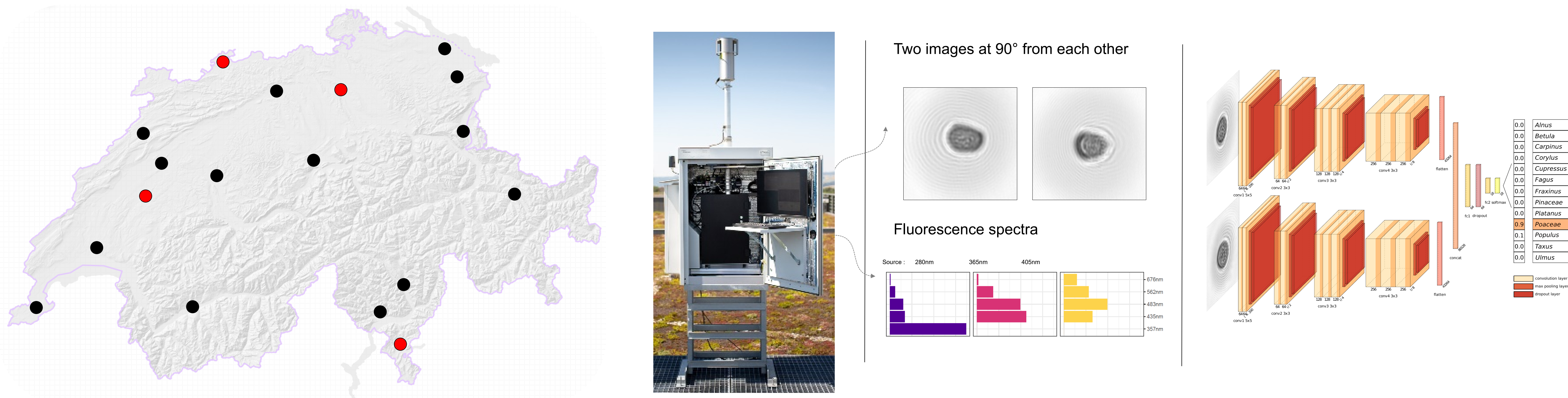


The Swiss real-time bioaerosol monitoring network

THE NETWORK

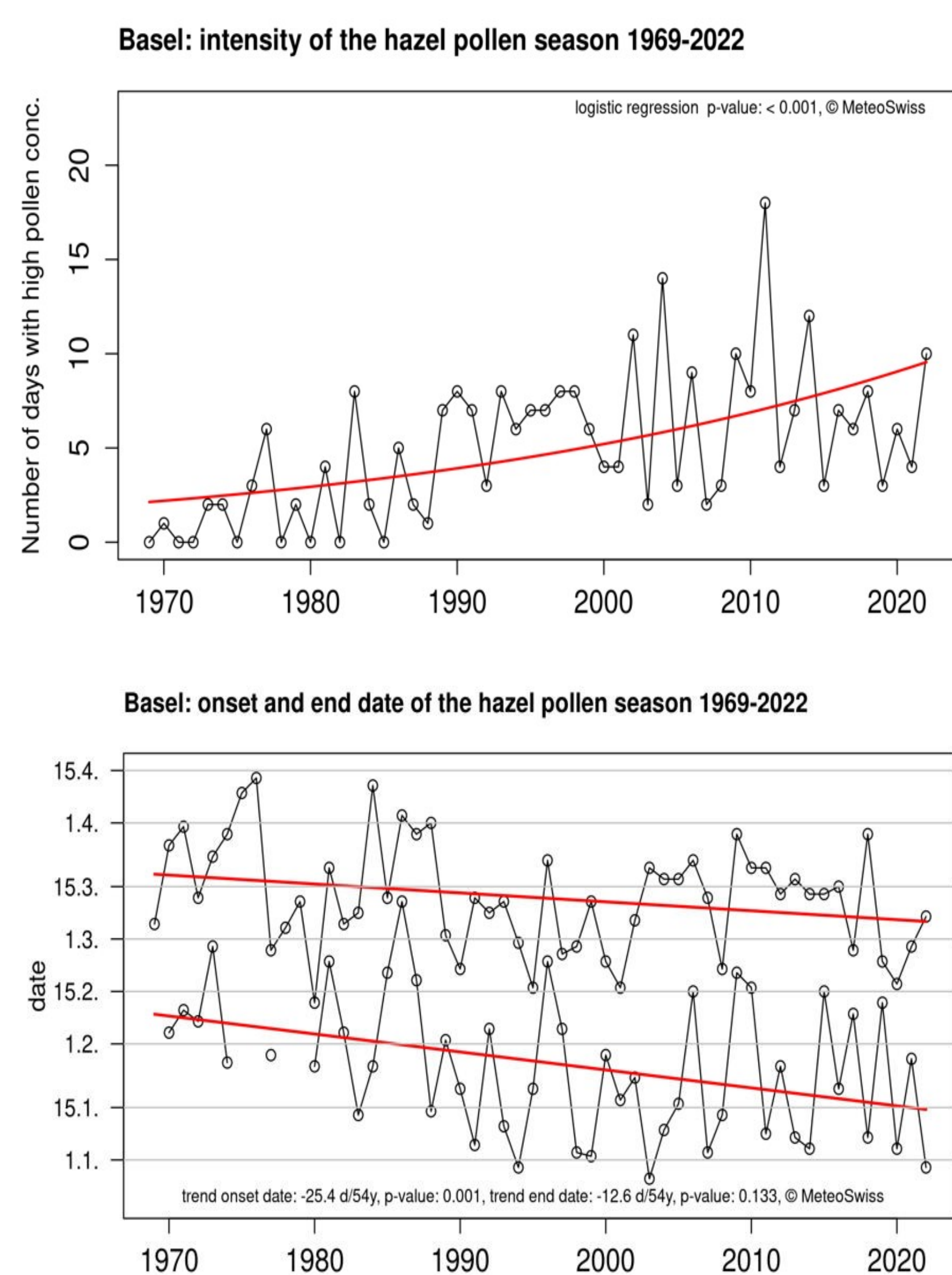


The network is composed of 16 operational automatic stations, four of which also have manual monitoring in parallel (red). This is operational since 2023 and delivers real-time data for seven pollen taxa as well as forecasts integrating these observations. The Swisens Poleno Jupiter device (Swisens AG) is used across the network. This device is an airflow cytometer