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Dissertation topic:

Ice Nucleating Particle in the Central Europe Atmosphere

Brief description of the dissertation: 5-10 sentences

In the atmosphere are present in important quantity small particles, ranging from a few nanometers to hundreds of micrometers; they are called Aerosols. They are emitted from the ground by natural processes, erosion from the wind, and resuspension of dust particles. They can be emitted from the sea with the brines, as well as from wildfires or volcanic eruptions, or produced by plants for pollens, spores, for example. They can also be produced by anthropogenic activities, from car emissions to industrial emissions through mines. All those aerosols are impacting our lives daily as we inhale them, but also as they impact natural phenomena such as cloud formation, fog, visibility, precipitation, and Earth's radiative balance. My dissertation focuses on a specific population of aerosols, the Ice Nucleus Particles (INP). Together with Cloud Condensation Nucleus (CCN), they are the particles at the origin of clouds, allowing the water vapor in the atmosphere to condense into water droplets or ice crystals. Depending on the ratio between water droplets and ice crystals, also called the solid fraction, clouds will have different radiative properties, lifetimes, and precipitation patterns. However, INP and solid fraction are difficult to measure, and the amount of data available is low. With a new instrument, PINE (Portable Ice Nucleation Experiment), we will be able to characterize the concentration and variability of INP in central Europe with high temporal

resolution over two seasonal cycles in rural background areas, using measurements at the National Atmospheric Observatory Kosetice (NAOK) and at a remote location, Milesovka. We will be able to describe seasonal cycles, the impact of weather events such as precipitation, cold fronts on the INP population. We will also improve INP parameterization to assess the amount of INP in climate models and weather forecasts, thanks to the analysis of those INP concentrations coupled with aerosol size number distribution measurement, as well as chemical analysis and biogenic aerosol measurements.

Date of commencement of studies, year

October 2024

