

Influence of petrochemical activities on fine particles and VOC observed in a Mediterranean urban area

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With traffic of about 97 million tons (Mt) (62.5% of crude oil and oil products) in 2007, the autonomous port of Marseilles is the most important port of the Mediterranean Sea. It handles twice the traffic compared to Genes, and nearly three times the traffic of Barcelona or Valencia. A huge petrochemical area among other industrial plants (steel mill, coke plant,..) is also located close to Marseilles, the second most populated city in France with more than 1 million inhabitants. This area is also well known for its photochemical pollution especially regarding ozone, and evidence of rapid formation of secondary organic aerosol have been pointed out within the framework of the ESCOMPTE experiments.

In this context, an intensive field campaign was carried out at an urban background site in July 2008, within the FORMES program. C-TOF-AMS, HS-PTR-MS, SMPS, and VHTDMA were connected together to a common inlet in order to investigate in detail fine particles and VOC's with high temporal resolution.

In addition to local sources, high concentrations of particles reaching $140\,000\text{ cm}^{-3}$, most of the time associated with SO_2 , were observed during the campaign. These particles had diameter less than 20 nm when the sampling site was directly downwind the main industrial area and their composition were dominated by sulphates and organics. Results presented in figure 1 were acquired during a typical sea breeze event. An increase of the particles diameter, of ozone and secondary VOCs (such as MEK) associated to a longer transit time of the air masses above the Mediterranean Sea were observed. During these events, particles present acidic conditions (30-40% of sulphates were in the form of bisulphate HSO_4^-) and VHTDMA results show an external mixing state of the aerosol ($D_p=25$ and 100 nm) with one hydrophobic mode (GF at 90% =1.05-1.30) and one hydrophilic mode (GF=1.35-1.70).

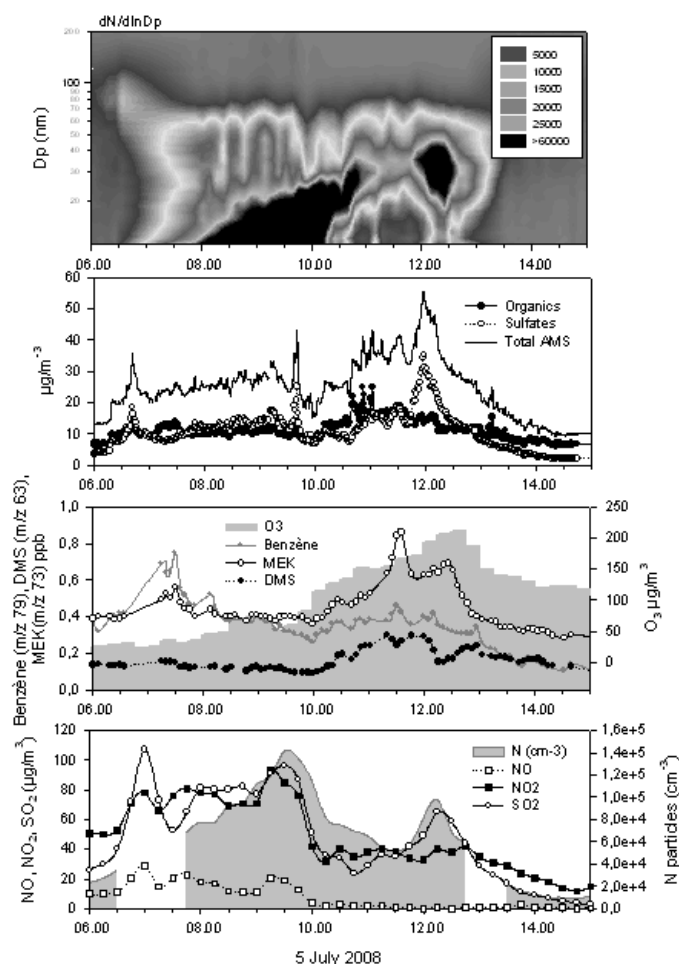


Figure 1: Evolutions of properties of aerosol and selected VOCs during typical sea breeze event heavily impacted by industrial emissions.

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