

Atmospheric PM episodes affecting a continental background site in the Western Mediterranean Basin

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Keywords: Black Carbon, Ultrafine particles, CPCs, Photochemical nucleation, Regional Pollution, African Dust

The Montsec (MSC) site is a continental background station located in the pre-Pyrenees mountain ranges, Lleida province (NE Spain), 1570 m.a.s.l. The MSC site was selected to study the tropospheric aerosols in the continental background of NE Iberia (CARIATI, CGL2008-06294/CLI). In the framework of the CARIATI project, the MSC measurements started on November 2009. The monitoring site was equipped with:

- a low detection-size (3-1000nm) condensation particle counter (TSI, CPC 3776), 5 minutes resolution;
- a multi-angle absorption photometer (Thermo Scientific model 5012, MAAP), each minute;
- an optical counter (0.3-10 μm) (Grimm Labortechnik GmbH & Co. KG, model 1107), 30 minutes resolution;
- a high-volume sampler equipped with a PM_{10} cut-off inlet (DIGITEL DH80), one 24-hour sample each 3 days;

These instruments allow the measurement of real time concentrations of PM_{10} , $\text{PM}_{2.5}$, PM_1 , Black Carbon (BC) and particle number (N). Furthermore, PM_{10} samples were used for a complete chemical characterization (Querol et al., 2008).

Meteorological interpretations and the origin of the air masses reaching the MSC site were made by means of: calculation of back-trajectories ending at MSC; study of local meteorology from the Montsec d'Ares station (Autonomous Meteorological Service, SMC); interpretation of aerosol maps for the identification of long range transport of atmospheric aerosols, including African dust, biomass PM and anthropogenic pollution plumes (BSC/DREAM8b; SKIRON, NAAPS).

Mean levels of PM_{10} , $\text{PM}_{2.5}$, PM_1 , Black Carbon and particle number (November 2009-March 2010) are shown in Table 1. PM and BC concentrations were very low, typical of winter continental background. N levels were akin to that measured in winter at regional background sites in the same region.

Table 1. Mean wintertime levels of PM_x , BC and N at MSC.

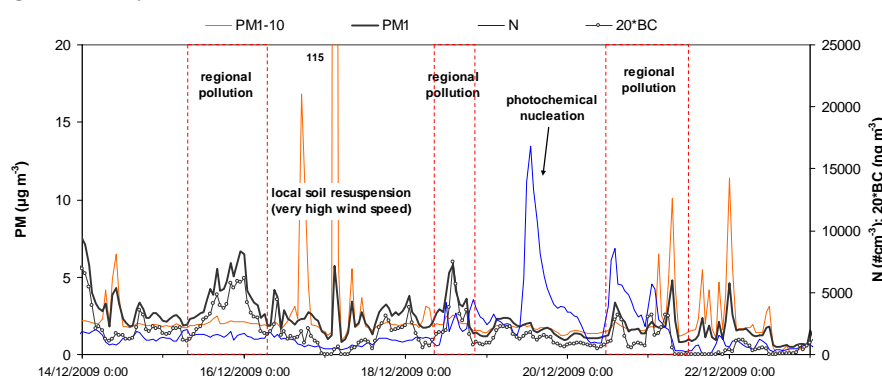
Instrument	Data coverage	Parameter	Mean concentration
GRIMM	100%	PM_{10} , $\text{PM}_{2.5}$, PM_1	4.4, 3.8, 2.0 ($\mu\text{g m}^{-3}$)
MAAP	100%	Black carbon	80 (ng m^{-3})
CPC	50%	number	2070 ($\# \text{cm}^{-3}$)

During the short period of measurements, different atmospheric PM episodes were identified:

- photochemical nucleation events affecting only N;
- regional pollution plumes influencing positively all the monitoring parameters;
- soil resuspension and African dust episodes increasing coarse PM (PM_{1-10});
- long range transport of pollutants from central Europe affecting mainly fine PM (PM_1) and the BC;

Figure 1 illustrates some of these PM episodes recorded at MSC. As seen in the 9 days shown in Figure 1, three types of PM episodes were registered: local soil resuspension induced by strong winds; three short regional pollution events; and a very intense photochemical nucleation episode.

Figure 1. Hourly concentrations of PM_{1-10} , PM_1 , BC and N at MSC from 14th to 23rd December 2009.



References: Querol et al. (2008). *Atmos. Environ.* 42, 3964-3979.

Acknowledgements: Ministry of Science and innovation of Spain (CGL2008-06294/CLI), HYSPLIT, SKIRON, BSC/DREAM8b and NRL-NAAPS. Thanks to Jesús Parga and Josep Salse for their technical support.