of Science and the Environment, University of Worcester, Worcester, United Kingdom

\* Corresponding author:

Jeroen Buters

ZAUM-Technical University Munich

Biedersteinerstrasse 29

80802 Munich, Germany

Buters@tum.de

+49-89-41403487

## Supporting Information

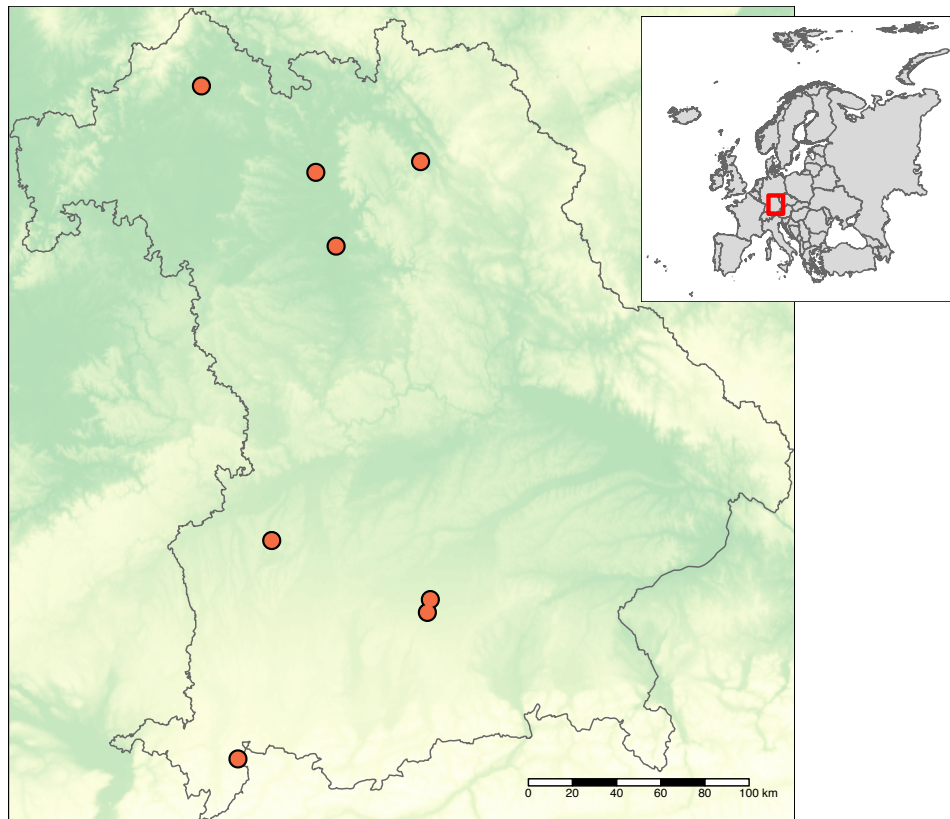


Figure S1. Location of aerobiological sampling points in the Bavaria region, Southern Germany.

