# Lidar Measurements of Aerosol and Ozone in Beijing and Antarctic

Qiu Jinhuan, Zheng Siping, Xia Qilin, Zhang Jinding and Lu Daren

Institute of Atmospheric Physics, Chinese Academy of Sciences, Beijing 100029, China

## Abstract

Some recent progress of lidar studies made in our institute is reviewed in this paper, which includes two new lidar systems to measure atmospheric aerosol and ozone, lidar measurements of aerosol in Beijing during 1999 and in Antarctic during 1993-1998.

## (1) Two new lidar systems

Two new lidar systems are recently constructed in our institute. One is four-wavelength lidar, which is designed to measure: (1) 10-50km ozone profile; (2) 6-40km aerosol profile; (3) high cloud optical property. It contains a XeCl excimer laser with output energy of 140mJ at 308nm, a Nd-YAG laser with three operating wavelengths of 355nm, 532nm and 1064nm, and a 1m receiving telescope. There are three analog-detection channels and three photon counting channels. Two analog channels are used for polarization detection of 532nmradiation and another is for the 1060nm radiation. Three photon counting channels are used for 308, 355 and 532nm radiation. Another system is backscatter Nd-YAG lidar, which was designed to measure and image the four-dimensional aerosol structure and to detect wind in lower atmosphere. It contains a Nd-YAG laser with maximum repetition rate of 15Hz and the output energy of 100mJ, a 20cm telescope, and a fast and exact computer-controlled angular scanning system.

These two systems and their preliminary applications will be presented.

## (2)Lidar measurements of aerosol in Beijing

Since April of this year our multi-wavelength lidar has been used in measuring aerosol or cloud extinction coefficient profile. Figs.1-4 show some measurement results. Invisible cirrus located between 6km and 11km is often detected. In near future this lidar will be used in detecting ozone profile.

The Nd-YAG backscatter lidar was used to measure spatial aerosol structure and wind field in the boundary layer in Beijing. Some measurement results will be presented.

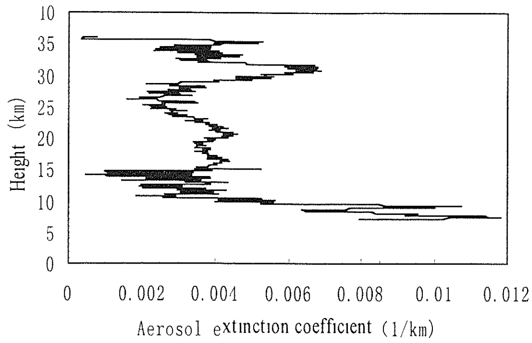


Fig.1 Lidar-detected aerosol extinction coefficient Profile in April 15, 1999

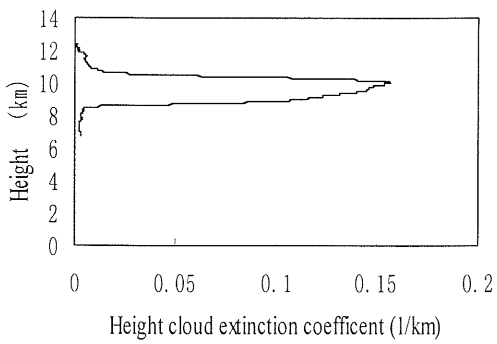


Fig.2 Same as in Fig.1 but for April 20, 1999

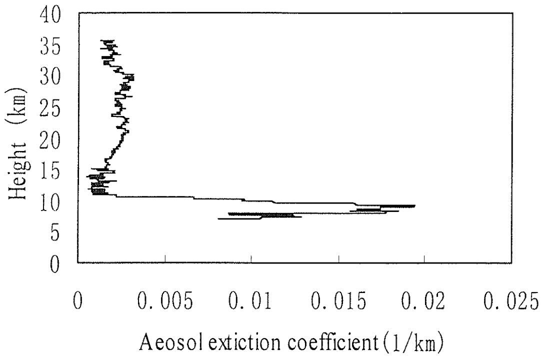


Fig.3 Same as in Fig.1 but for April 30, 1999

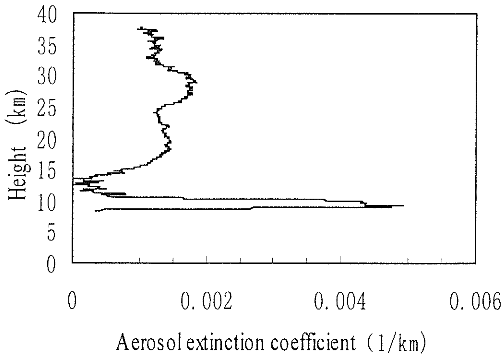


Fig.4 Same as in Fig.1 but for May 5, 1999

## (3) Lidar measurements of stratospheric aerosol over Antarctic

A ruby lidar system (694nm) was used to measure the stratospheric aerosol at Zhongshan Station (69°22′S, 76 °22′E) in Antarctic during 1993-1998. In this paper we present Lidar observations of the vertical profiles of the stratopheric aerosol backscattering ratio and the integrated backscatter coefficients over the 10-30km altitude range. The observations show an evident effect on the stratospheric aerosol in 1993. We also presented the seasonal variation of the integrated backscatter coefficient (IBC). The noticeable maximum of IBC was observed from late May until September found (the Antarctic winter season). The vertical profiles of the stratospheric aerosol backscattering ratio show a clear double-layer structure. One layer is at an altitude of about 12km, and another is at an altitude of about 25km.