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Mass closure on the chemical species in size-segregated atmospheric aerosol collected in an urban area of the Po Valley, Italy

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Abstract. A complete size segregated chemical characterisation was carried out for aerosol samples collected in the urban area of Bologna over a period of one year, using five-stage low pressure Berner impactors. An original dual-substrate technique was adopted to obtain samples suitable for a complete chemical characterisation. Total mass, inorganic, and organic components were analysed as a function of size, and a detailed characterisation of the water soluble organic compounds was also performed by means of a previously developed methodology, based on HPLC separation of organic compounds according to their acid character and functional group analysis by Proton Nuclear Magnetic Resonance. Chemical mass closure of the collected samples was reached to within a few percent on average in the submicron aerosol range, while a higher unknown fraction in the coarse aerosol range was attributed to soil-derived species not analysed in this experiment. Comparison of the functional group analysis results with model results simulating water soluble organic compound production by gas-to-particle conversion of anthropogenic VOCs showed that this pathway provides a minor contribution to the organic composition of the aerosol samples in the urban area of Bologna.

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