High spatial resolution aerosol lidar for observing the aerosol distribution within and above the forest canopies

*Fumiya Kitafuji[1], Masanori Yabuki[1]

1. Kyoto university

Forests interact in a complex way with the atmosphere. They are sinks for many atmospheric pollutants, and they emit biogenic compounds that are an important natural source of small aerosol particles. Aerosol distribution vary both temporally and spatially because of various processes (e.g., condensation, deposition, and scavenging) that occur during the dispersion and transportation of air masses within and above forest canopies.
Aerosol lidar is conventionally associated with long-range measurements at maximum resolutions of several meters. Recent improvements in the performance of short-pulse lasers and high-sampling-rate detectors have led to the development of lidar systems with high spatiotemporal resolution. In this study, we propose the use of high spatial resolution lidar with a multispectral detector to construct a system that can obtain the detailed spatial distribution of aerosol particles in the small area. The spectral detection component of the aerosol lidar consists of a grating and a photomultiplier tube (PMT) array that enables the simultaneous acquisition of 32-channel photon counts with a maximum range resolution of 18.8 cm. Here we have designed a prototype system equipped with a 15 cm receiving telescope at a diode-laser-pumped Nd:YAG laser of 532 nm at a high-repetition rate (1 kHz). In this presentation, we introduce our proposed system as well as the preliminary results of the high range resolution lidar for observing the spatial distribution of particles around forest canopies.

Keywords: aerosol lidar, high spatial resolution measurement

