

Towards a Spatially Transferable Pollen Emission Parameterization for ICON-ART

Supervisor: Ali Hoshyaripour, Corinna Hoose
Collaborator: DWD, MeteoSwiss

Introduction

Pollen emissions are an important component of bioaerosols and affect air quality, human health, and atmospheric composition. In ICON-ART, pollen emissions are currently parameterized using the EMPOL scheme, which relies on station-based pollen productivity and phenological input data. These inputs are not uniformly available across regions, limiting the spatial transferability of the model. A European pollen reanalysis (1980–2022) provides spatially continuous, species-specific pollen emission fluxes and offers the opportunity to develop a data-driven and more transferable pollen emission parameterization.

Research Question

How can machine learning be used to develop a spatially transferable pollen emission parameterization for ICON-ART based on European pollen reanalysis data?

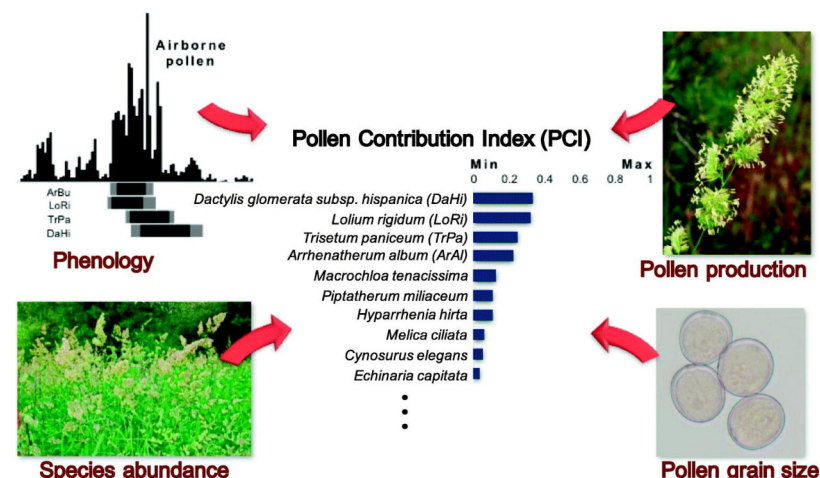
Working plan

- Step 1: Review existing pollen emission parameterizations (EMPOL) and machine-learning approaches for atmospheric emissions.
- Step 2: Analyze pollen emission fluxes from the European pollen reanalysis (focus on birch).
- Step 3: Develop and train a machine-learning model to predict pollen emission fluxes using meteorological, land-surface, and phenological predictors.
- Step 4: Compare ML-based emissions with the EMPOL parameterization and assess spatial generalization using observational footprint data.
- Step 5: Synthesize results, discuss implications for ICON-ART, and write the thesis.

Requirements

Motivation, self-organization, interest in atmospheric modeling and data-driven methods

Programming: Python (basic–intermediate), shell & Unix (basic)



Romero-Morte et al. 2018