Chacterisation of PM_{10} emission sources in Coimbra through Positive Matrix Factorization

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Objectives:

PM10 source apportionment in the city of Coimbra through Positive Matrix Factorization

Methods and Results:

The sampling campaign was carried out in Coimbra, from December 2018 until June 2019. Two places were selected, one for traffic (*Estádio Universitário*) and the other one for urban background (*Instituto Geofísico*). Sampling was performed through a High-Volume Sampler (MCV CAV-A/mb, 30 m3/h) and a Tecora Low Volume Sampler (2.3 m3/h), both equipped with a PM10 inlet. Ambient air samples were collected onto quartz and Teflon filters for subsequent gravimetric and chemical component analysis. Organic and elemental carbon (OC and EC) were determined by a thermal-optical technique. Ion Chromatography was carried out for the determination of soluble ions, whereas high-performance anion-exchange chromatography with pulsed amperometric detection (HPAE-PAD) was employed to obtain the concentration of saccharides, tracers of biomass burning. Additionally, samples were subjected to elemental analysis by PIXE. The chemical databases were used as input of the Positive Matrix Factorization (PMF) software to perform source apportionment. It is a multivariate factor analysis technique, released by the US-EPA.

Figure 1. Samplers located on top of the background site.

The mass concentrations of all the afore-mentioned elements were compiled in a database to feed in a source apportionment software, the Positive Matrix Factorization (PMF). It is a multivariate factor analysis technique, released by the US-EPA. Results from data processing through this technique points at traffic-related sources, as expected, but also to other sources that proof themselves to be consistent and relevant over the considered months. Interestingly, biomass burning is responsible for as much as 31% of PM10 concentrations in both the trafficked area and in the urban background site. Nonetheless peaks of PM_{10} concentrations were registered in the winter months, from December until February, so did the contribution of biomass-burning which, in some cases even exceeded the other sources.

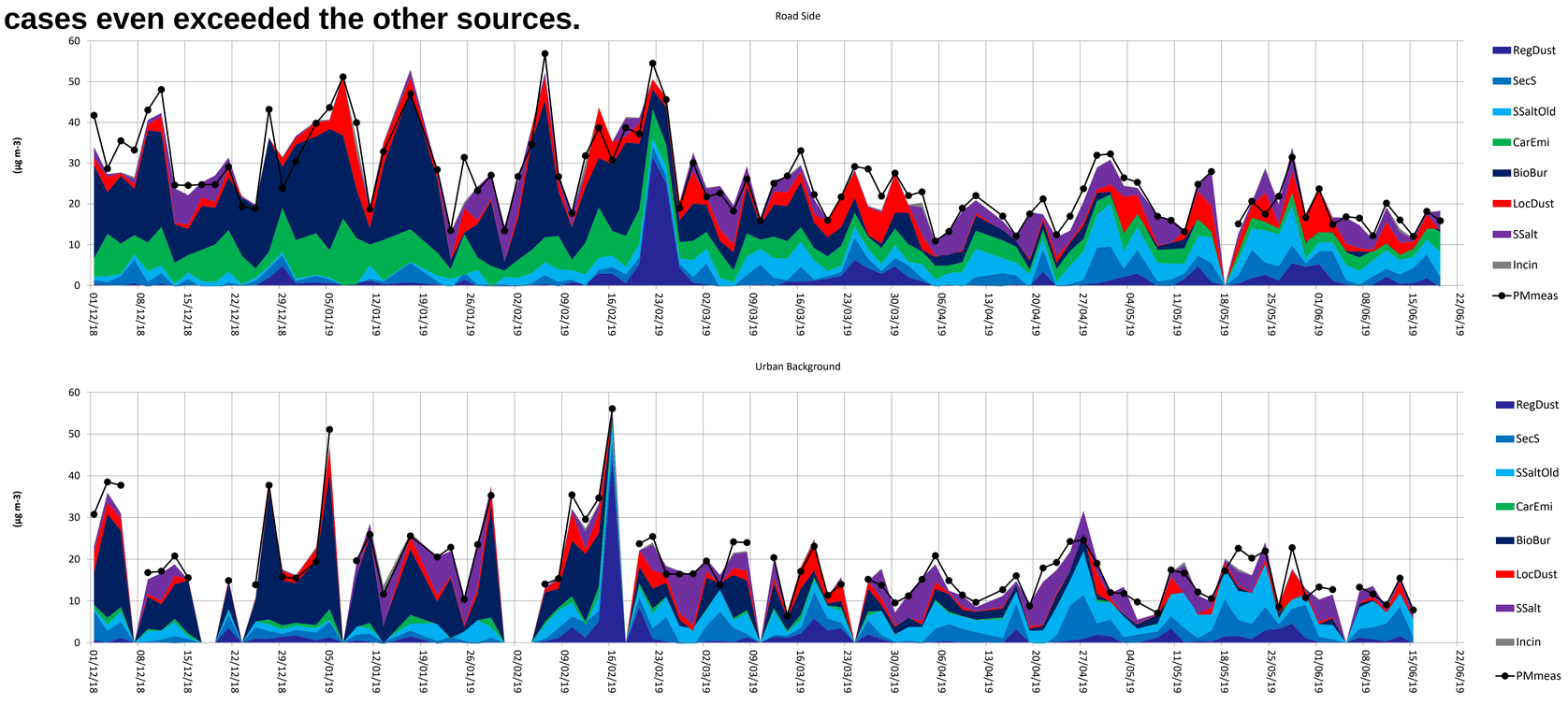

Figure 2. Contribution of emission sources to PM_{10} in both road-side and background sampling sites.

Conclusions:

Car traffic in European cities is socially accepted as a major source of air pollution. There is indeed scientific evidence that emissions from motor vehicles jeopardise the quality of life of citizens. Notwithstanding, other sources can be responsible for a non-negligible amount of particulate matter emitted, such as biomass burning that is responsible for severe air pollution episodes in cities. It is then vital to thoroughly identify the sources for implementing measures and reduce hazardous levels of PM in the air.

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