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Source apportionment of fine atmospheric particles in Marseille: a one year study

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Marseille is the second most populated city in France with more than one million inhabitants. With traffic of about 88 million tons (Mt) in 2011, Marseille is also the most important port of the Mediterranean Sea, and also in the vicinity of the large petrochemical and industrial area of Fos-Berre, located 40 km northwest of the metropolitan area.

For these reasons, Marseille area represents a challenging case study for source apportionment exercises, combining an active photochemistry and multiple emission sources, including fugitive emissions from industrial sources and shipping. In order to develop strategies for controlling and reducing air pollution, there is a need of source apportionment studies in order to better understand the influence of the different sources of aerosol particles.

Within the framework of the EU-MED APICE project (Common Mediterranean strategy and local practical Actions for the mitigation of Port, Industries and Cities Emissions ; www.apice-project.eu), sources of atmospheric particles in Marseille were evaluated for a one-year period by a long monitoring campaign conducted at two sampling sites. PM2.5 were collected continuously on a 24h-basis in an urban background site from July 2011 to July 2012 and on a 48h-basis for the Eastern dock from November 2011 to July 2012 using high volume samplers (DA80) operating at a flow rate of 30m3 h^{-1}.

In this work, two different source apportionment models were used to explain the chemical observations, and to investigate the sources of organic aerosol in Marseille. Two sources apportionment models were used and combined to quantify the contribution of the main aerosol particles sources: CMB (Chemical Mass Balance) and PMF (Positive Matrix Factorization). Both models were used with organic molecular markers and metals/trace elements.

Both approaches are able to identify major sources, the combination of these two commonly used receptor models offer interesting perspective, especially when the factors derived from PMF analysis are injected as source profiles in CMB calculation.