Multiyear in-situ measurements of atmospheric aerosol absorption properties in Valencia (Spain)

S. Segura[1], V. Estellés[1], A.R. Esteve[2], C.R. Marcos[1], M.P. Utrillas[1], and J.A. Martínez-Lozano[1]

[1]Department of Earth Physics and Thermodynamics, University of Valencia, Valencia, Spain
[2]Department of Didactics of Experimental and Social Sciences, University of Valencia, Spain
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Presenting author email: sara.segura@uv.es

Due to their high spatial and temporal variability, atmospheric aerosols are one of the major processes affecting climate (IPCC, 2013). They play an important role in the radiative forcing in the Earth's atmosphere by both scattering and absorbing solar radiation. Therefore, absorption is an important component of the radiation budget which still needs to be better characterized to reduce uncertainties in climate models.

Continuous i*n-situ* absorption optical properties measured in Valencia (Spain) from February 2011 to February 2015 using an Aethalometer model AE-31 have been analysed. The Aethalometer is one of the instruments most commonly used to measure *in-situ* aerosol absorption coefficients. It is based on a filter technique which obtains the light absorption by measuring changes in light attenuation as aerosols are collected on a filter matrix. The model used in this work measures light absorption at seven different wavelengths, covering from the UV (370 nm) to the IR (950 nm).

However, as most filter-based instruments, Aethalometer measurements are not free of suffering several artefacts and therefore, some compensation of the data is needed to obtain the absorption coefficients. Compensation parameters at different wavelengths have been obtained following the method proposed by Segura *et al.* (2014). Due to the large data-set, seasonal differences have been considered when calculating these parameters.

Values obtained for the shadowing factor (*f*) decrease with wavelength and are highest in winter, ranging from 1.09 (at 950 nm) to 1.23 (at 370 nm), and lowest in summer, ranging from 1.01 (at 950 nm) to 1.13 (at 370 nm). In the case of the multiscattering effect (C) values increase with wavelength and are lowest in winter/spring (from 3.02 at 370 nm in spring to 4.08 at 950 nm in winter) and highest in summer/autumn (from 3.34 at 370 nm in autumn to 4.56 at 950 nm in summer).

Temporal evolution of daily averaged absorption coefficients (b_{abs}) and Ångström exponent (α_{abs}) is shown in Figure 1. Values obtained for b_{abs} range between 9 ± 4 Mm^{-1} at 950 nm and 33 ± 18 Mm^{-1} at 370 nm. These results are typical of a moderate polluted urban site. The average value of α_{abs} is 1.42 ± 0.08, which suggests the presence of brown carbon or black carbon coated by non-absorbing particles, rather than pure black carbon, in our site. Seasonal and daily variations of these parameters, along with traffic influence and mixing layer height seasonal changes, were also analysed.

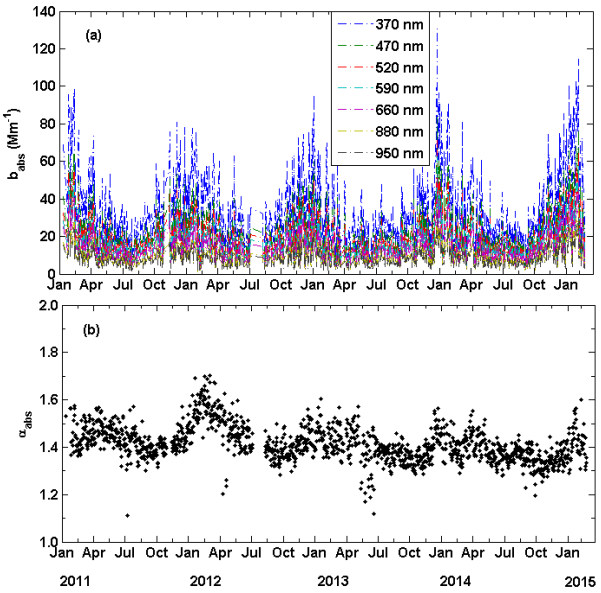

Figure 1. Temporal evolution of daily mean values of the (a) absorption coefficient, b_{abs}, at 370, 450, 520, 590, 660, 880, and 950 nm and (b) absorption Ångström exponent, α_{abs}, obtained at Burjassot.

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