

First measurements of aerosol black carbon in a very humid area using the “dual-spot” Aethalometer with a new drier

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Aerosol black carbon (BC) is a short-lived climate forcing agent and plays an important role in climate change, atmospheric environment, and human health.

Black carbon was measured with the new Aethalometer model AE33 (Magee Scientific, Aerosol d.o.o.), which was connected to an air inlet with a cut of size of 10 μm , at an urban and a suburban site close to A Coruña in Galicia, a zone of the northwest of Spain where the use of the firewood as domestic fuel is very widespread. In this Aethalometer, two measurements are obtained simultaneously from two sample spots. Both spots derive their samples from the same input air stream. The flow through the two spots differs between two spots, resulting in different sample accumulation rates, and consequently different attenuation of light passing through each of the sample spots. Measurement at two different attenuation values allows the compensation of the non-linear loading effects.

The measurement locations featured large changes in ambient relative humidity (RH). Global Atmospheric Watch recommends that aerosol optical properties should be measured at low and stable RH (WMO/GAW, 2003). We found large oscillations in the data due to changing RH at high RH values. We installed a newly developed nafion drier (Magee Scientific, Aerosol d.o.o.) with a large reduction of the dew point (Figure 1). The drier considerably improved the data quality, reducing the noise in the measurement.

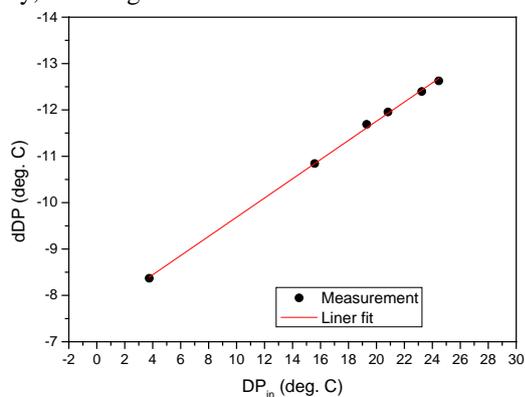


Figure 1. The change in the dew point of the sample air (dDP) as the function of the inlet air dew point (DP).

Once the optimal conditions were set up, BC measurements were conducted between the 21 and 30 of November 2014 and between the 17 and 31 of December

in a suburban area and between the 1 and 16 of December in the urban area. In Table 1, mean concentrations of BC and % biomass burning (BB), estimated by the Aethalometer, are presented. BC mean concentrations were much higher in the suburban site than in the urban site. Urban concentrations are similar to ones found in Barcelona (2,1 $\mu\text{g}/\text{m}^3$), higher than in Athens (0,74 $\mu\text{g}/\text{m}^3$) (Ostro *et al* (2015)) and lower than in London (7,8 $\mu\text{g}/\text{m}^3$) (Reche *et al* (2011)).

Table 1. Concentrations of black carbon.

Site	BC ($\mu\text{g}/\text{m}^3$)	% BB
Suburban	3,3	26
Urban	1,8	6

Higher BC concentrations in the suburban area can be due to the frequent use of wood for heating, which is reflected in biomass burning results.

The newly acquired dataset BC dataset, unique in this area, provides insights into the operation of the drier, its influence on the BC measurements, sources of BC and will provide useful information for the authorities interested in regulating biomass burning.

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