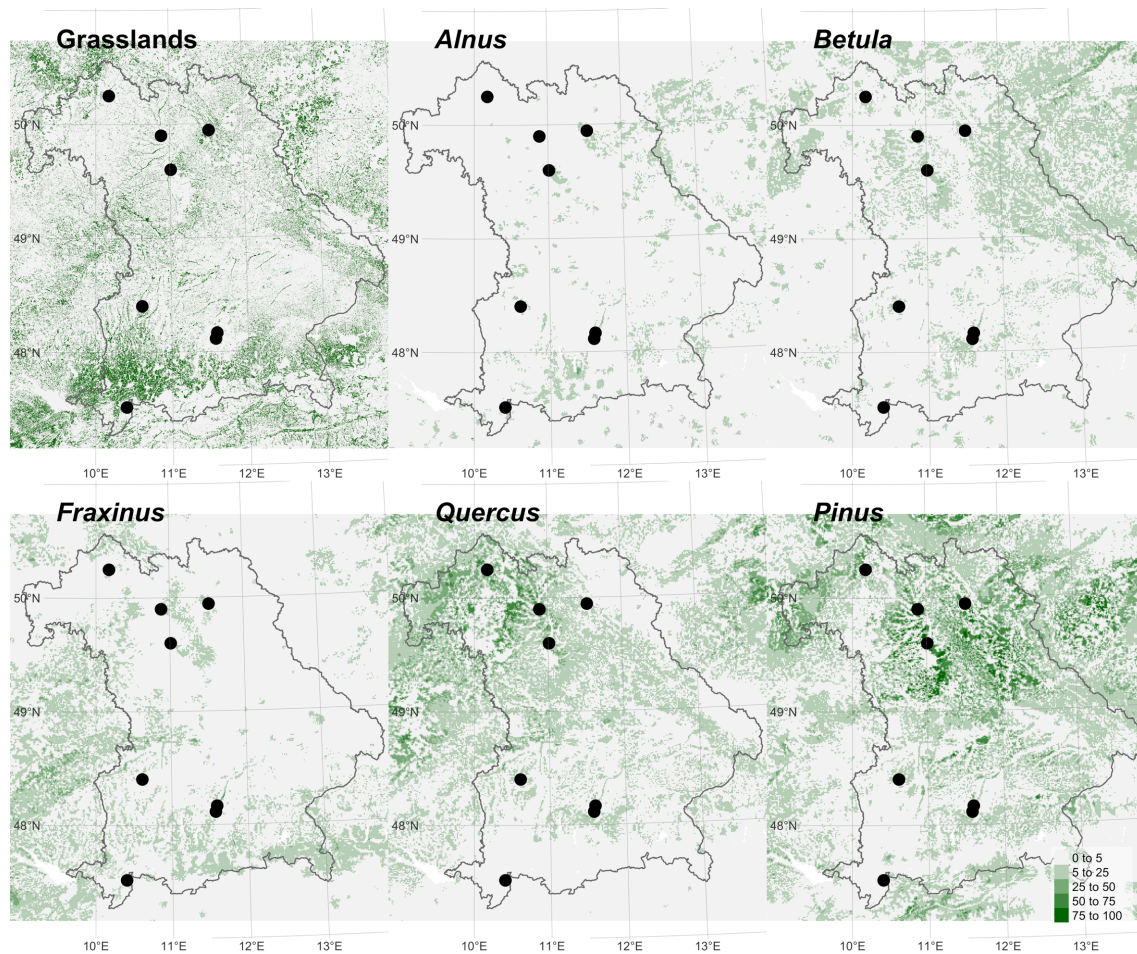


Figure S2. Distribution and abundance of the main studied taxa in the region of Bavaria. Abundance probability maps (1x1 km) of the arboreal species from the genera *Alnus*, *Betula*, *Fraxinus*, *Quercus* and *Pinus* were provided by the European Atlas of Forest Tree Species (De Rigo et al., 2016). Presence/Absence map (100x100 m) of grasslands was provided by the Copernicus Land Monitoring Service (Copernicus Land Monitoring Service 2020).

De Rigo, D., Caudullo, G., Houston Durrant, T., San-Miguel-Ayanz, J., 2016. *The European Atlas of Forest Tree Species: modelling, data and information on forest tree species. European Atlas of Forest Tree Species e01aa69+*.

Copernicus Land Monitoring Service, 2020. *Grasslands. 2018, European Environment Agency (EEA). URL <https://land.copernicus.eu/> (accessed 7.11.20).*

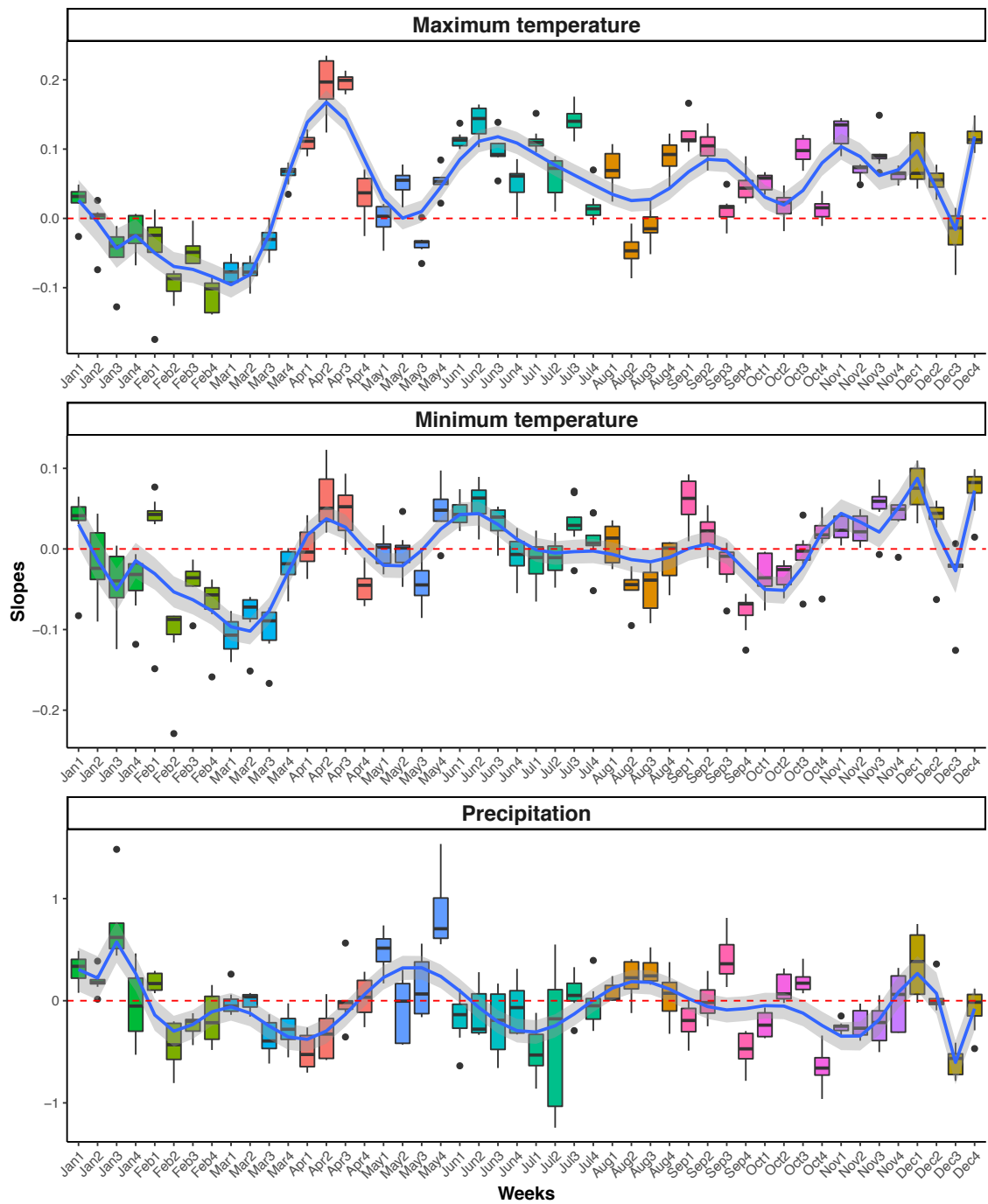


Figure S3. Slopes of weekly climatic variables (average maximum and minimum temperature and accumulated rainfall) recorded in Bavaria, Central Europe (1989-2018). Only the geographical location of the 8 pollen stations were considered.

