



## **The use of backward trajectories to characterize long-range transport episodes of particulate matter in the center of the Iberian Península**

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This work is primarily concerned with characterizing those meteorological scenarios and source regions, which give rise to long-range transport episodes that contribute to the levels of particulate matter (PM) in central Spain. Air mass back trajectories arriving at a background rural station in the 1999-2005 period have been analysed by statistical methods. First, cluster analysis has been used to group trajectories into clusters depending on their direction and speed. Meteorological scenarios based on mean sea level pressure and 850 hPa geopotential height composite synoptic maps, have been obtained and interpreted for each cluster. Then, the incidence of different transport patterns of air mass on particle concentrations and chemical composition recorded at this station has been evaluated. Finally, a residence time analysis of trajectories has also been performed for detecting remote sources and transport pathways.

Air mass back trajectories have been grouped into 8 clusters, each one representing a characteristic meteorological scenario. Results have shown a marked zonal component in the transport patterns of the air mass towards central Spain. A clear seasonal pattern has been observed with marked fast westerly and northeasterly flows during the winter, to low baric gradient situations in summertime. Frequent moderate Atlantic flows have been observed during transition periods in spring and autumn. Significantly elevated concentrations of TSP and PM10 have been observed for northern-African flows. Significant inter cluster differences were also observed for PM2.5 and secondary inorganic compounds, with highest concentrations associated with low baric gradient situations and south-european flows. The residence time analysis has confirmed that current TSP and PM10 daily concentrations at central Spain are likely to

be significantly influenced by long-range transport of desert dust from different desertic regions in North Africa. Furthermore, emissions from southern Europe with an elevated time of residence in the western and central areas of the Mediterranean basin, seems to significantly influence PM<sub>2.5</sub> and secondary inorganic compounds concentrations in this study area.

These results imply that the effectiveness of abatement strategies for achieving compliance with the European air quality standards in the center of Spain, might be compromised by long-range transport processes. The information obtained in this study can be used as a complementary tool for their prediction, analysis and interpretation.