ON THE MEASUREMENT OF AEROSOL AND GROWING DROPLETS BY TWO-COLOR LIDAR

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ABSTRACT

This paper presents the design of two-color (1.06μm and 0.694μm) lidar for the measurement of aerosol particles and the change of size distribution of growing droplets condensed on them in the troposphere and stratosphere. Table 1 gives the characteristics of lidar of Water Research Institute, Nagoya University. Table 2 gives the result of calculation of relative contribution of back-scattered power by scatteres of each size range indicated in the table to the total back-scattered power. As is seen in the table, the 0.694μm light is more sensitive to particles in the 0.1-0.4μm size range whereas the 1.06μm light is sensitive to particles in the largest size range. Therefore, for instance, when aerosol particles, in the size range of 0.1 - 0.4μm grow in size, received power of 0.694μm increases more than that of 1.06μm. The method of determination of the size distribution of aerosol particles will be discussed.

Table 1
Characteristics of Lidar System
of Water Research Institute, Nagoya Univ.

Transmitter	
Laser	Ruby and YAG
Wavelength	0.694μm and 1.06μm
Output	1J/pulse (single pulse), 20ns
Telescope	10 cm ∅
Beam divergence	0.5 mrad
Receiver	
Telescope	40 cm ∅
Filter bandwidth	5Å (Ruby), 10Å (YAG)
Photomultiplier	RCA C-31000F, RCA C-70007A

Table 2

Relative contribution of back-scattered power by particles of three size range to the total received power (per cent)

Wavelength	0.694μm	1.06μm
size range (μm)		
0.10 - 0.40	48	28
0.40 - 0.75	43	40
0.75 - 1.00	9	32