



Department SAGE (Sciences de l'Atmosphère et Génie de l'Environnement)

February 2018

Ph.D. Position in Atmospheric Chemistry

Title: Sources and atmospheric impact of shipping activities on organic carbon in Marseille

En Fr : Sources et impacts atmosphériques des activités portuaires sur le carbone organique à Marseille

The Department of "Atmospheric Sciences and Environmental Engineering" (SAGE) of the Institute Mines Telecom Lille Douai, France (<http://www.mines-douai.fr/>, <http://sage.mines-douai.fr/>), has ongoing research activities focused on atmospheric chemistry, air quality and the impacts of human activities on atmospheric composition. SAGE is currently composed of a staff of about 55 persons including 16 full-time faculty members. Research projects aim at a better understanding of the physical and chemical processes involved in the formation, transport and aging/transformation of gaseous and particulate pollutants in the indoor and outdoor atmospheres.

The SAGE department from IMT Lille Douai is looking for a highly motivated Ph.D. candidate to conduct scientific research in the field of atmospheric chemistry. The proposed work is part of a large initiative seeking to improve knowledge and understanding of gaseous and particulate pollutants emissions in a Mediterranean urban area with a particular interest in the shipping emissions and their variability. This Ph.D. will focus on Volatile Organic Compounds (VOCs) which are of great interest due to their key role in atmospheric chemistry leading to secondary pollutants formation like secondary organic aerosols and ozone. The project strategy is based on receptor oriented approach (in-situ measurements) in the city of Marseille.

Project description:

In the context of global climate change and growing urbanization, the Mediterranean basin is a highly sensitive environment under considerable anthropogenic and environmental pressures. Studies already held in Mediterranean urban areas highlighted the importance of secondary organic aerosol formation as a significant part of the fine particulate matter, the spatial and temporal variability of the sources composition, and the significant discrepancies between emission inventories and in-situ observations within the framework of the program ChArMEx. While the influence of shipping emissions is suspected to be significant, especially in Western Mediterranean basin, their overall impact on urban air quality is still barely known. Considering that this activity sector will significantly grow in a near future, this question must be addressed to develop efficient abatement policy.

Among the different air pollutants, fine particulate matter (PM_{2.5}) has very significant direct and indirect effects on climate change, depending on their chemical composition and associated properties. Moreover, a large portion of atmospheric particles mass especially in the Mediterranean basin is of secondary origin, produced in the atmosphere by complex processes involving gaseous precursors like volatile organic compounds (VOCs). VOCs

include a large range of species (>100) characterized with different volatilities as well as different reactivity raising the question of their impacts on the atmospheric composition and processes at urban and regional scales.

The main objectives of this Ph.D project are to:

- document the gaseous organic carbon speciation (chemical composition) of specific sources (ship emissions) on a wide range of volatility
- evaluate and constrain the regional emission inventory
- assess these source impacts on air quality and especially on secondary pollutant formation at the urban and regional scales

The representative study area for our project is the Marseille metropolitan area where is located the most important port of the Mediterranean Sea and the leading port in France with over 2 million passengers/year, the third world harbor for crude oil and oil products, and where an accurate quantification of the harbor activities impact on air pollution is still uncertain. This project will benefit of several initiatives on-going in this area like CO₂ and Aerosol source apportionment.

Keywords: Volatile Organic Compounds, aerosols, shipping emissions, field campaigns, data analysis, source-receptor modeling, air mass back-trajectory

Candidate profile:

The successful applicant must hold a master degree in a relevant area of atmospheric sciences along with excellent communication and interpersonal skills. Skills in analytical chemistry, atmospheric chemistry, and previous experience of field measurements will be an asset for this position. Good proficiency in English is a prerequisite.

Doctoral School: Sciences de la Matière, du Rayonnement et de l'Environnement (SMRE), Université de Lille, France

Laboratory: Department of "Atmospheric Sciences and Environmental Engineering" (SAGE) of the Institute Mines Telecom Lille Douai, France (<http://sage.mines-douai.fr/>) – 941 rue Charles Bourseul – CS 10838 – 59500 Douai

Academic supervision:

The successful Ph.D. student will be awarded a Ph.D. degree from IMT Lille Douai. This work will be directed by Dr. Stéphane Sauvage with the supervision of Dr. Thérèse Salameh. A Ph.D. committee involving researchers leading related projects in Marseille will follow the progress of the work over the 3 years.

Appointment: The Ph.D. fellowship is a fixed-term position available for a total duration of 3 years with a starting date on October 2018.

This project and the selected candidate will be proposed at the ADEME call "Programme de Thèse ADEME 2018", deadline of submission the 3rd of April 2018.

Job application: Applicants are invited to send (i) their curriculum Vitae and a cover letter and (ii) a recommendation letter and at least one reference of previous or current employer(s)/supervisor(s), to Dr. Thérèse Salameh and Dr. Stéphane Sauvage to the following email addresses: therese.salameh@imt-lille-douai.fr ; stephane.sauvage@imt-lille-douai.fr