Master's Internship Subject (2025–2026)

Title: PM2.5 Air Pollution: Source Contributions and Oxidative Potential Compared to PM10

Host Laboratory: Institut de Géosciences de l'Environnement (IGE, Université Grenoble Alpes)

Supervisors: Ludovic Farnier, Pamela Dominutti, Stéphane Sauvage

Keywords: atmospheric aerosols, PM2.5, source apportionment, oxidative potential, air quality and health

Duration: up to 6 months, starting late January 2026

Context

Fine particles (PM2.5) represent one of the most harmful fractions of air pollution, as they penetrate deeply into the respiratory system and are strongly linked to adverse health effects. Understanding not only their chemical composition but also their *oxidative potential* (OP) — a key indicator of their ability to induce oxidative stress in humans — is crucial to better evaluate population exposure.

The **DECOMPOSE project** (funded by ADEME, coordinated by Atmo Grand Est with partners IGE and SNCF) has generated a unique dataset in Reims (France), combining intensive winter and summer sampling of PM2.5 and PM10 together with several online measurements across three contrasting sites: an urban background, a traffic site, and a train station site.

Objectives of the Internship

The internship will focus specifically on:

- **PM2.5 characterization**: analyzing their chemical composition and identifying major emission sources by applying source apportionment techniques.
- **Oxidative Potential (OP) evaluation**: comparing PM2.5 OP with that of PM10, and assessing differences in OP activity for both fractions.
- **Source–health link**: highlighting how PM2.5 source contributions translate into potential health risks relative to PM10.
- **Investigate the relationship between offline and online PM chemical composition,** comparing the relationship between both datasets and the potential improvements of source identification.

Methodology

The student will participate in the chemical analysis of PM samples at the Air-o-Sol analytical platform to train themself on the analytical techniques performed for PM chemical composition. The student will then process and analyze an extensive dataset using statistical and geochemical tools for source apportionment (e.g., source apportionment by PMF, correlation analysis).

Particular attention will be given to the links between source contributions and oxidative potential for the PM2.5 fraction.

Student Experience & Learning Outcomes

- Hands-on experience with **large environmental datasets** and **geochemical source apportionment tools**.
- Development of skills in **statistical data analysis**, **air quality research**, and **health-oriented environmental science**.
- Opportunity to contribute to **scientific publications** and to work within an interdisciplinary network involving research institutes, environmental agencies, and transportation (SNCF).
- Insight into pressing societal issues on **air pollution and human health**, with direct policy relevance.

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