

## Current issues linked to particulate matter in North-Western Europe

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### Abstract

Particulate matter (PM) or aerosols can be defined as solid or liquid particles suspended in a gas, excluding hydrometeors such as cloud and rain droplets or ice crystals. The size of PM ranges from a few nanometers up to several micrometers. Among them, fine particulate matter (PM), that is to say, particles with an aerodynamic diameter smaller than 2.5  $\mu\text{m}$  (PM<sub>2.5</sub>), causes several human health and environmental concerns. In 2013, the International Agency for Research on Cancer (IARC), part of the World Health Organization (WHO) even classified outdoor air pollution and one of its major components, particulate matter, as carcinogenic to human beings.

Yet (apart from a few minor but particularly toxic constituents), only its mass concentration is regulated in ambient air in Europe by the 2008/50/EC Directive, which sets a limit value of 25  $\mu\text{g m}^{-3}$  on an average annual basis. The WHO recommends even stricter air quality guidelines with an annual average of 10  $\mu\text{g m}^{-3}$  for PM<sub>2.5</sub>, and a 24-hour mean of 25  $\mu\text{g m}^{-3}$  (not to be exceeded for more than 3 days/year). These limits are however frequently exceeded in many parts of the world, including the North-Western Europe region where extensive road traffic, urban density, as well as significant industrial areas are significant sources of primary or secondary particles.

Primary sources, corresponding to the direct emission of particles into the air, can be anthropogenic such as vehicular exhaust and non-exhaust emissions, biomass burning, industrial plumes, etc.; or natural such as mechanical erosion processes, sea salt or biological aerosols. But particles can also come from secondary processes related to gas-to-particle conversion, either from volatile organic compounds (VOC) which can form secondary organic aerosols (SOA) or from inorganic gases such as nitrogen or sulfur dioxides which can form secondary inorganic aerosols (SIA). These precursor gases can come from various chemical sources and therefore be of different chemical natures.

Long-term observations and intensive field campaigns have been going on these past years to better assess both the spatial and temporal variability of fine particles in Europe and the underlying mechanisms and/or processes explaining the occurrence of exceedances, in order to provide models with high-quality data. A few examples of these coordinated efforts will also be presented to illustrate the current issues associated with fine particles in this region.

**Keywords:** *Particulate matter (PM), North-Western Europe, secondary inorganic aerosols, Long-term observations*

### Biography

Dr. Veronique Riffault is a Full Professor at the Department of Atmospheric Sciences and Environmental Engineering (SAGE) at IMT Lille Douai. She received her PhD from the University of Orleans in 2002. After a 2-year postdoctoral position at ESRL-NOAA/Univ. Colorado in Boulder (USA), she was recruited at IMT Lille Douai in 2006 and got her Habilitation diploma from the University of Lille in 2012. She is the current scientific coordinator of the “Reactivity and air treatment” group.