Observation capability of JEM/SMILES on International Space Station

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A new generation of sub-millimeter-wave receivers employing super sensitive SIS (Superconductor-Insulator- Superconductor) detector technology will provide new opportunities for precise passive remote sensing observation of minor constituents in atmosphere. Superconducting Submillimeter-Wave Limb-Emission Sounder (SMILES) had been launched in September 11, 2009 and installed to the Japanese Experiment Module (JEM) on the International Space Station (ISS). SMILES is a collaboration project of National Institute of Information and Communications Technology (NICT) and Japan Aerospace Exploration Agency (JAXA).

Mission objectives of SMILES are:

i) Space demonstration of super-sensitive SIS mixer and 4-K mechanical cooler technology
ii) Super-sensitive global observation of atmospheric compositions with sub-millimeter-wave limb emission sounder

JEM/SMILES is providing the spectra with system temperature of about 300K. Spectrum calibration is stable, and there are almost no standing wave. These spectrum allow to observe the atmospheric species such as O_3, $H^{35}Cl$, $H^{37}Cl$, ClO, HO_2, BrO, HOCl, HOBr, HNO_3, CH_3CN, Ozone isotope species, H_2O, and Ice Cloud with the precisions in a few to several tens percents. The altitude region of observation is from the upper troposphere to the mesopouse.

We performed the early comparison/validation of ozone with 4 satellites measurements, AURA/MLS, Odin/SMR, ACE, and Odin/OSIRIS. These results are consistent with the observation capabilities of JEM/SMILES with error analysis. This super technology may allow us to open new issues in atmospheric science.