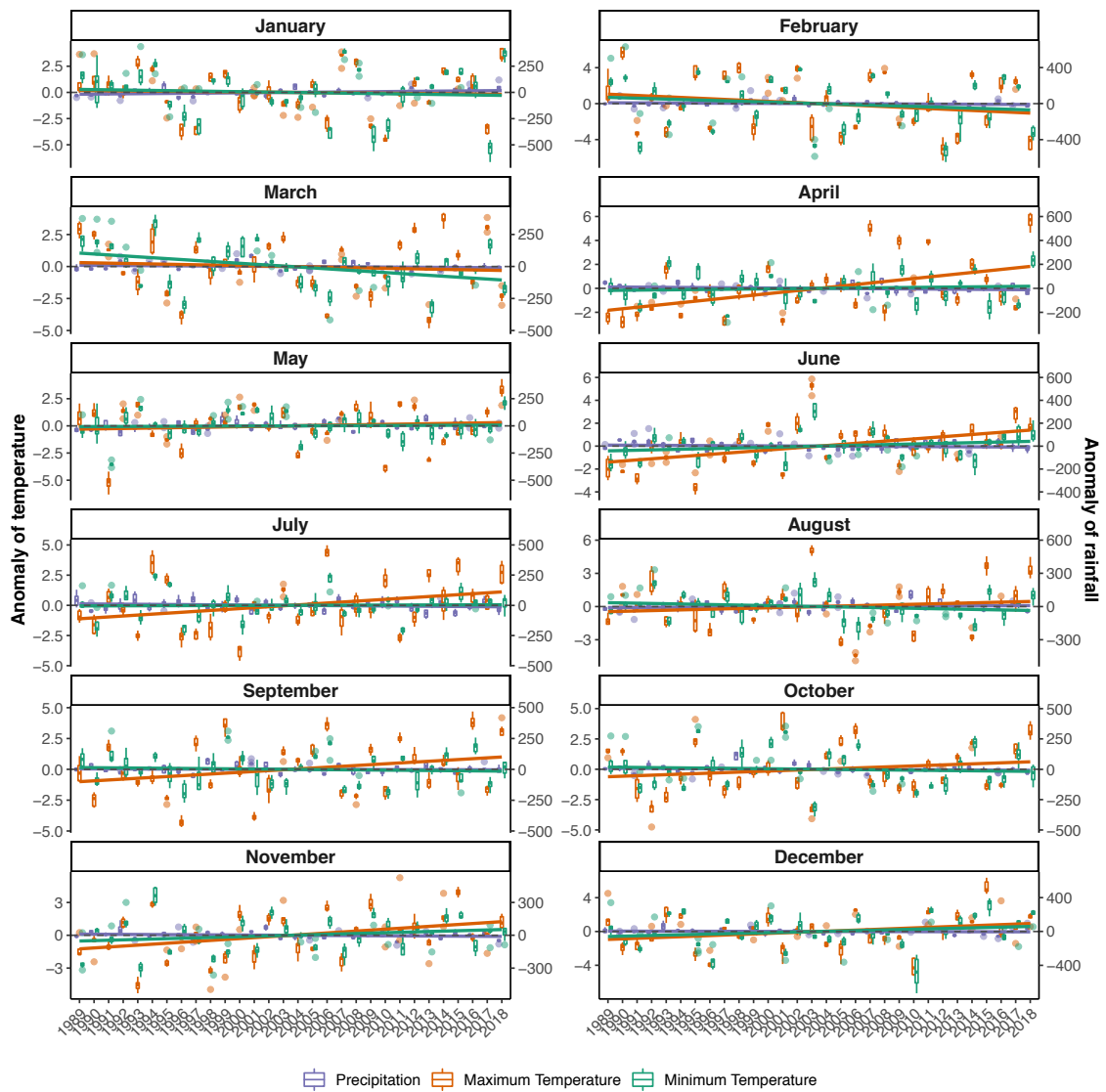


Figure S4. Trends in climate anomalies (average maximum and minimum temperature and accumulated rainfall) recorded in Bavaria, Central Europe (1989-2018). Only the geographical location of the 8 pollen stations were considered.

