

Aerosol optical properties of Western Mediterranean basin from multi-year AERONET data

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Aerosol optical properties including the total and coarse mode aerosol extinction optical depth (τ_{ext} , $\tau_{\text{ext-C}}$), Angstrom exponent (α), size distribution, single scattering albedo (SSA) were examined using long-term ground-based radiometric measurements at nine Western Mediterranean sites: Oujda (N 34°39', W 01°53'), Malaga (N 36°42', W 04°28'), Barcelona (N 41°23', E 02°07'), Carpentras (N 44°04', E 05°03'), Rome_Tor_Vergata (N 41°50', E 12°38'), Ersar (N 43°00', E 09°21'), Ispra (N 45°48', E 08°37'), Venise (N 45°18', E 12°30'), Evora (N 38°34', W 07°54').



Figure 1. Locations of the 9 Mediterranean AERONET sites are found in the western basin with long time series used in this work.

The analysis of the time series of $\tau_{\text{ext-C}}$ reveals that all those sites are affected by mineral dust transport from the Sahara. The maximum in dust intensity was observed in June 2012, with large peaks values around 0.9 ± 0.1 observed in Oujda and Evora Sites. In summer periods, the daily average α is 0.1 ± 0.05 , showing the dusty climate.

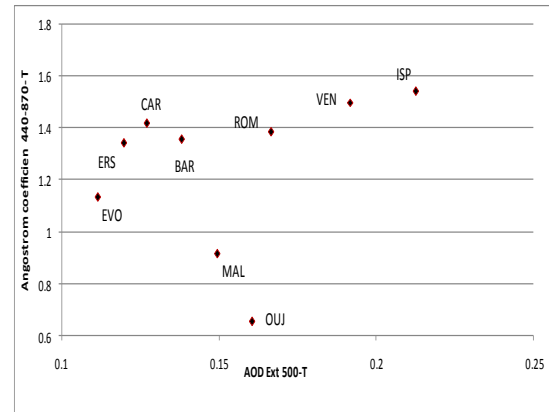


Figure 2. Average AERONET level 2 aerosol Angstrom Exponent as a function of the optical depth of the 9 selected stations in four years (2010 to 2013).

We have analyzed the intrinsic dust optical properties by selecting the dusty days corresponding to a total optical depth above 0.2 and a fraction of the coarse mode optical depth above 50%. For those cases we show that the size distribution is clearly dominated by a coarse mode with an effective radius between $1.76 \mu\text{m}$ close to the source and $1.52 \mu\text{m}$ far from the dust source.

We also observe an increase in the single scattering albedo ranging between 0.89 close to the dust source and 0.94 in the remote part of the domain. This change in the size distribution and the absorption properties can be due to the aging of the dust aerosol as they are transported over the Mediterranean basin.

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