Individual exposure to air pollutants: differentiating indoor and outdoor exposure

Air quality is a strong environmental and health issue. The health and economic impacts have been and continue to be the subject of numerous studies. On the public health front, since the early 2000s, work has been carried out to gain a better understanding of air quality, whether it is outdoor ambient air or, more recently, indoor air, and to identify effective solutions for reducing pollutant emissions. For several years now, this subject has been a regular topic of public debate.

Epidemiologic and public health studies show that exposure to air pollutants is associated to an increase in mortality and morbidity. But these studies use as a proxy for individual exposure outdoor air concentrations extrapolated to the home address of the individual, because actual measurements are not available. This potentially leads to important biases, because they do not take into account possible local sources, nor the indoor exposure, nor the fast temporal variability of some pollution phenomena. Miniature individual sensors such as the ones developed within the APOLLINE project at the University of Lille allow to quantify this individual exposure, and therefore to reevaluate the epidemiological studies.

The objectives of this PhD program are:
- To measure with individual sensors the exposure of people in outdoor air in urban environment (Lille urban area), in buildings (home, workplace, leisure activities...) and in public transportation.
- To evaluate the drivers of indoor air pollution, which are far from being well known, in spite of the fact that we spend 90% of our time indoors.
- To propose recommendations for future large-scale epidemiologic studies, combining data from sensors and from reference fixed measurement stations.

Potential candidates should hold a Master degree in atmospheric chemistry, environmental sciences, analytical physics and chemistry... Data analysis skills are expected.

The candidate will be supervised by B. Hanoune (http://pc2a.univ-lille.fr/), and S. Crumeyrolle (https://www-loa.univ-lille1.fr/). The work will take place at PC2A and LOA laboratories.

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