Inter-Comparison of Different Aerosol and Cloud LiDAR Systems

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MOTIVATION

This study presents an aerosol and cloud measurement comparison between four different Light Detection and Ranging (LiDAR) systems carried out by the Optical Remote Sensing Laboratory at the City College of New York (CCNY) site. The purpose of our study is to highlight the differences between the LiDAR systems in order to acquire a comprehensive observation of the atmosphere.

INTRODUCTION

LiDAR is an efficient tool employed in the remote observation of atmospheric gases, aerosols, and clouds; it is well suited to remotely provide measurements of the aerosol and cloud optical properties.

The systems compared:

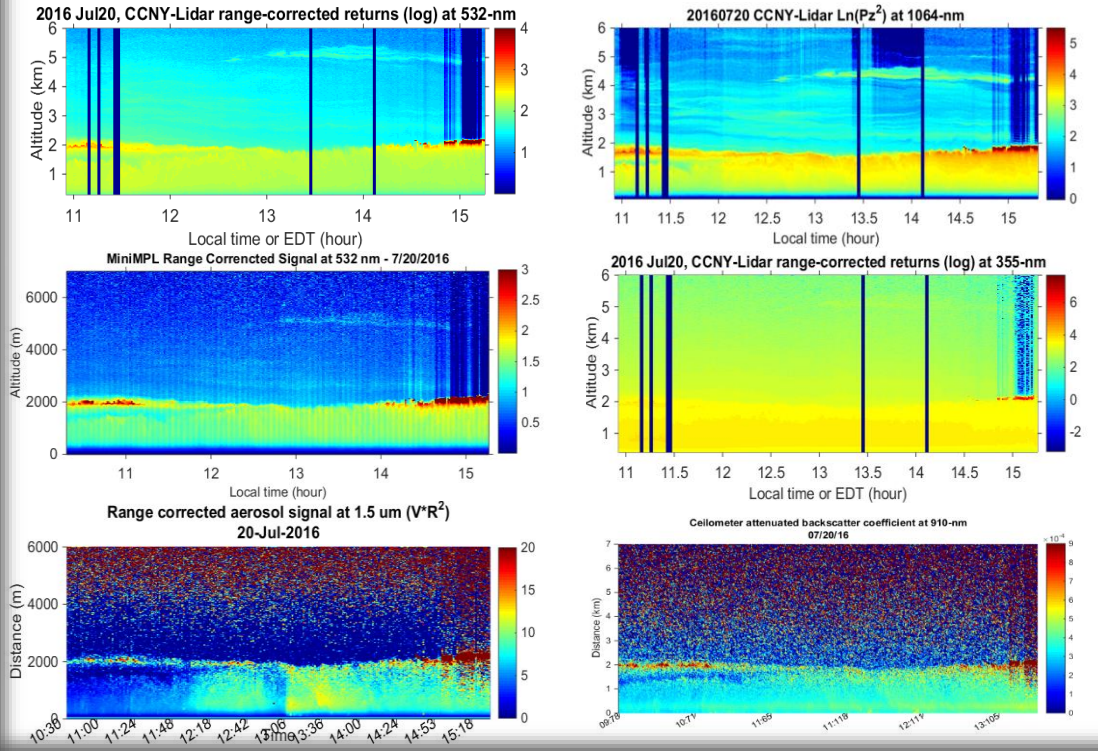
- Sigma Space MiniMPL
- Vaisala CL51 ceilometer
- CCNY Micro Pulse IR system
- CCNY Mie-Raman system

LiDAR SYSTEMS

CCNY Mie-Raman LiDAR

- 1064 nm wavelength
- 532 nm wavelength
- 355 nm wavelength
- Two Raman returns at 387 nm.

MEASUREMENT COMPARISON AND DISCUSSION



The results of this study show satisfactory agreement of the data. Comparison of range corrected backscatter shows planetary boundary layer (PBL) dynamics ranging from 1.2 to 2 km. In addition, this day's data shows interesting features including aerosols in the PBL, plume at about 5000 m and low-level clouds at about 2000m.
The differences show the relative performance of micropulse eye-safe lidars versus high energy lidars; as well as the variations in backscatter signal with wavelength due to the Rayleigh and Mie scattering.

Sigma Space MiniMPL

- 532 nm wavelength
- Eye-safe laser
- Scanner
- Polarized/Cross-polarized
- it can be ran continuously and unattended

Vaisala CL51 Ceilometer

- 910 nm wavelength
- cloud detection algorithm
- it can be ran continuously and unattended

CCNY Infrared LiDAR

- 1550 nm wavelength
- Eye-safe laser
- Lightweight and portable

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