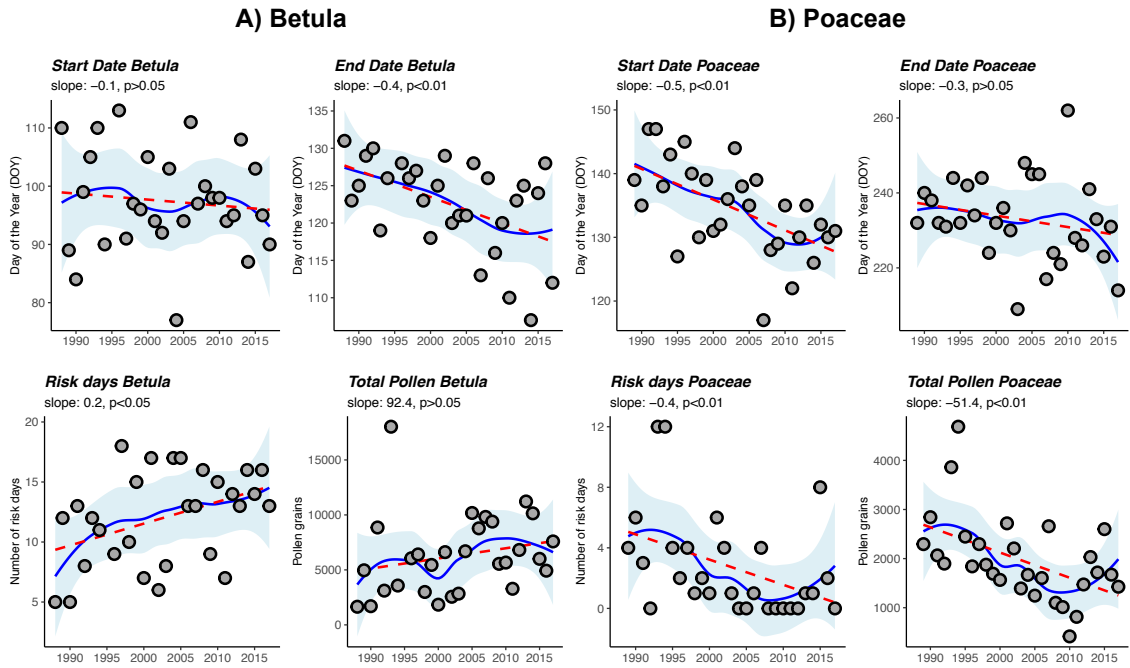


Figure S5. Linear trends (red dashed line) for the main characteristics of the pollen seasons (according to pollen timing and pollen intensity) of birch (A) and grasses (B) for the longest historical pollen time-series in Bavaria (Munich, DEMUNC). Blue line represents the smoothed trend using the LOESS smoother and the confidence interval (95%).

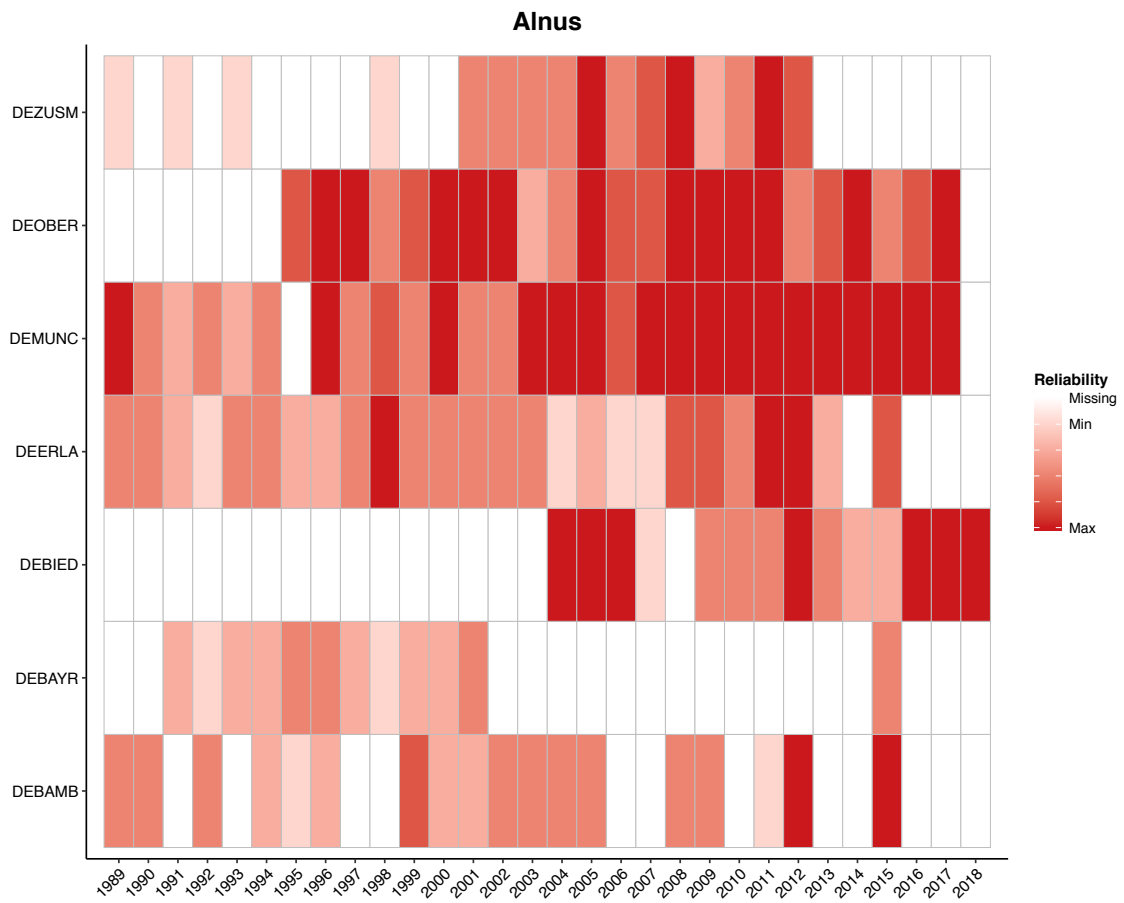


Figure S6. Availability of the data for *Alnus* pollen in the Bavaria region (Central Europe).

