

Impact of allergenic pollen on the optical and microphysical properties of the urban aerosol

In an increasingly polluted air, rich in different atmospheric aerosol types, the plant pollen and fungal spores have a huge impact on people's lives, being often a source of allergies and respiratory diseases. This aerosol appears during the growing season of plants, from early spring until late autumn. Climate change - currently courting more and more attention in the media – affects the growing season by prolonging pollination of plants, which in return increases public exposure to this type of aerosol. In Poland, an important role in warning about the severity of allergenic pollen episodes is taken by the Allergology Service of the Allergen Research Center (OBAS). The number of researchers dedicating their work to atmospheric aerosol investigations is growing. Anthropogenic pollution, biomass burning, etc., are considered highly important. But currently, it is pollination being referred to in the scientific community as a so-called hot topic, especially in the field of remote sensing measurements. Unique lidar measurements conducted at the Remote Sensing Laboratory (RS-Lab) of the Faculty of Physics of the University of Warsaw provide information on the distribution of aerosols in the atmosphere. Modern Lidar measures continuously the aerosol optical properties in 12 channels in the altitude range up to 25 km. These measurements can be used to derive the amount of aerosol, the size, and shape of aerosol particles, as well as the height and thickness of the formed aerosol layers. Lidar provides high-quality data for the European Aerosol, Clouds and Trace Gases Research Infrastructure (ACTRIS). As part of this project, the RS-Lab research infrastructure will be enriched with advanced automated in-situ measurements of plant pollen and fungal spores. The observations will be carried out using the optical Pollen Monitor of the Institute for Research and Development in Optoelectronics (INOE, Romania). Pollen Monitor and RS-Lab Lidar will simultaneously perform continuous measurements for 8 months in Warsaw. Based on the information provided by the afore-mentioned instruments, it will be possible to describe the physical and optical properties of the aerosol associated with pollination episodes in the city. This work will be done in close collaboration with the Polytechnic University of Catalonia (UPC, Spain). We will examine these properties in terms of their differences depending on the type, shape and amount of pollen. The obtained optical properties will be used as an input for microphysical properties retrieval done in collaboration with University of Potsdam (UP). Taking into account the specificity of the urban agglomeration, we will undertake studies on the possible mixing of allergenic pollen with other types of aerosol. Specifically, anthropogenic pollution monitored by the Mazovian Voivodship Inspectorate for Environmental Protection (WIOŚ). This will allow us to conduct a more complete assessment of the impact of pollen on the aerosol properties observed in the urban environment in Warsaw. The project results may be used as a source of information for both modeling and prediction of plant pollination and air quality, and thus, indirectly improve the life-quality of Warsaw inhabitants.