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Transport and evolution of an urban aerosol plume from the east coast of the United States

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In situ measurements of particle size distributions, bulk and single particle composition, and reactive and trace gas species were made aboard the NOAA P-3 aircraft as part of the International Consortium for Atmospheric Research on Transport and Transformation (ICARTT) field program in summer 2004. A plume of pollution originating from industrial and urban sources along the heavily populated Atlantic coastline of the northeastern USA was studied as it propagated over Atlantic coastal waters toward the northeast over a three-day period. Ratios of gas-phase precursors to particle mass decreased over the period, consistent with to gas-to-particle conversion. For this mix of urban and industrial sources, increases in particle mass with increasing plume age were dominated by particulate sulfate formation. Particle size distributions evolved with time from complex, multimodal distributions having significant numbers of particles with diameters < 0.1 μm, to a unimodal distribution with a mass mean diameter near 0.5 μm.