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Chemical characterization of the aerosol in the free troposphere and during dust events at Mount Cimone, Italy, in the period 2002-2005

L. Emblico, V. Mancinelli, M. Rinaldi, M. C. Facchini, S. Decesari, M. Mircea, S. Fuzzi, P. Cristofanelli, P. Bonasoni

Istituto di Scienze dell'Atmosfera e del Clima, Consiglio Nazionale delle Ricerche, Italy

Aiming at the chemical characterization of free troposphere aerosol particles, PM10 aerosol samples were collected by means of a Digitel HiVol sampler on quartz fiber filters at Mount Cimone (2165 m a.s.l.). The sampling period ranged over 4 years, from 2002 to 2005. Typically, sampling started on Tuesday at 8 pm and lasted 12 hours. Therefore the whole set of samples was collected during night time, when the top of Mount Cimone was usually above the top of the boundary layer. The mass concentration was gravimetrically determined. The water soluble fraction was characterized for major inorganic ions (by means of ion chromatography) and total organic carbon (TOC) content. The mineral fraction was characterized for Fe, Zn, Mg, Ca, K, Na, Cu, Pb and Al by atomic spectroscopy. Furthermore, total carbon (TC) analysis was conducted on each sample. On the basis of the analytical data, crustal matter was evaluated, as well as water soluble and water insoluble organic matter (WSOM and WIOM). On average, mass concentrations are lower during winter (below 8 μgm-^{3}) and higher in summer (15 μgm-^{3}). When a Saharan dust event occurs, the mass concentration can be as high as 35 μgm-^{3} and the crustal matter accounts for 70% of the total mass. Out of dust episodes, SO4= and organic matter (OM) are the most abundant aerosol components. Their concentrations show large variation between winter and summer, ranging from 0.36 to 3.31 μgm for sulphate and from 1 to 5.2 μgm-^{3} for organic matter. NH4+ average concentrations range from 0.14 μgm-^{3} in winter to 1.87 μgm-^{3} in summer. Sea salt and NO3- do not show a similar seasonal pattern and can be considered minor components all over the year. Crustal matter accounts on average for 10% of the total mass for samples collected out of dust events. The water-soluble fraction of the organic matter is ca. 70% throughout the year, with the exception of

winter, when lower fractions, down to 30%, are encountered, usually associated with low OM concentrations.