The MEGAPOLI Paris campaign for urban aerosol characterisation

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Within the FP7 MEGAPOLI project, an intensive field campaign will be conducted in the Greater Paris region during July 2009 and January/February 2010. The aim is to quantify sources of primary and secondary aerosol, and the interaction with gaseous precursors, in and around a large agglomeration and to document its evolution in the megacity plume.

Greater Paris has been chosen for such a campaign because it is a major and dense pollution source (more than 10 million inhabitants), surrounded by rural areas and relatively flat terrain. A particular focus will be put on organic carbon, for which secondary formation, but also primary emissions are still not well quantified.
Detailed aerosol measurements and gaseous precursor measurements will be conducted at an urban and a sub-urban site, from two mobile platforms and from the French ATR-42 research aircraft (for plume characterisation). State of the art instrumentation will allow determination of aerosol chemical composition, either with very high frequency (several minutes to half an hour), or with large chemical detail (several dozens of organic compounds from filter samples). In addition, the size distribution, optical and hygroscopic and mixing properties will be determined in order to relate the aerosol chemical composition to its potential radiative and climate impact in the urban region and its plume. Gas phase measurements will focus especially on detailed VOC measurements in order to relate SOA build-up to gaseous precursor species abundance. A network of backscatter lidars including fixed station (urban, sub-urban) and mobile platforms (car and aircraft, see Cuesta et al., this session) will give the access to the aerosol vertical distribution in the region and to variations of the boundary layer height at the urban / rural interface.

All in all, the campaign will be the most intensive urban aerosol characterisation experiment ever conducted over Europe. The present paper will present an overview over campaign aims and the campaign set-up (sites, instruments, measurement strategy). Plans for exploiting campaign measurements will be given: this includes application of source apportionment methods to better constrain uncertain emission sources, specific methods to derive the kinetics of SOA build-up in an urban plume, and comparison with air quality models.

The paper will also highlight current uncertainties in air quality models to simulate urban aerosol sources and evolution, these uncertainties being one of the rationales for organising the campaign. Simulations with the state of the art air quality model CHIMERE in the Greater Paris region performed for several seasons will be compared with PM10 / PM2.5 measurements from the AIRPARIF air quality network and to chemical mass closure measurements for dedicated periods (see Sciare et al., this session) and major flaws identified. This will include the analysis of a highly polluted period in beginning of January 2009, when PM10 levels up to 200 μg/m3 were observed by the AIRPARIF air quality network at urban background sites.