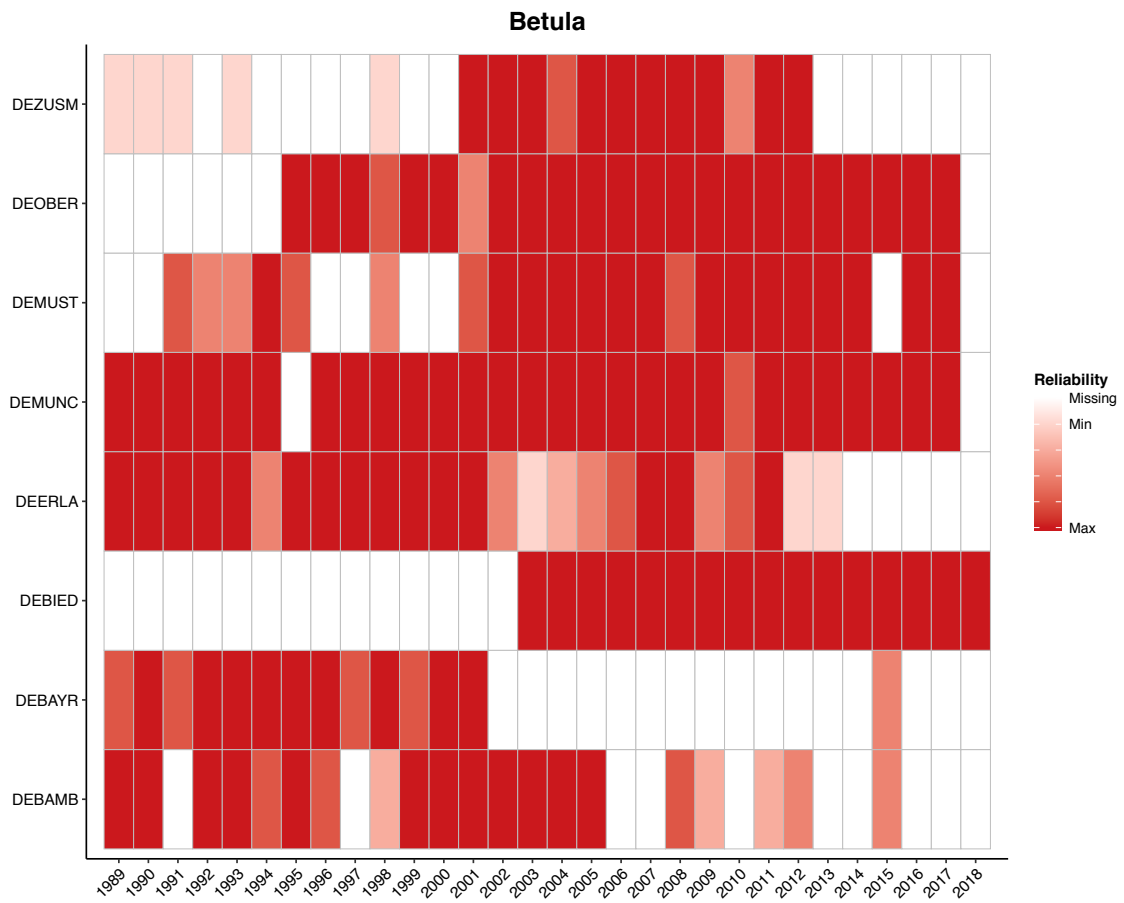


Figure S7. Availability of the data for *Betula* pollen in the Bavaria region (Central Europe).



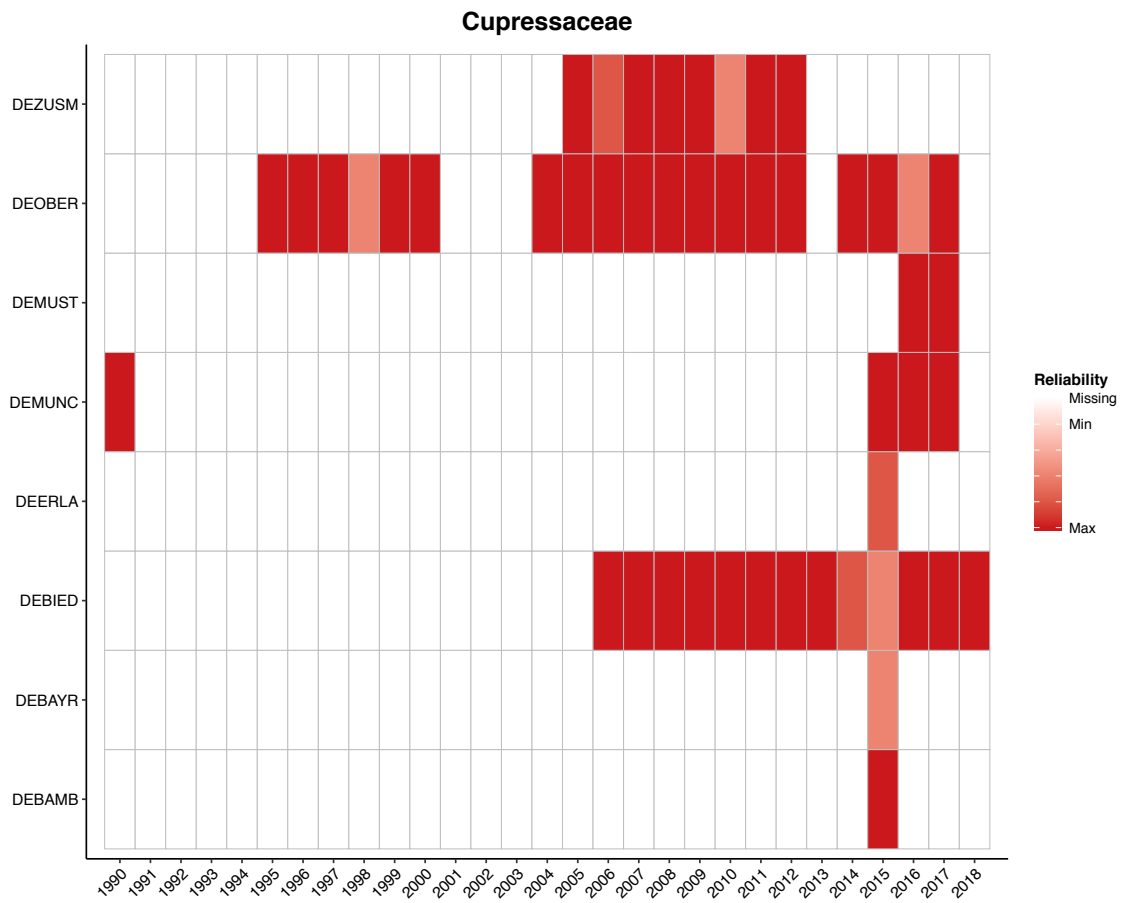


Figure S8. Availability of the data for *Cupressaceae* pollen in the Bavaria region (Central Europe).

