

AAS003-P01

Room: Convention Hall

Time: May 27 17:15-18:45

Observation performance and results of initial checkout of JEM/SMILES in orbit

Satoshi Ochiai^{1*}, Kenichi Kikuchi², Toshiyuki Nishibori², Yoshihisa Irimajiri¹, Takeshi Manabe³, Hiroyuki Ozeki⁴, Masato Shiotani⁵

¹NICT, ²JAXA, ³Osaka Prefecture University, ⁴Toho University, ⁵Kyoto University

Superconducting Submillimeter-Wave Limb-Emission Sounder (SMILES) was launched in September 2009 via Japanese rocket, H-IIB/HTV. SMILES went aboard Japanese Experiment Module of the international space station (ISS) and started observation of Earth's atmosphere. SMILES observes limb emission from the atmosphere in submillimeter wave band, ie. 624.32 - 626.32 GHz and 649.12 - 650.32 GHz. Height profiles of stratospheric and mesospheric chemical components such as, O₃, HCl, ClO, HOCl, HO₂, HNO₃, CH₃CN, and BrO can be retrieved from the SMILES limb spectra.

The submillimeter-wave receiver of SMILES works healthy since its initial check-out in October 2009. The receiver noise temperature, that is an indicator of the receiver sensitivity, shows between 340 and 380 K in orbit. The noise temperature is lower than that expected from the pre-launch ground tests. The sensitivity is several times higher than the receiver of Aura/MLS which uses the same frequency band for atmospheric observation. On the point of the number of observations or an efficiency of observation, SMILES, however, might not be advantageous than Aura/MLS because of restrictions of an experiment on the ISS. There are many occasions of interference of the SMILES field-of-view by the solar array wing of the ISS. It is not a few chance SMILES fails to see the atmosphere because of variations of ISS attitude by some activities in other parts of the ISS.

The measurement of the attitude is important to know the tangent height of the SMILES observation. SMILES has star sensors to measure its attitude. The attitude measurement system of the SMILES is not optimized unfortunately. We have had little information about ISS attitude before starting measurement by ourselves. We are now trying to improve the ground system in processing the attitude data based on the measured data since the SMILES initial check-out.

In this paper, as well as the discussion of the SMILES attitude, we discuss the stability of the submillimeter-wave receiver and the radiometric calibration with reporting the measured data from last October to recent days. The errors on the minor constituents measurements by the results of those calibrations will be also discussed.

Keywords: Superconducting Submillimeter-Wave Limb-Emission Sounder, International space station, Stratospheric observation, Microwave remote sensing, SMILES