# Aerosol Science and Technology

7.5 ECTS

Course responsible: Paul Zieger

Small airborne particles – also known as aerosols – are in the air all around us. They vary in size from nanometers to hundreds of micrometers. Aerosols can come from many different sources and have a broad environmental influence, affecting climate, visibility, ecosystems and human health. Aerosols also play a role in numerous industrial processes. The course *Aerosol Science and Technology* dives into the world of basic aerosol properties, main processes of aerosols and how we can measure them.

Almost all properties of aerosols and their interaction with its surroundings change fundamentally with the particle sizes. This includes diffusion, condensation of gases on the particle, coagulation between colliding particles; or deposition on the planet surface, vegetation, lungs, as well as aerosol sampling tubes and inside aerosol instruments. It also includes the aerosols interaction with radiation and with clouds.

Aerosol physical properties and processes are of fundamental importance for understanding and solving problems such as:

- In- and outdoor air quality
- Aerosol health effects
- Climate change
- Deposition of medications in the respiration system
- Air-filtering
- Aerosol measurements
- and a multitude of industrial applications

Topics covered in this course include:

- Natural and human sources, and sinks of aerosol particles
- Physical properties of aerosols (e.g., particle size distributions, particle motion, particle forces, coagulation, optical properties, condensation and evaporation, electrical properties)
- Sampling techniques (e.g., filtration, sampling and measurement of concentration)

- Chemical properties of aerosols (e.g., chemical transformations, nucleation, gas-to-particle conversion)
- Analytical methods for determining the aerosol chemical and physical properties

Teaching format:

Besides general lectures, this course includes experimental demonstrations, theoretical and experimental exercises, a field excursion, and laboratory work, where the students use modern aerosol instrumentation on their own or in groups to solve a problem, followed by laboratory report-writing. The course therefore offers hands-on experience with common aerosol physical instruments complementing the lectures that covers a broader set of alternative experimental methods.