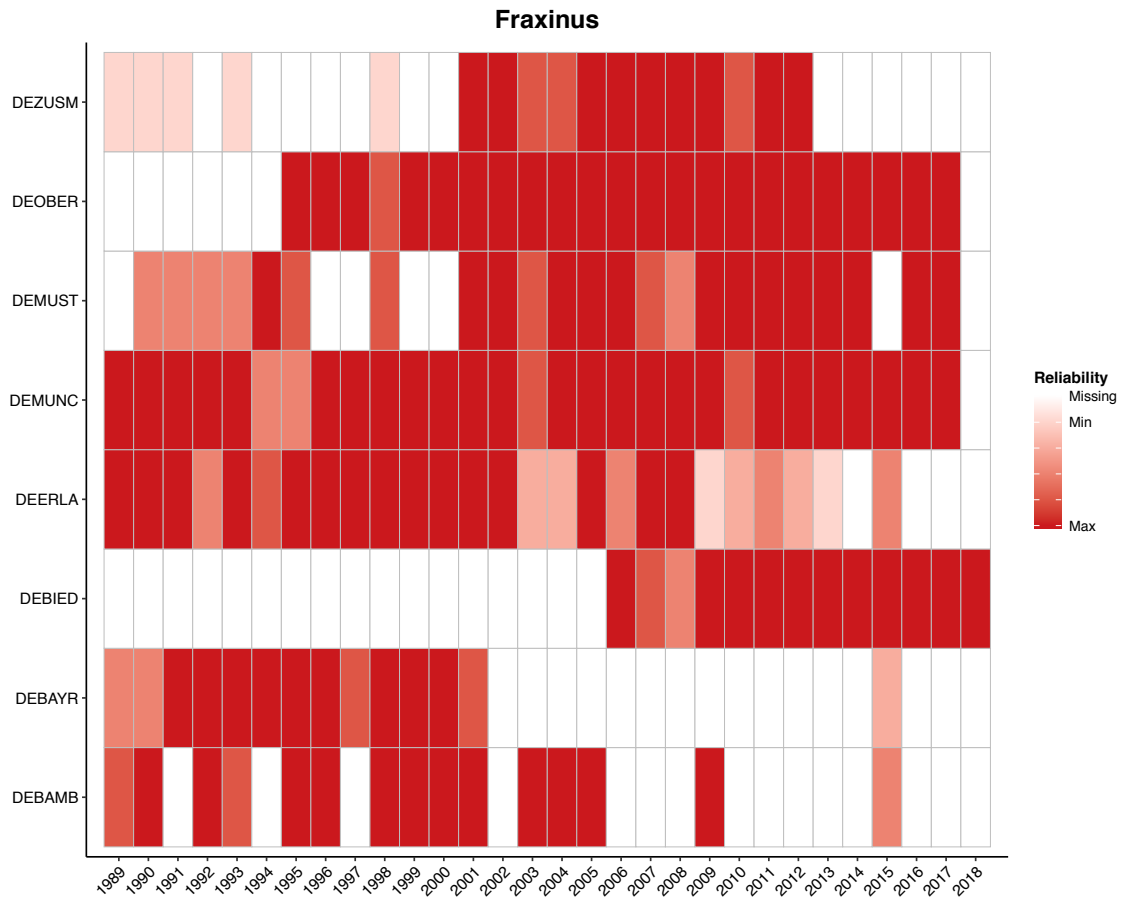


Figure S9. Availability of the data for *Fraxinus* pollen in the Bavaria region (Central Europe).