that performs single particle measurements (holographic imaging and light-induced fluorescence) together with identification using a machine learning classification algorithm.

APPLICATIONS

Pollen climatology

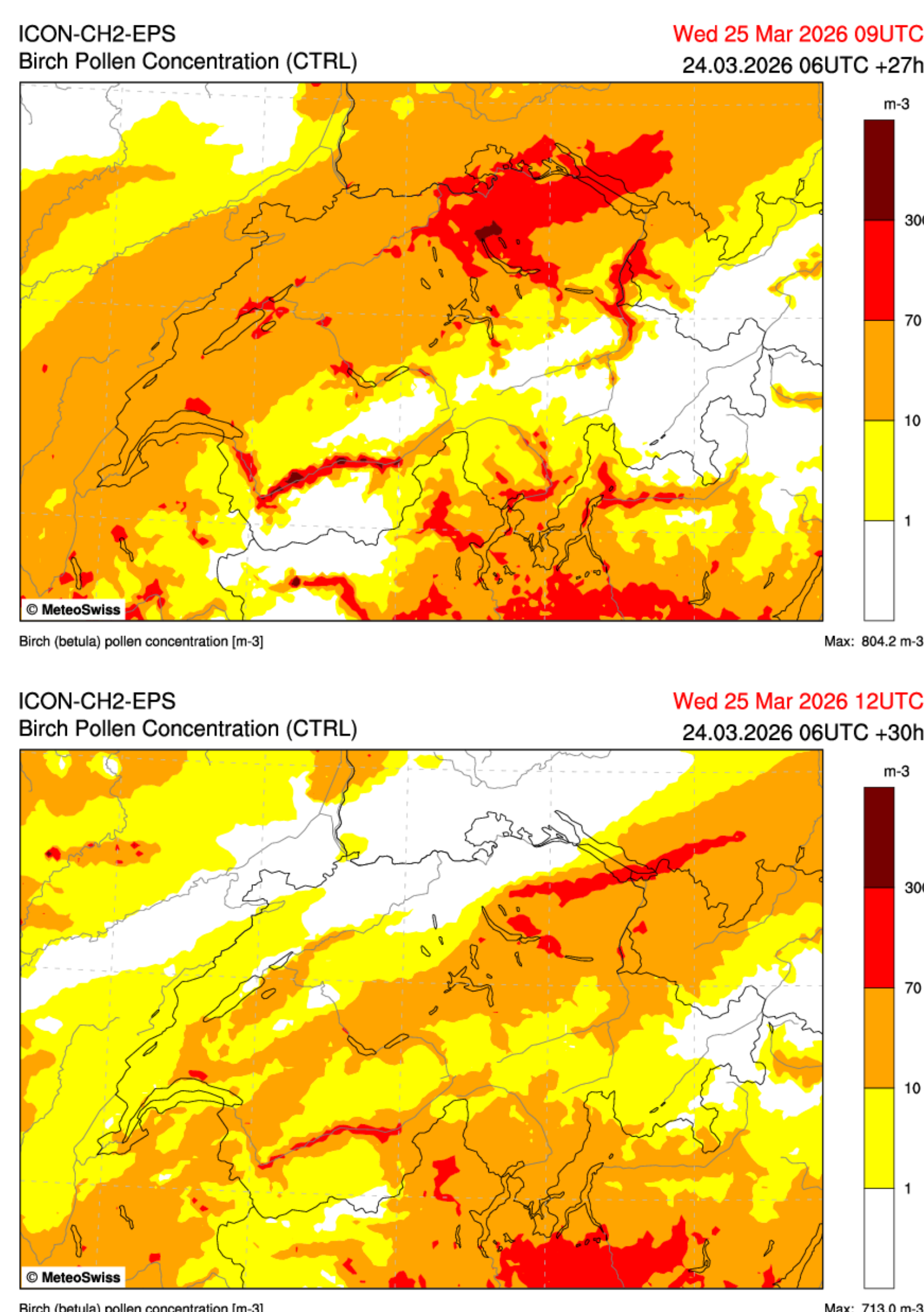
Meteorology determines the timing and intensity of pollen seasons. Long pollen time series are key for studying and documenting climate change and its impacts. To ensure the continuity of long-term datasets, manual and automatic measurements are being homogenised.



