Atmospheric Chemistry and Physics
An Interactive Open Access Journal of the European Geosciences Union

Atmos. Chem. Phys., 4, 1201-1215, 2004
www.atmos-chem-phys.net/4/1201/2004/

Aerosol-ozone correlations during dust transport episodes

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Abstract. Its location in the Mediterranean region and its physical characteristics render Mt. Cimone (44°11′ N, 10°42′ E), the highest peak of the Italian northern Apennines (2165 m asl), particularly suitable to study the transport of air masses from the north African desert area to Europe. During these northward transports 12 dust events were registered in measurements of the aerosol concentration at the station during the period June–December 2000, allowing the study of the impact of mineral dust transports on free tropospheric ozone concentrations, which were also measured at Mt. Cimone. Three-dimensional backward trajectories were used to determine the air mass origin, while TOMS Aerosol Index data for the Mt. Cimone area were used to confirm the presence of absorbing aerosol over the measurement site.

A trajectory statistical analysis allowed identifying the main source areas of ozone and aerosols. The analysis of these back trajectories showed that central Europe and north and central Italy are the major pollution source areas for ozone and fine aerosol, whereas the north African desert regions were the most important source areas for coarse aerosol and low ozone concentrations. During dust events, the Mt. Cimone mean volume concentration for coarse particles was 6.18 $\mu m^3/cm^3$ compared to 0.63 $\mu m^3/cm^3$ in dust-free conditions, while the ozone concentrations were 4% to 21% lower than the monthly mean background values. Our observations show that surface ozone concentrations were lower than the background values in air masses coming from north Africa, and when these air masses were also rich in coarse particles, the lowest ozone values were registered. Moreover, preliminary results on the possible impact of the dust events on PM_{10} and ozone values measured in Italian urban and rural areas showed that during the greater number of the considered dust events, significant PM_{10} increases and ozone decreases have occurred in the Po valley.

Final Revised Paper (PDF, 6743 KB) Discussion Paper (ACPD)

Citation: Bonasoni, P., Cristofanelli, P., Calzolari, F., Bonafè, U., Evangelisti, F., Stohl, A., Zauli Sajani, S., van Dingenen, R., Colombo, T., and Balkanski, Y.: Aerosol-ozone correlations during dust transport episodes, Atmos. Chem. Phys., 4, 1201-1215, 2004. Bibtex EndNote Reference Manager