CIO observation by 4K cooled submm limb sounder ISS/JEM/SMILES

Makoto Suzuki\textsuperscript{1*}, Chihiro Mitsuda\textsuperscript{2}, Chikako Takahashi\textsuperscript{2}, Takuki Sano\textsuperscript{1}, Koji Imai\textsuperscript{3}, Hiroo Hayashi\textsuperscript{4}, Eriko NISHIMOTO\textsuperscript{4}, Yoko Naito\textsuperscript{4}, Masato Shiotani\textsuperscript{4}

\textsuperscript{1}ISAS, \textsuperscript{2}Fujitsu FIP, \textsuperscript{3}Tome R&D Inc., \textsuperscript{4}Kyoto U.

The Superconducting Submillimeter-Wave Limb-Emission Sounder (SMILES) is one of the first instruments to use 4K mechanical cooler in space. It was successfully launched and attached to the Japanese Experiment Module (JEM) on the International Space Station (ISS) on September 25, 2009. It has been making atmospheric observations since October 12, 2009 with the 4-K cooled superconducting mixers for submillimeter limb-emission sounding in the frequency bands of 624.32-626.32 GHz and 649.12-650.32 GHz. Unfortunately, SMILES observations have been suspended since April 21, 2010 due to the failure of a critical component. On the basis of the observed spectra, the data processing has been retrieving vertical profiles for the atmospheric minor constituents and trace free radicals in the middle atmosphere, such as O3 with isotopes, HCl, ClO, HO2, BrO, and HNO3.

SMILES observed CIO several times higher sensitivity compared to previous satellite programs, Aura/MLS and Odin/SMR. Validation of SMILES CIO has been carried out with Aura/MLS data, and it agreed within error bars of Aura/MLS (since MLS has lower sensitivity and larger error bar). SMILES CIO in nighttime showed small bias and histogram showed gaussian shape, and it looks SMILES CIO value is reasonable at low altitude region down to 22 km altitude. Diurnal variation of CIO was obtained from 30-45 days dataset. CIO and CIO-OCI equilibrium is observed within arctic polar vortex in January 2009.

Keywords: submm, CIO, stratosphere, ISS, Limb Observation