

## 昭和基地におけるレイジーライダー観測

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### Rayleigh lidar observation at Syowa Station, Antarctica

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The dynamics of the middle and upper atmosphere is still not fully understood. In particular, a quantitative estimation of dynamical effects related to energetic particle precipitation such as aurora, disturbances propagated from lower atmosphere, and a global circulation in polar middle atmosphere are not satisfactorily conducted mainly due to the lack of observations.

A new Rayleigh lidar system which can measure a vertical profile of the atmospheric temperature between 15km and 80 km are developed for the Antarctic observation. This lidar will be transported to the Syowa Station (39E, 69S) in Dec, 2010 by the 52nd Japanese Antarctic Research Expedition (JARE52) and start an Operation from Feb, 2011.

The transmitter of the lidar system consists of a pulsed Nd:YAG laser (355nm) with 300 mJ energy and 20 Hz repetition frequency, which emits the beam into the vertical direction with a beam divergence of 0.5 mrad. The receiver consists of an 82cm diameter telescope with three photo multiplier tubes (PMT) which are to detect Rayleigh scattered light from low and high atmosphere at 355 nm and N<sub>2</sub> Raman emission at 387nm. Additionally, a 35cm diameter telescope is also used for reception with a PMT for N<sub>2</sub> RAMAN emission at 355nm. By using these channels, the lidar can deduce the wide range of altitude in a temperature profile. In addition to these PMT channels, an image-intensified CCD camera (ICCD) with a gating is also installed in the receiving system, in order to monitor the image of scattered light from a certain altitude even in a day-time and to align the laser beam to the center of the field of view of the telescope.

An etalon with a transmittance width of 10 pm in FWHM is inserted to Rayleigh channels in the day time in order to reduce background scattering from the sky. The daytime observation will be carried out not only for profiling the temperature in the stratosphere in summer, but also profiling polar mesospheric clouds (PMCs) around 80 – 85 km which are formed in summer. The system is controlled and operated with two personal computers and manual operations are minimized. Operation will be carried out by operators in Syowa, who are not an expert of lidar system, under supports by remote operations through the network. We present some of the results of test observations.

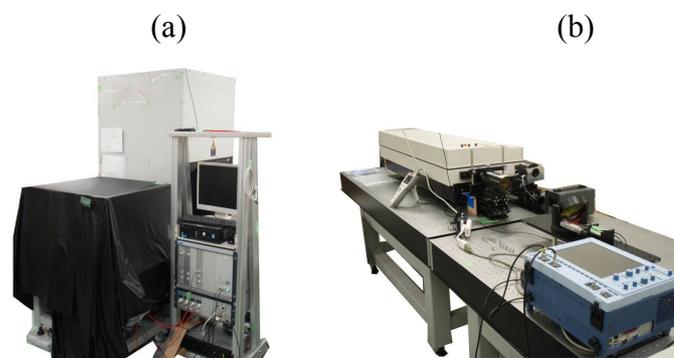


Figure 1. (a) The receiver part of the lidar system, consisted with an 82cm diameter telescope with three photo multiplier tubes (PMTs) and a computer for data logging. (b) The transmitter part of the lidar system, consisted with a pulsed Nd:YAG laser and a beam steering mirror.