Over the period 1969-2022 the Hazel pollen season in Basel has become more intense. The number of days with high pollen loads has increased from 2 to 10. In addition, the pollen season now starts 25 days earlier than in 1969.

Pollen maps and forecasts for the public

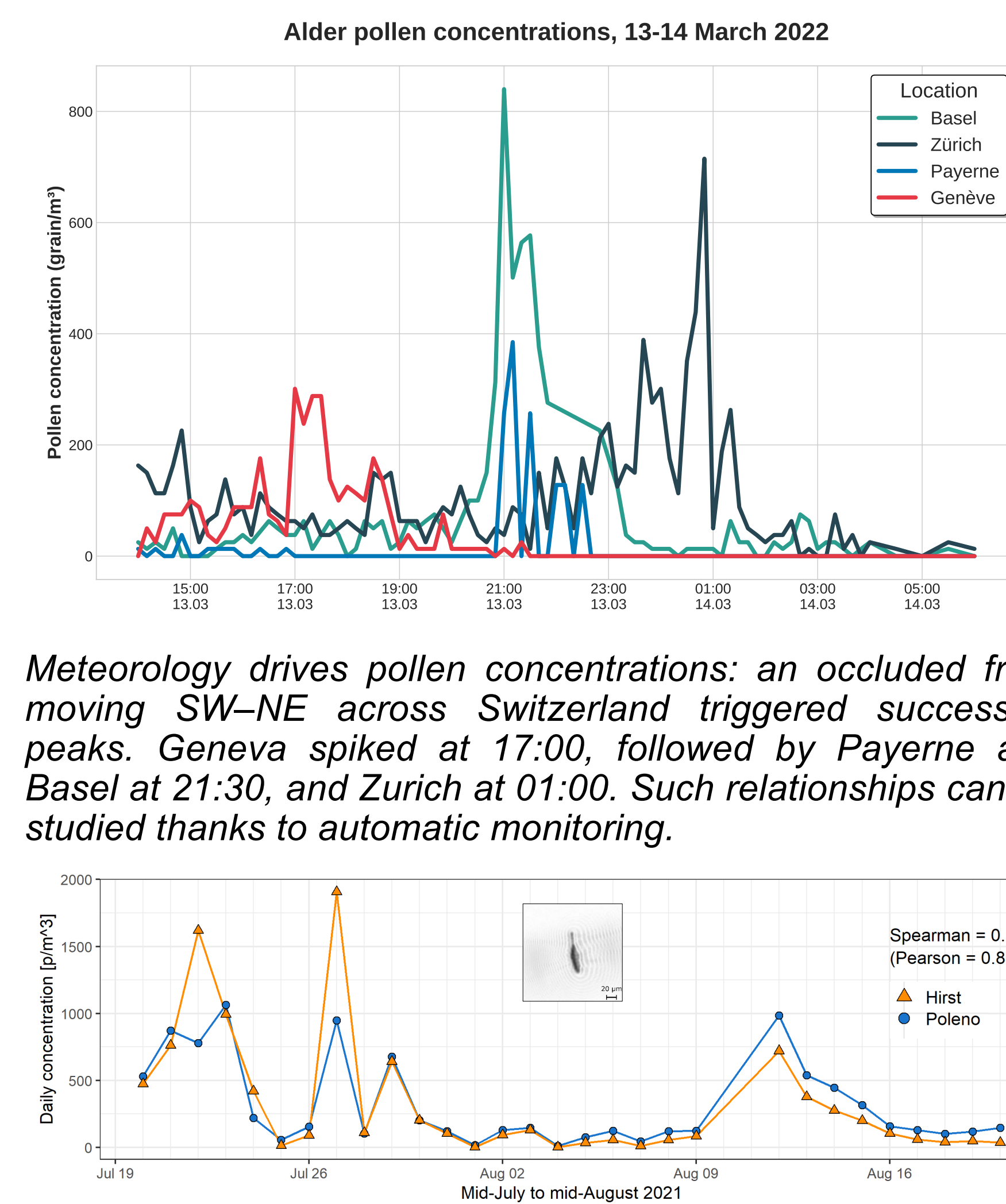
Real-time pollen data are integrated into the ICON-ART model. This has led to significantly improved forecasts. Information on atmospheric pollen concentrations is crucial to diagnose, treat and manage pollen allergies.



