Université de Lille 1 SCIENCES ET TECHNOLOGIES — UFR de Physique

Master Physique
du fondamental au professionnel
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International Master 2 Atmospheric Environment: Research Training 2018-2019

Laboratory: LOA

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CaPPA Work Package: WP 2,3 (Aerosol microphysical, chemical and optical properties from fundamental heterogeneous processes to remote sensing) / WP 3 (Aerosol observations: Instrumentation and intensive field campaigns Monitoring from networks and satellite)

Profiling of aerosols concentration and type based on synergetic use of a mini dual-wavelength LiDAR and sun/sky-photometer

Abstract

Aerosols are highly variable components of the Earth's atmosphere, playing a key role in the global radiation budget and in the air quality. Their various impacts are depending on their vertical concentration, their size, shape, absorption and chemical composition also influenced by the amount of water vapor in their environment and their hygroscopic properties.

Several technologies are currently being developed by industry and research laboratories to monitor the vertical distribution of aerosol properties. Among them is LIDAR (Light Detection And Ranging) that provides a powerful tool for both high spatial (7.5 m) and high temporal (3 minutes) resolutions measurements. Such sounding instrument is able to measure the light backscattered by the atmospheric layers in the 0.15-12km-altitude range. At the same time and location are also being performed, often, complementary column integrated (sun-photometer) and local (in situ, at ground level) optical and/or microphysical measurements.

LOA laboratory is operated, in the framework of regional, national and international research programs, such instrumentation for many years but recently starts operating a new and compact *dual-wavelength* micro-LiDAR (532 nm depolarization channel and 808 nm).

The proposed internship will consist in (i) preliminary specific instrumental characterization (those not yet performed, for the LiDAR, at the start time of the internship) and in (ii) the synergetic determination of aerosols properties combining remote sensing techniques like LiDAR and sunphotometer, possibly with in situ techniques like Optical Particles Counter (Size Distribution), Particle Matter in suspension (PM). The analysis of these atmospheric observations and aerosol properties retrievals will be performed, primarily, at the LOA atmospheric platform but possibly during some specific field campaigns organized in North and South of France in the framework of the PM3 (*PM assessment by coupling Measure and reverse Modeling - Technological and methodological developments for the quantification of diffuse dust emissions*) supported by ADEME (Agence De l'Environnement et de la Maîtrise de l'Energie) and involving several SMEs such as CIMEL Advanced Monitoring in Paris.

Keywords: aerosols profiling, remote sensing and in situ observations synergy, LiDAR.