Japan Geoscience Union Meeting 2015
(May 24th - 28th at Makuhari, Chiba, Japan)

PEM27-06 Room:A01 Time:May 26 09:30-09:45

Derivation of the stratospheric temperature with the sodium lidar

HIBINO, Tatsuya[1*] ; NOZAWA, Satonori[1] ; TSUDA, Takuo[2] ; KAWAHARA, Takuya[3] ; SAITO, Norihito[4] ; WADA, Satoshi[4] ; TAKAHASHI, Toru[1] ; FUJIWARA, Hitoshi[5] ; HALL, Chris[6]

[1]Solar-Terrestrial Environment Laboratory, Nagoya University, [2]The University of Electro-Communications, [3]Faculty of Engineering, Shinshu University, [4]The RIKEN Center forAdvanced Photonics Technology Development Group, RIKEN, [5]Faculty of Science and Technology, Seikei University, [6]Tromso Geophysical Observatory, The Arctic University of Tromso, Tromso, Norway

We have derived the temperature in the upper stratosphere between 30 and 50 km by using Rayleigh scatter data obtained by the sodium LIDAR at Tromsoe (69.6N, 19.2E), Norway. We have carried out observations of the neutral temperature and sodium density between 80 and 110 km in the polar upper mesosphere and lower thermosphere for five winter seasons (October-March) starting in October 2010 by using the sodium LIDAR. To date, about 2800 hours of data are obtained. Together with datasets obtained by EISCAT radars, MF radar and meteor radar operated at the same observational field, we have studied the vertical coupling of the atmosphere as well as the magnetosphere-ionosphere-thermosphere coupling. To facilitate these activities, a millimeter wave receiver for measuring minor constituent in the stratosphere/mesosphere/lower thermosphere will be installed at the same observational field in the near future. In this talk, we will present results of the derivation of the neutral temperature in the upper stratosphere (30-50 km) by using the sodium LIDAR.

A sodium LIDAR observations use the resonance scattering from sodium atoms in the sodium layer between 80 and 110 km. We also successfully receive Rayleigh scattering light from the atmosphere between about 30 and 60 km. The upper height depends on the background noise level, while the lower height limit is determined by contamination of Mie scatter light. We calculated the temperatures between November 2011 and February 2012 with a 1 km resolution and compared them with the calculated atmospheric temperatures with the ECMWF (The European Centre for Medium-Range Weather Forecasts) data. The comparison shows a reasonable agreement.

This new addition of the datasets will make it possible to investigate the correlation of the temperature variation between the upper stratosphere (30-50 km) and the upper mesosphere/lower thermosphere (80-110 km). Furthermore, the observed stratospheric temperature will improve the accuracy of the millimeter wave observations.

Keywords: Sodium Lidar, Rayleigh scattering