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Multistatic lidar profiling of urban atmospheric aerosols

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Abstract

It has become increasingly important to obtain information on the vertical distribution, i.e., profile, of aerosols in the open atmosphere. To complement data obtained from a monostatic Raman lidar, a multistatic receiver configuration was designed to take measurements of the parallel and perpendicular polarization scattered components for altitudes from 10 m to 1000 m above the ground. The measurements, taken at night, were used to form a polarization ratio that was subsequently fitted using Mie theory and a trimodal lognormal aerosol distribution. Experimental results revealed the presence of strong variations in the aerosol distribution within the nighttime planetary boundary layer with some time sequences revealing rapid temporal and spatial changes. Subsequent modeling of the aerosol profile suggested that the observed aerosol variations may depend on a combination of factors, including altitude, composition, and number density. However, in instances when the atmosphere was found to be uniformly mixed, retrieval of aerosol parameters (number density, median radius, and geometric standard deviation) was obtained.

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