ICON-ART birch pollen forecasts for 25.03.2026. A cold front is forecast – initially (top image) pollen concentrations are high, but after the front has passed across the Swiss plateau, pollen concentrations decrease notably (bottom image).

Research on coarse bioaerosol

Atmospheric pollen concentrations can vary rapidly in response to meteorological conditions. Automatic monitoring makes it possible to investigate these relationships while considering other bioaerosols too, e.g. fungal spores.

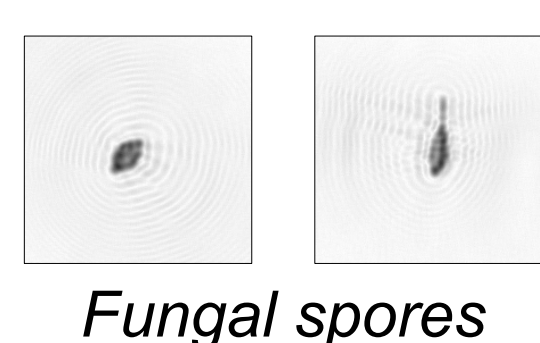


Test application of pathogenic fungal spore monitoring: automatic measurements agree well with the manual method for concentrations of *Alternaria* spores in Payerne. This classification model will be developed further to allow operational monitoring of *Alternaria*, an important crop pathogen, across Switzerland. Further developments will focus on additional allergenic/pathogenic fungal spores.

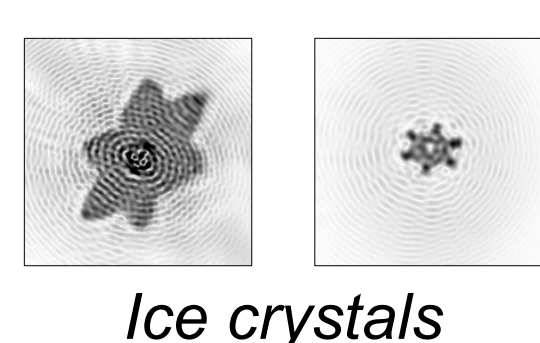
BENEFITS AND PERSPECTIVES

Automatic monitoring allows

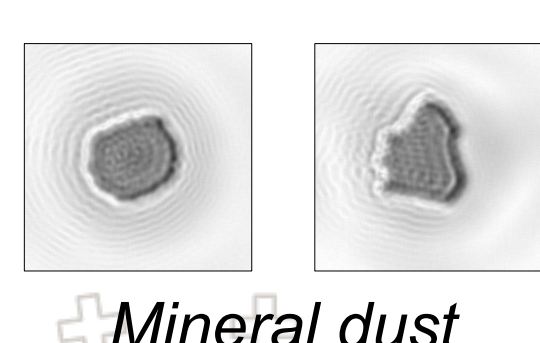
- Significantly improved **numerical forecasts** thanks to real-time data
- A better understanding of **diurnal cycles** and relationships with meteorology
- Insights into the interaction between **bioaerosol and the hydrological cycle** (e.g. ice nucleation, cloud condensation)
- New particles of importance for agriculture or public health, e.g. **fungal spores** or **microplastics**, will hopefully be able to be monitored soon



Fungal spores



Ice crystals



Mineral dust

Related projects

- **Standardisation and homogenisation** at the European level



- Measurements in **extreme environments** (high altitude, arctic, hot/dusty)

