Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)

AAS22-P07 Room:Convention Hall Time:May 21 17:00-18:30

Mesospheric O3 observed by ISS/JEM/SMILES

SANO, Takuki[1*], MANAGO, Naohiro[1], SUZUKI, Makoto[1], MITSUDA, Chihiro[2], TAKAHASHI, Chikako[2], IMAI, Koji[3], AKIYOSHI, Hideharu[4], SAKAZAKI, Takatoshi[5], FUJIWARA, Masatomo[5], NAITO, Yoko[6], NISHI, Noriyuki[6], TAKAHASHI, Kenshi[7], HAYASHI, Hiroo[7], SHIOTANI, Masato[7]

[1]Institute of Space and Astronautical Science, JAXA, [2]Fujitsu FIP Corporation, [3]Tome R&D Inc., [4]Center for Global Environmental Research, NIES, [5]Graduate School of Environmental Science, Hokkaido University, [6]Graduate School of Science, Kyoto University, [7]Research Institute for Sustainable Humanosphere, Kyoto University

The Superconducting Sub-millimeter Limb-emission Sounder (SMILES) onboard Japan Experiment Module (JEM) of the International Space Station (ISS) have observed atmospheric minor constituents related with ozone chemistry, such as O_3, HCl, ClO, HO_2, HOCl, BrO, with high sensitivity. Especially, O_3, HCl and ClO can be detected with altitude up to the mesosphere (around 80km). In comparison with the stratosphere, "in situ" photochemistry controls concentration of minor constituents, so that we can examine current understanding of whole atmospheric chemical reactions by the direct comparison with SMILES observational data and results from numerical model calculations. In this study, we report the characteristics of mesospheric ozone observed with SMILES, some results of comparative validation with past satellite data and numerical model calculations, and diurnal variation of mesospheric ozone.

In the atmospheric chemistry studies, numerical models calculation are the powerful tools for understanding of observation data and future forecasting, but we have to notice that the rates of chemical reactions which these models based on may have 30-50% of error, because these coefficients are extrapolated to stratosphere / mesosphere from the results from laboratory experiments. Therefore, the observation results of mesospheric minor constituents with 10-20% of error, such as SMILES data, can review the whole of past science of atmospheric chemistry with unprecedented accuracy.

Mesospheric ozone have been observed with ACE-FTS onboard Scisat-1, SABER onboard TIMED, and MLS onboard EOS-Aura. In this study, we have compared SMILES data with ACE-FTS and SABER (MLS data exists only for sunrise and sunset localtime, so they cannot be used for this comparison), as well as reproduction results of meteorological field from numerical model (SD-WACCM) calculation. As a result of this comparison, SMILES data relatively agreed with the results from SD-WACCM and 1.27micron-channel of SABER.

It is known that mesospheric ozone distribution has diurnal variation, such as time-variable characteristics after sunset, from numerical model calculations. Though the quality of past ground-based and space-borne observation data are not enough for discussing these diurnal variation. Thank to the unique orbital characteristics, diurnal variation can be plotted from about 45-day data of SMILES observation. The diurnal vatiation of mesospheric ozone will be discussed in combination with the mixing ratio of water vapor, so we also report these results.

Keywords: SMILES, Mesosphere, Atmospheric minor constituents, Ozone, Diurnal variation, Satellite observation