

Black Carbon over the region of Paris (France): spatial distribution, sources, and trends

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Road traffic and domestic wood burning emissions are two major soot-containing aerosol source contributions to particulate pollution in our cities. A better characterization of these sources should provide useful information for policy makers attempting assessment, implementation and monitoring of air pollution abatement strategies aimed at issues affecting human health with additional benefits for climate change.

As part of the PRIMEQUAL “PREQUALIF” and ADEME “REBECCA” projects, a dense Black Carbon (BC) network has been implemented over the city of Paris with various real-time instruments (Multi-Angle Absorption Photometer, MAAP by THERMO; Multi-wavelength Aethalometers by MAGEE Scientific) operating in contrasted locations (rural background, urban background, traffic). To our best knowledge, this is the largest BC network currently operating in a city providing the longest record (>5 years) of measurements and allowing to apportion between fossil fuel (traffic) and domestic heating (wood burning) sources of Black Carbon. This unique database is used here to address, for the first time, spatial distribution, sources, and trends of BC at the scale of a city (Paris) often used as a model to mimic urban pollution of large occidental cities (Beekman *et al.*, 2015).

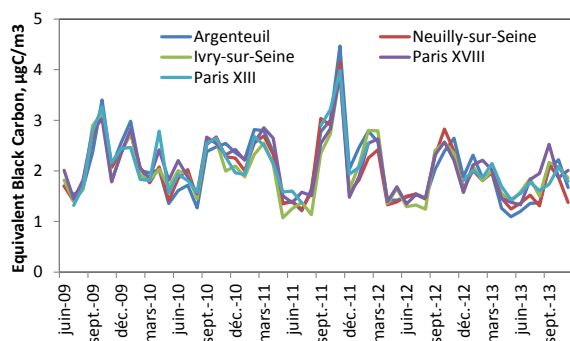


Figure 1: Time series (monthly mean) of equivalent Black Carbon (EBC) at the 5 “historical” urban background station of Paris.

Although many studies have reported strong gradients of Black Carbon concentrations for city centres to rural sites (see for instance Bressi *et al.*, 2013 for Paris), our dataset (Figure 1) suggests that, at a monthly mean level, urban background concentrations of BC at different

location (up to 15km distance) within the agglomeration are rather homogeneous, providing evidence of the representativeness of this network to monitor long-term trends in black carbon concentrations over the city of Paris.

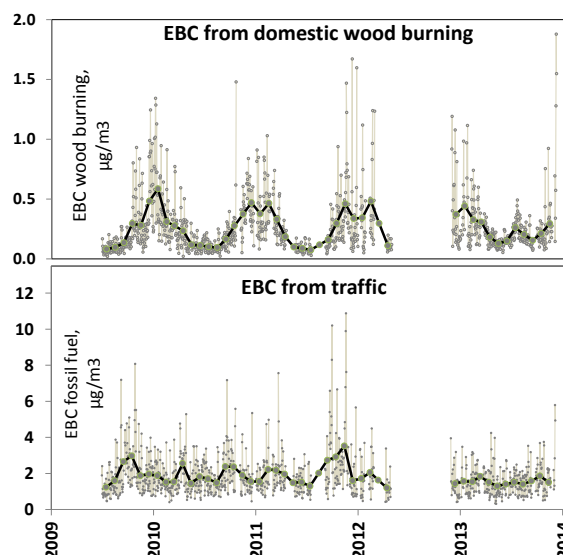


Figure 2. Daily and monthly mean concentration of EBC from domestic wood burning and traffic at an urban background site of Paris (XIIIth district)

Using the Aethalometer model developed by Sandradewi *et al.* (2008) and tested over the region of Paris (e.g. Sciare *et al.*, 2011), source apportionment of Equivalent Black Carbon was performed. Figure 2 shows a strong seasonal cycle of BC from wood burning covering as much as 6 months the year (from October to April). An in-depth analysis of the spatial distribution of BC sources at the scale of the region of Paris and multi-year BC trends are presented and discussed in this study.

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Sandradewi, J., *et al.* (2008) *Environ. Sci. Technol.*, **42**, 3316-3323

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