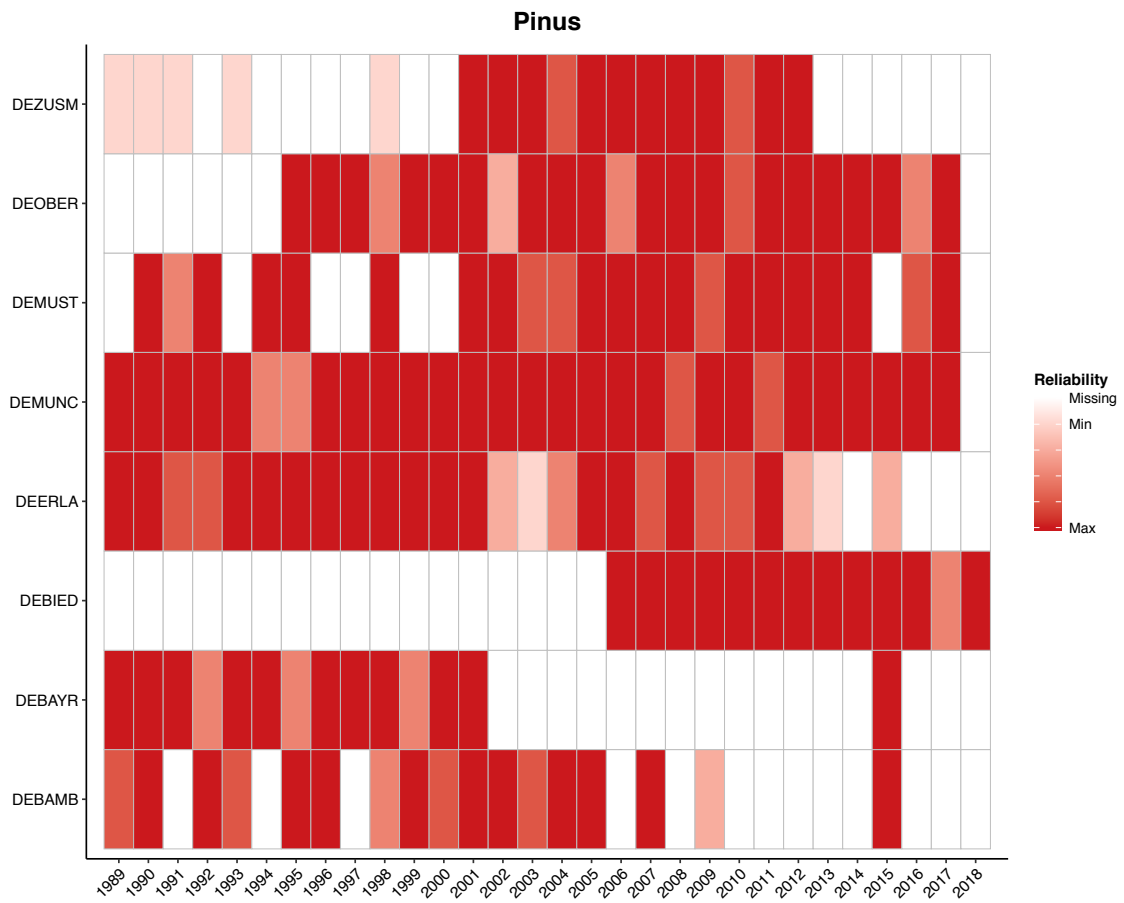


Figure S10. Availability of the data for *Pinus* pollen in the Bavaria region (Central Europe).

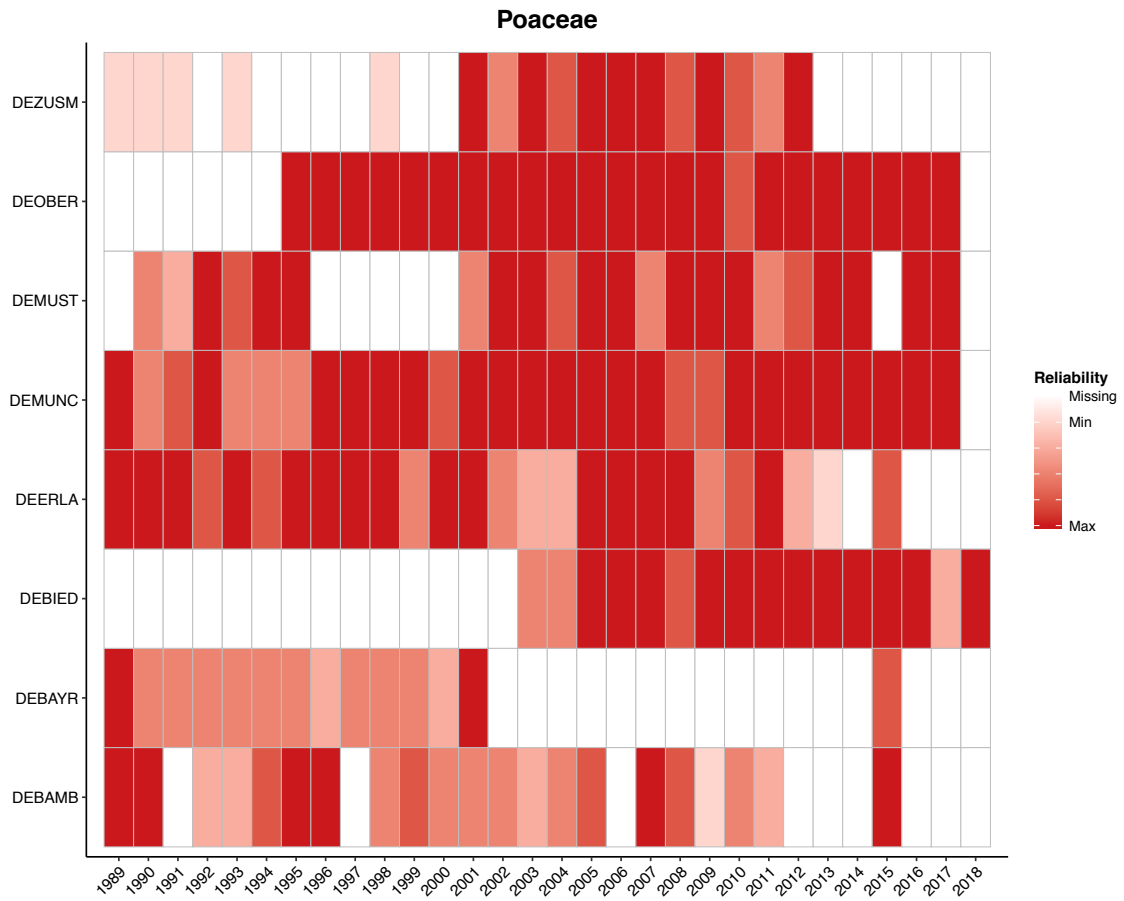


Figure S11. Availability of the data for *Poaceae* pollen in the Bavaria region (Central Europe).

