Japan Geoscience Union Meeting 2011
(May 22-27 2011 at Makuhari, Chiba, Japan)

PEM032-P26 Room:Convention Hall Time:May 27 10:30-13:00

Automated Rayleigh lidar observation in Syowa station, Antarctica.

Hidehiko Suzuki[1*], Takuji Nakamura[1], Mitsumu Ejiri[1], Makoto Abo[2], Yoshihiro Tomikawa[1], Takuya Kawahara[3], Masaki Tsutsumi[1], Members of Syowa Lidar project in the 8th term Antarctic core research project[1]

[1]National Institute of Polar Research, [2]Tokyo Metropolitan University, [3]Shinshu University

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 80km is developed for the Antarctic observation. This lidar had been transported to the Syowa Station (39E, 69S) in Dec, 2010 by the 52nd Japanese Antarctic Research Expedition (JARE52) and started operation in Feb, 2011. The transmitter of the lidar system consists of a pulsed Nd:YAG laser (355nm) with 300mJ energy and 20Hz repetition frequency, which emits the beam into the vertical direction with a beam divergence of 0.5mrad. The receiver consists of an 82cm diameter telescope with three photo multiplier tubes (PMTs) which are to detect Rayleigh scattered light from low and high atmosphere at 355nm and N2 Raman emission at 387nm. Additionally, a 35cm diameter telescope is also used for reception with a PMT for N2 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 10pm in FWHM and a polarizer are 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 80-85km 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 experts of lidar system. Therefore, control PC and softwares have been prepared in order to continue observation automatically, with assistance from a remote place. We present details about the lidar system and a current status of the first year observation.

Keywords: stratosphere, mesosphere, lidar, Antarctica, gravity wave, PMC