Ground-based lidar-ceilometer profiling observations of wildfire smoke and impact on air quality in New York City

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Abstract: Long-range transports of wildfire smoke have potential impact on air quality and atmospheric radiative properties in regional-continental scales. In this study, we present an integrated profiling observation of aerosol plumes with a co-located multi-wavelength elastic-Raman lidar and ceilometer in New York City. Two episodes of the aloft plume intrusions and their mixing down into the planetary-boundary layer (PBL) are investigated, along with a coincident increase of ground $PM_{2.5}$ in both the NYC urban and upwind non-urban areas. The sources and transport paths are illustrated from the satellite MODIS, NOAA-HMS and HYSPLIT model product. With our vertical profiling observation data, we evaluate the model $PM_{2.5}$ and PBL-height (PBLH) from the NAQFC (the NOAA National Air Quality Forecasting Capability) during May 24-30, 2016. Finally, we show a climatology analysis of aloft aerosol transport path, seasonal-height occurrence and the potential impact on the ground $PM_{2.5}$ based on our multi-year observations.