

Mixture of bioaerosols (e.g. allergenic pollen) and air pollutants (e.g. particulate matter, ozone) exists in the atmosphere and affects significantly population health. Over the past 30 years, the prevalence of pollen allergy and asthma in Europe has increased fourfold. These levels continue to increase, with approximately 25% of the adult population being affected but nearly 30-40% of children having allergies. Moreover, several studies have shown that climate change will worsen the impact of allergy in the next decades.

Different methods (modelling, measurements, satellite) have been intensively developing for more than 30 years for estimation of chemical air pollution (e.g. nitrogen oxides, particulate matters, ozone) concentrations and are currently used for assessment, forecasting and management of air quality. Simultaneously, currently there are growing efforts to develop and improve the measurements and modelling methods for assessment of allergenic pollen concentrations in the air. Recent studies emphasize that reliable estimates of aeroallergens in the air are required for improved understanding of hay fever symptoms, diagnosis of seasonal allergies and evaluation of its treatment as well as designing mitigation strategies. A milestone in the sampling methods has been the introduction of the automatic detectors which provide near-real time information on pollen concentrations. This is valuable information for physicians and allergic subjects, but it can be also applied for the improvement of the results of pollen modelling. This is why there is a strong need for the development of pollen models with the emphasis put on methods that integrate modelling and measurements.

The main gaps in pollen modelling are: 1) use of pollen observational data to chemical transport models (data assimilation) to improve spatial and temporal variability of modelled pollen concentrations; 2) modelling pollen concentrations in a local scale, at high spatial resolution.

The proposal undertakes these challenges and aims for the development of an integrated air pollutants-pollen modelling system with the assimilation of observational data, allowing for the calculation of air pollution and allergenic pollen dispersion and concentrations.

The main objectives of the study are:

- Development of the integrated regional and local scale modelling system for joint simulations of pollen and air pollution concentrations.
- Development of data assimilation methods that integrate pollen observations, including near-real-time data, with modelling to improve the pollen concentration fields.
- Identification of spatial and temporal variability of pollen concentrations within a city using chemical transport models and the network of automatic pollen samplers.