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Size-segregated aerosol mass closure and chemical composition in Monte Cimone (I) during MINATROC

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Abstract. Physical and chemical characterizations of the atmospheric aerosol were carried out at Mt. Cimone (Italy) during the 4 June-4 July 2000 period. Particle size distributions in the size range 6nm-10µm were measured with a differential mobility analyzer (DMA) and an optical particle counter (OPC). Size-segregated aerosol was sampled using a 6-stage low pressure impactor. Aerosol samples were submitted to gravimetric and chemical analyses. Ionic, carbonaceous and refractory components of the aerosol were quantified. We compared the sub- and superµm aerosol mass concentrations determined by gravimetric measurements (m_{GM}), chemical analyses (mm_{CA}), and by converting particle size distribution to aerosol mass concentrations (mm_{SD}). Mean random uncertainties associated with the determination of mm_{GM}, mm_{CA}, and mm_{SD} were assessed. The three estimates of the sub-µm aerosol mass concentration agreed, which shows that within experimental uncertainty, the sub-µm aerosol was composed of the quantified components. The three estimates of the super-µm aerosol mass concentration did not agree, which indicates that random uncertainties and/or possible systematic errors in aerosol sampling, sizing or analyses were not adequately accounted for. Aerosol chemical composition in air masses from different origins showed differences, which were significant in regard to experimental uncertainties. During the Saharan dust advection period, coarse dust and fine anthropogenic particles were externally mixed. No anthropogenic sulfate could be found in the super-µm dust particles. In contrast, nitrate was shifted towards the aerosol super-µm fraction in presence of desert dust.

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