

AAS020-19

Room:102

Time:May 22 17:00-17:15

SMILES observation on global distribution of minor constituents and the QBO

Yoko Naito^{1*}, Noriyuki Nishi¹, Eriko NISHIMOTO², Makoto Suzuki³, Chihiro Mitsuda⁴, Chikako Takahashi⁴, Koji Imai⁵, Naohiro Manago³, Hiroo Hayashi², Takuki Sano³, Masato Shiotani²

¹Graduate School of Science, Kyoto Univ., ²RISH, Kyoto Univ., ³ISAS / JAXA, ⁴Fujitsu F.I.P., ⁵TOME R&D Inc.

The Superconducting Submillimeter-Wave Limb-Emission Sounder (SMILES) is an instrument designed to make observation of the global 3-dimensional distribution of the minor constituents in the middle atmosphere, such as O₃ and some species related to ozone depletion (HCl, ClO, and so on). It was attached to the Japanese Experiment Module (JEM) on the International Space Station (ISS) and have made observation for the period over half a year since October 12, 2009. Three spectral ranges of submillimeter-wave limb-emission are measured by the SMILES: band A (624.32 - 625.52 GHz), band B (625.12 - 626.32 GHz), or band C (649.12 - 650.32 GHz).

The present study investigates how the global distribution of minor constituents such as ozone observed by the SMILES is related to the phase of the quasi-biennial oscillation (QBO).

During the period of the SMILES observation, easterly wind have stayed around 20-hPa level in the equatorial stratosphere, and westerly shear above the easterly wind have changed its strength according to the phase of the semi-annual oscillation (SAO). The variation in latitude-altitude distribution of minor constituents observed by the SMILES corresponds to such variation in background wind field. In October 2009 or April 2010, isolines of the distribution of minor constituents was bending downward over the equator in association with meridional circulation accompanied with the westerly shear. It resulted in clear double-peaked structure with two peaks in latitude (as for ozone, the structure called "rabbit-ears" by Randel and Wu (1996)). January 2010, on the other hand, the double-peaked structure was absent corresponding to weaker westerly shear over the easterly wind. The SMILES observation displays the double-peaked structure even in daily-mapped data without monthly averaging. Such variation in the double-peaked structure was observed also in other minor species such as HCl and CH₃CN.

Keywords: Atmospheric minor constituents, Atmospheric dynamics, Stratosphere, Quasi-Biennial Oscillation