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Hydration and wetting of soot in urban areas: laboratory simulations

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Soot aerosols emission from transport systems, industry, and domestic heating is currently acknowledged to be the largest source of uncertainties in understanding the aerosol impact in the urban areas. The main reason is the soot particles emitted from a great variety of combustion sources have a wide range of a natural variability; their properties may be changed under humid/polluted urban atmosphere processing and due to aerosol/cloud interactions. Being the solid product of incomplete combustion of fuels, soot not only addresses the properties of black carbon (BC) fraction (commonly associated with “soot”) but also includes organic carbon (OC) fraction (large for diesel soot) as well as inorganic (sulfur) contaminations. The water interaction with various OC compounds defines wetting characteristics and efficiency for wet deposition; hydrophobic soot may resist rain event preserving the high level of the atmosphere contamination in megasities.

Laboratory simulation opens the unique opportunity for variation of soot properties in a wide range of original ones to address the water uptake ability and wetting of diesel soot, coal burning soot and mixing BC aerosols. New methodic for production of model laboratory soots is developed. The systematic analysis of water interaction with soots of different properties allows a quantitative classification of water uptake by soot aerosols in urban areas. Study of soot wetting by water, inorganic and organic acids highlights the role of emitted soot in aerosol interactions and wet deposition.