



# MEGAPOLI - PARIS

## Pollution by AeRosols: Impact on air quality and Source quantification

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### ► CONTEXTE ET ENJEUX

Megacities concentrate a large part of countries' population, economic activities and pollutant emissions. This creates very often huge impact on local air quality. In addition, the interaction with the regional scale atmosphere needs to be taken into account. Pollution transport from outside can contribute to megacity pollution levels. Pollution export related to secondary pollutant build-up affects the atmospheric chemical composition at larger scales, with potential impact both on regional air quality and climate.

Primary sources of carbonaceous aerosol are today not well enough constrained, chemical processes of secondary organic aerosol build-up need to be better understood and documented in the field.



Figure : fixed and mobile ground based and mobile measurement platforms during the MEGAPOLI campaign

### ► OBJECTIFS et METHODES

The Paris agglomeration, a tertiary type megacity with 12 millions inhabitants, flat orography, and a mostly rural environment has been chosen as a case study. The major objective was to quantify the origin of carbonaceous (carbon containing) particulate matter (PM).

An intensive field campaign, combining ground-based and airborne measurements, with about 20 European laboratories involved, has been set-up during two monthly periods in summer 2009 and winter 2009/2010.

In parallel to the intensive campaign, year round measurements of the chemical composition of fine PM have been performed (PARTICULE project, AirParif, LSCE) at an urban site, and several sites outside of the agglomeration.

### ► POINTS FORTS

Major particulate matter control by advection from outside the Paris agglomeration, previously known for inorganic aerosol, was also made evident for organic aerosol from a combination of ground based and satellite observations and modelling.

Major non-fossil (modern) carbonaceous aerosol source, ~80 % in winter, ~60% in summer, due to wood burning, biogenic secondary aerosol formation, cooking activities.

Major nitrous acid (HONO) source made evident in odd hydrogen radical (major tropospheric oxidation agent) budget, new evidence of snow –pollution interaction during winter leading to HONO formation.

Enhanced fraction of aromatic VOCs (volatile organic compounds) in Paris agglomeration (as compared to other urban locations); these compounds strongly contribute to organic aerosol formation in Paris pollution plume.

Valorisation by nearly 30 peer reviewed articles (including FP7 project)

Campaign data on-line at [www.pole-ether.fr/megapoli/](http://www.pole-ether.fr/megapoli/).

### ► PRODUCTIONS SCIENTIFIQUES

Ait-Helal, W., et al., 2014, ACP, 10439. Beekmann, M., et al., 2015, ACPD, 8647. Bressi, M. et al., 2013, ACP, 7825. Crippa M., et al., 2013, ACP, 961. Dolgorouky C., et al., 2012, ACP, 9593. Freney, E.J., et al., 2014, ACP, 1397. Michoud, V., et al., 2014, ACP, 2805. Zhang Q.J., et al. 2013, ACP, 5767.

### ► PERSPECTIVES

Need for air quality management action on regional scale recognised, but reducing urban black carbon levels also requires local policy measures

French atmospheric research is better structured: => Set-up of an instrumental ensemble for airborne pollution measurements (aerosol composition and size distribution, major gas phase species), later used in MISTRALS / CHARMEX project.

=> Improvement of models used for air quality simulations (CHIMERE, Polyphemus)

Seven PHD's accomplished, one thesis (CIFFRE) in collaboration with an enterprise (ARIA Technologies).