Laboratoire Inter-universitaire des Systèmes Atmosphériques

PhD Student Opportunity on black and brown carbon aerosol optical properties in LISA, France - deadline: 30th June 2020

Particulate "black carbon" (BC) and "brown carbon" (BrC), generated by the incomplete combustion of fossil fuels or biomasses or by atmospheric reactions of gaseous pollutants, strongly absorb light in the solar spectrum, which induces a warming effect of climate. BC and BrC contribute to more than 80% of the absorption by aerosols and represent the main source of global warming after carbon dioxide, both globally and regionally. The direct radiative effect of BC and BrC, although very large and expected to increase in the next decades due to the increase in fire frequency and growing anthropization, remains to date one of the largest uncertainties in the assessment of global climate forcing. The level of scientific understanding of the fundamental mechanisms of aerosol-radiation interactions for these species remains very low, resulting in the inability to represent the spectral optical properties (complex refractive index, mass absorption efficiency, single scattering albedo) of BC and BrC in climate models. In particular still little is known on the spectral optical properties of BC and BrC under ambient conditions (i.e. as a function of RH) and their possible modifications according to different atmospheric ageing processes (heterogeneous reactions with gaseous species, mixing, ...), as well as the link with the particle chemical composition.

This thesis work has the objective to spectrally resolve the ambient optical properties of BC and BrC aerosols and to understand their variability in relation to formation processes/conditions and atmospheric ageing based on original systematic experiments performed at the CESAM atmospheric simulation chamber developed at LISA (http://cesam.cnrs.fr/). The BC and BrC aerosols will be generated in the chamber where different atmospheric aging processes will be mimicked. The ensemble of the physico-chemical and optical properties of the particles will be measured by combining state-of-the-art techniques, and combined to advanced numerical modelling.

The PhD work will be conducted at LISA (Laboratoire Interuniversitaire des Systèmes Atmosphériques, http://www.lisa.u-pec.fr/fr) at the campus of the University of Paris-Est Creteil (https://www.u-pec.fr/), in the suburbs of Paris. The candidate must have a master's degree in chemistry or physics and have a good knowledge of atmospheric sciences. Knowledge of radiation transfer and/or organic chemistry will also be appreciated. The candidate must have programming skills (R, IDL, Python,...), capacities in statistical analysis of data sets, a good level of English (oral and written), as well as a taste for teamwork and should also show strong motivation.

Applications should be sent to Jean-Francois Doussin (Jean-Francois.Doussin@lisa.u-pec.fr) and Claudia Di Biagio (Claudia.Dibiagio@lisa.u-pec.fr)