



Air mass origin and its influence over the aerosol size distribution: a study in SE Spain

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We have studied the aerosol size distribution and its relationship with the origin of the air masses arriving in SE Spain. The study site, Agost, is a village of 4000 inhabitants located 18 km from the Mediterranean coast, where main activities include brick manufacturing and grape cultivation. Size distribution was measured every ten minutes from January to May 2006 with a GRIMM 190 aerosol spectrometer (particle diameter ranging from 0.25 to greater-than-32 μm in 31 size channels).

The backtrajectories corresponding to the study period were classified according to a k-means cluster analysis of 96 hour trajectories arriving in 38.3N, 0.7W at 3000, 1500 and 500m for the 7-year period 2000-2006. Back-trajectories at 12UTC were computed with the HYSPLIT model v. 4 (www.arl.noaa.gov/ready/hysplit4.html) with the FNL meteorological data. Hourly latitude and longitude were used as input variables in the clustering procedure. We have considered some modifications to the procedures followed in the literature (Dorling et al., 1992; Mattis, 2001) to retain the appropriate number of clusters and to deal with the dependence of the final results on the seed centroids used to initialise the method; in some cases those procedures are far from achieving the smallest total sum of the Root Mean Square Deviation of each cluster.

Application of principal components analysis to the normalized aerosol size channels, using varimax rotation, reduced the 31 variables to four factors accounting for the 93.8% of the variance. The factor loadings indicate that the factors correspond to four particulate size intervals. We considered one representative particle size interval for each factor: 0.30-0.35, 0.8-1.0, 6.5-7.5 and 30.0-32.0 μm . The autocorrelation function of the selected four size channels shows a stronger one-week periodicity (anthropogenic) the smaller the particle size; no periodicity is found for the 30 μm size.

The variation of the particle concentration on these size channels according to the dif-

ferent clusters is significant as shown by the Kruskal-Wallis and the Mann-Whitney tests. That variation can be linked to specific aerosol contributions of local, regional and long range origins. Atmospheric parameters like precipitation, mixing height and surface wind speed are also discriminated by the clustering results and affect particulate load as well.

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Dorling, S. R., Davies, T. D. Pierce, C. E. (1992). *Atmos. Environ.*, 26a, 2575-2581.
Mattis, I. (2001). <http://lidarb.dkrz.de/earlinet/scirep1.pdf>