Variability of aerosol properties in Málaga (Spain).

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Atmospheric aerosol particles are one of the most variable components of the Earth's atmosphere, and are known to influence the energy budget and climate. Aerosols particles affect the climate directly by absorbing and scattering solar radiation and indirectly by effects on cloud properties. On other hand, the high spatial and temporal variability of aerosols imply a high uncertainty about it. To determine the influence of aerosols on climate different physical and optical aerosol properties are required.

The radiative effect of the atmospheric aerosol can be described with the help of the aerosol optical depth (AOD) at one or more wavelength and its spectral dependence, described by the Angström exponent (α). In this work we analyse both quantities at a coastal location in the Western Mediterranean, Málaga (36.72ºN, 4.5ºW, 40 m a.s.l) from June 2007 to February 2010. The study considers the seasonal features of both quantities and their variability due to the influence of air masses of different origins. The study area is located in the Mediterranean coast and due to its proximity to the African Continent, is frequently affected by intrusions of Saharan air masses. In the study area both anthropogenic and natural aerosols are present.

The AOD has been derived from measurements of a sun-photometer CE-318-4, which is the standard sun/sky photometer used in the AERONET network. The station is operated by the Atmospheric Physics Group of the Andalusian Center for Environmental Studies (GFAT_CEAMA) in the framework of RIMA and AERONET networks. The direct sun measurements at 340, 380, 440, 670, 870 and 1020 nm (wavelengths) are used to derive AOD at these sets of wavelengths. α, is evaluated for the interval from 440 to 870 nm.

The seasonal variations of AOD at 440, 670 and 870 nm are shown in Figure 1. These averages values are calculated from daily averages. The error bars are standard deviations. The columnar aerosol optical depth at all wavelengths are larger in summer (0.22±0.01 at 440 nm) and lower in winter (0.12±0.03 at 440 nm) indicating larger columnar aerosol load in summer than in winter. The Angström exponent shows seasonal cycle with winter values larger than summer values (1.1±0.1 and 0.8±0.1). This opposite pattern suggests the dominance of larger size particles during the dry summer months due to the contribution of local and regional mineral and marine particles. Furthermore, during summer the frequency of events with long range transport of mineral aerosol from the Sahara desert is larger (Alados-Arboledas et al., 2007). These seasonal patterns for AOD and α are similar to those found at the urban inland site of Granada (Lyamani et al., 2010).

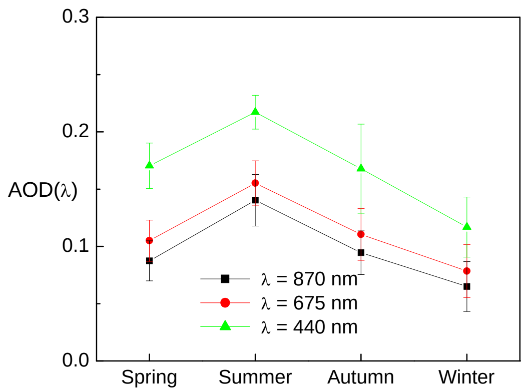

Figure 1. Seasonal averages of aerosol optical depth at three wavelenghts for the analysed period.

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