

Estimating Aerosol Optical Properties Using LIDAR and Shadowband Radiometer

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With increasing concerns over the environment and its sustainability, developing capabilities of monitoring the earth's atmosphere using optical remote sensing, or LIDAR technology, holds significant potential. Infrared radiation is sensitive to the detection of aerosols and can be used in conjunction with visible and UV radiation to derive vertical profiles of aerosols from vertically pointing lidar systems. Elevated aerosol plumes can be detected and then traced backwards to their origins. We are developing algorithms for graphical analyses of lidar observation and calculation of aerosol extinction coefficient (Fig. 1). Vertical integration of the extinction coefficient yields aerosol optical depth, an important measure of aerosol impacts on atmospheric radiation due to aerosol scattering and absorption. Aerosol optical depth time series can be measured with shadowband radiometers. The radiometer measures total horizontal and diffuse horizontal solar irradiance, adjusting to the position of the sun throughout the day (Fig. 2). Utilizing several other input factors in addition to the calculated direct normal solar radiation, air mass and irradiance at the top of the aerosol-free atmosphere, I_0 , is determined. A Langley plot graphs the linear relation between the natural log of irradiance versus air mass, and its slope represents total optical depth. Analyses of aerosol optical properties will be presented based on observations from lidar and radiometer observations at the Princeton and CCNY monitoring sites. Analyses will be used to examine the variability of aerosol properties in urban environments.

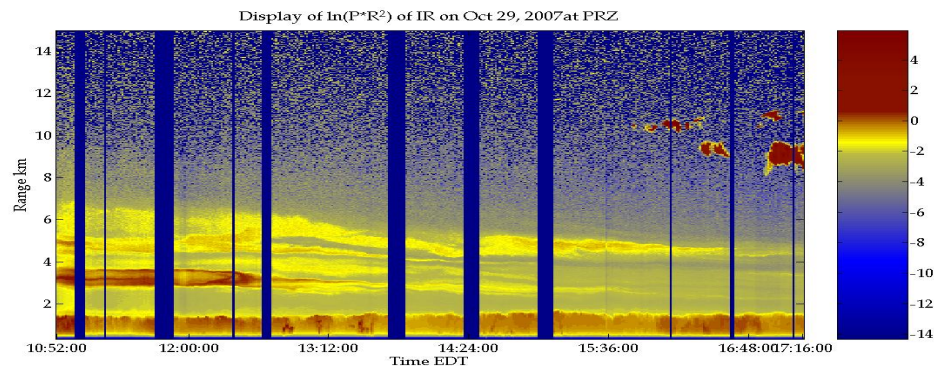


Fig. 1 1064nm (near IR) lidar at Princeton site on 10/29/2007

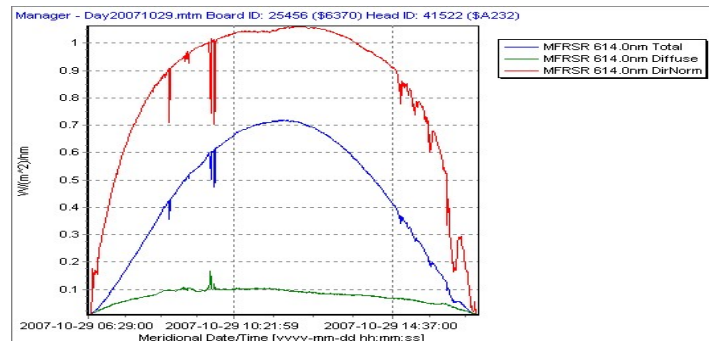


Fig. 2 614nm radiometer at Princeton site on 10/29/2007