



# SOURCES OF FINE AEROSOLS AT VARIOUS FRENCH SITES USING HIGHLY TIME-RESOLVED MULTIYEAR DATASETS

## Keywords

Air quality; Atmospheric Chemistry; Aerosols; Sources; Receptor Models

## Context

Impact of particulate matter (PM) (aerosols) on air quality, and so on health, is now well recognized. However, due to their wide emission sources and to the complexity of their (trans)-formation processes in the atmosphere, the implementation of actions, in order to tackle ambient PM concentration levels, depends on a better knowledge on the origin and the behaviour of the pollutants emitted by human activities.

If aerosols are formed of a complex mixture, organic matter (organic aerosol, OA) represents a large fraction of the total mass of the fine particles in the atmosphere (from 20 to 90 % in the low troposphere). The complexity of OA composition and formation processes hinders an accurate comprehension of their impacts. Along with OA, secondary inorganic aerosols (SIA) and black carbon (BC) constitute the predominant fractions of submicron aerosols, mainly originating from anthropogenic activities.

The combination of various robust instruments - e.g., Aerosol Chemical Speciation Monitor (ACSM), multi-wavelength Aethalometers (AE33), Scanning Mobility Particle Sizer (SMPS), etc - nowadays allow for the monitoring of the physical properties and the chemical composition of this fine PM fraction over long-term periods. The use of receptor models - such as Positive Matrix Factorization (PMF) - and the investigation of air mass origins - using tools such as Concentration Field analysis (CF) or Potential Source Contribution Function (PSCF) - are furthermore needed to elucidate the main sources responsible of PM levels observed in ambient air.

## Objectives

Cooperative research infrastructures (e.g., the European ACTRIS program, [www.actris.net](http://www.actris.net)) as well as regional/national air quality monitoring networks are currently implementing a growing number of in-situ and real-time aerosol observation facilities all around the world. The present PhD thesis is aimed at taking advantage of innovative analysis tools to improve our understanding on OA sources and impacts beyond what is currently possible. The PhD student will work under the aegis of the French reference laboratory for air quality monitoring (LCSQA, [www.lcsqa.org](http://www.lcsqa.org)) to investigate the main sources and geographical origins of submicron aerosols, using receptor models.

Databases to be analysed have been obtained at different research supersites ([www.sirta.ipsl.fr](http://www.sirta.ipsl.fr) and <http://www-loa.univ-lille1.fr/observations/plateformes.html?p=lille>) as well as stations from French regional monitoring networks. A particular emphasis will be placed in the investigation of long-term (2-3 years) datasets, in close collaboration with the Swiss Paul Scherrer Institute ([www.psi.ch](http://www.psi.ch)), notably developing new source apportionment tools (e.g., SoFi). This work also relies strongly at setting the basis for innovative methodologies for near real-time source apportionment.



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## Candidate profile

### Essential:

- Master in Environmental Engineering and/or Atmospheric Chemistry
- Interest in data analysis, creativity, motivation
- Autonomy, adaptability, communication and writing abilities.
- Good proficiency in English and French

### Desirable:

- Familiarity with programming (Igor, Python, MATLAB, ...).
- Knowledge in online aerosol in situ measurements (Aerosol Mass Spectrometer, Aerosol Chemical Speciation Monitor, Multi-wavelength Aethalometer, Scanning Mobility Particle Sizer, ...).

### More advanced skills: (good if you have, if not, you will learn):

- Source apportionment by factor analysis (Positive Matrix Factorization)
- Wind and trajectory analysis

## Supervision

Doctoral School for Materials, Radiation and Environmental Sciences (EDSMRE)

<http://edsmre.univ-lille1.fr/index.php?id=accueil&L=2>

Thesis director: Prof. Véronique Riffault, SAGE / IMT Lille Douai

Thesis supervisors: Olivier Favez (INERIS), Joël Brito (SAGE), Jean-Eudes Petit (LSCE)

## Job Application

Applicants are invited to send their Curriculum, a cover letter, and two reference letters to Prof. Véronique Riffault: [veronique.riffault@imt-lille-douai.fr](mailto:veronique.riffault@imt-lille-douai.fr) and Dr. Olivier Favez: [olivier.favez@ineris.fr](mailto:olivier.favez@ineris.fr).

Review of applications will take place until the position is filled.

The fellowship is a fixed-term position available for a total duration of 36 months. The thesis is expected to start in the Fall 2019.

The successful candidate will be based in Douai with stays in other laboratories. Douai is a middle-size city of 40,000 inhabitants, located in the North of France at 20 min from the metropolis of Lille by road or suburban train, 1 hour from Paris and Brussels by train and 1.5 hour from London by Eurostar.