Master 2 thesis position offer – 2019

Analysis of the aerosols detected by LIDAR backscattering and photometry (solar and lunar) in the atmospheric boundary layer and in the free troposphere at the Observatory of Haute Provence (France).

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In collaboration with Philippe Goloub, professor at LOA (Lille).

Atmospheric aerosols play an important role on climate, atmospheric physics and atmospheric chemistry. The Observatory of Haute Provence (OHP) is a multi-instrumented site which allows the study of the composition and of the dynamics of the atmosphere, and especially the study of atmospheric aerosols. In the framework of the French national infrastructures ICOS-Fr (atmospheric greenhouse gases monitoring), NDACC-Fr (monitoring the atmosphere in the context of climate change) and ACTRIS-Fr (atmospheric aerosols, reactive trace gases and water vapor monitoring), a LIDAR operated at 532 nm continuously records the light backscattered by atmospheric aerosols from about 400 m to about 10 km above ground level (AGL). This LIDAR is also set-up for characterizing the polarization of the backscattered light. This instrument is operational since July 2014. A second LIDAR of the same type is operating from 3 km AGL to the stratosphere. OHP is also equipped with a solar and a lunar photometers, which probe the aerosols content of the atmospheric total column. All these observations allow the characterization of the troposphere aerosols content, its variability, the optical properties of the aerosols. They also permit the monitoring of the atmospheric boundary layer (ABL) height, which is a key parameter to understand the composition and the dynamics of the lowest atmosphere. Indeed, the ABL integrates aerosols fluxes but also gas fluxes (reactive species, water vapor and greenhouse gases) emitted by the earth surface, among which some are monitored at OHP.

In the framework of this thesis work, the student will make a synthesis of the data available, and will select those that are valid and that can be exploited scientifically. He/she will treat the raw datasets to extract the geophysical aerosols backscattered signals. The student will analyze these signals in function of wind direction and speed and at different altitudes of the troposphere to identify the spatial origin of aerosols at the diurnal, synoptic and seasonal scales. To fulfill these objectives, he/she will also use modeling tools such as backtrajectories. Furthermore, he/she will have the opportunity to reinforce his/her analysis by exploring the correlations between the aerosols and some gaseous species monitored at OHP (CO, O₃, CO₂, CH₄…) that can provide additional information on the origin of aerosols. The information collected on the light polarization will also help to reinforce this analysis, especially by delivering some indication on the sphericity/non-sphericity of aerosols: therefore, desertic dusts, urban aerosols, pyrogenic particles or volcanic aerosols advected to OHP might be identified.

This position is funded by ACTRIS-Fr, for a duration of 5 to 6 months, and will be filled as soon as possible. The student can be based in Paris at LATMOS (Jussieu) or at the OSU Pytheas (Aix-en-Provence) close to OHP, and will also closely collaborate with LOA (Lille). Please send a CV and a motivation letter at irene.remy-xueref@univ-amu.fr, francois.ravetta@latmos.ipsl.fr and philippe.goloub@univ-lille.fr. This work might be follow within a PhD program.