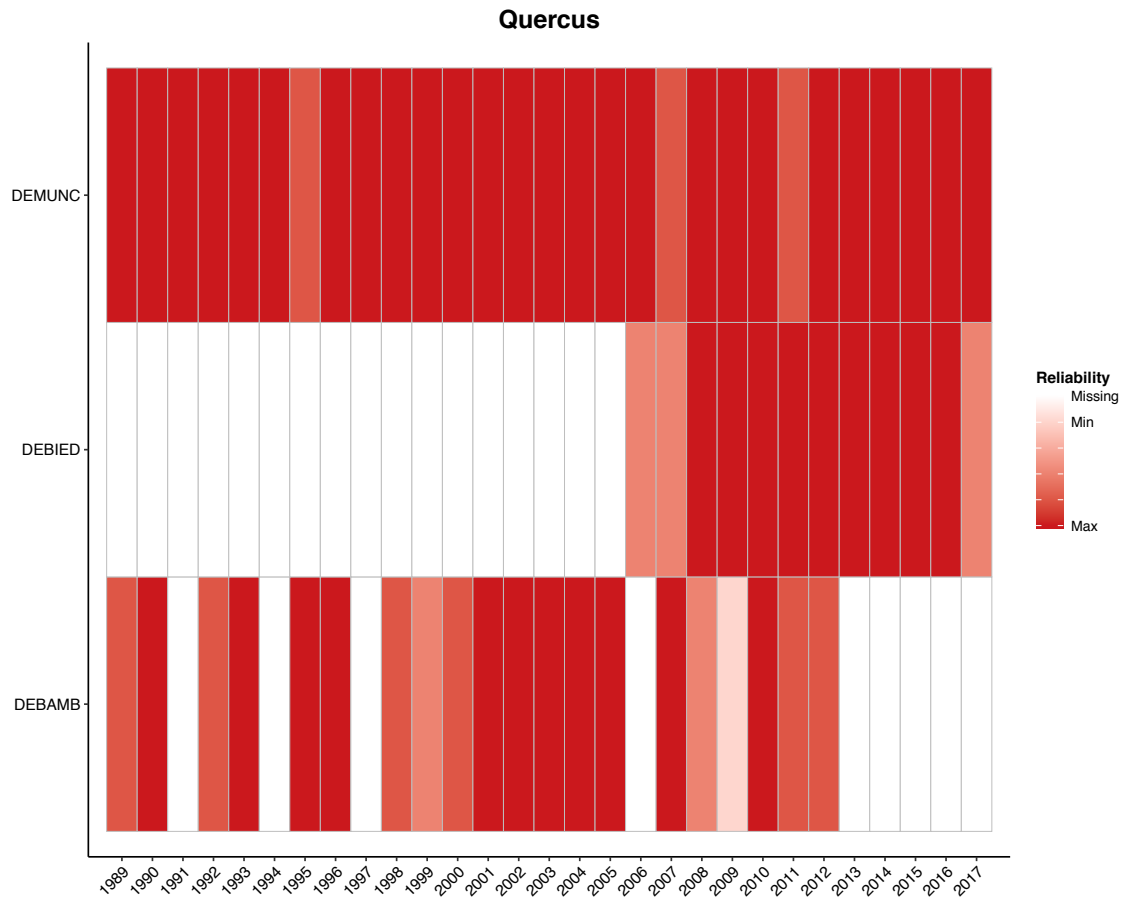


Figure S12. Availability of the data for *Quercus* pollen in the Bavaria region (Central Europe).

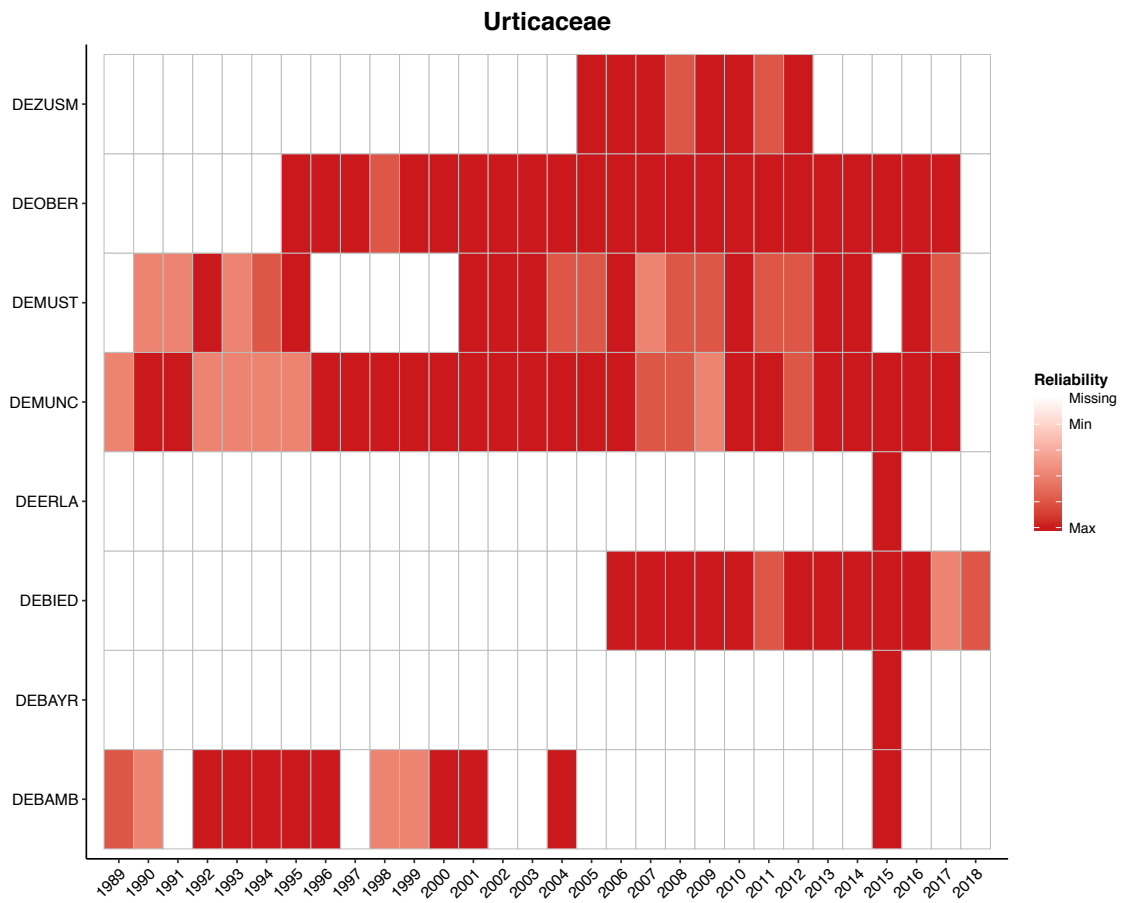


Figure S13. Availability of the data for *Urticaceae* pollen in the Bavaria region (Central Europe).