

CIO observation with JEM/SMILES on International Space Station: SMILES L2 research product and comparison with MLS and Odin/SMR

Tomohiro Sato^{1,2}, Yasuko Kasai¹, Philippe Baron¹, Satoshi Ochiai¹, Hideto Kanamori²,
Yasuhiro Murayama¹, Takeshi Manabe³, Joachim Urban⁴, Donal Murtagh⁴, Nathaniel J.
Livesey⁶ and SMILES Mission Team^{1,6,7}

¹ *National Institute of Information and Communications Technology*

² *Tokyo Institute of Technology*

³ *Osaka Prefecture University*

⁴ *Chalmers University of Technology*

⁵ *Japan Aerospace Exploration Agency*

⁶ *Jet Propulsion Laboratory*

⁷ *Kyoto University*

A new submillimeter-wave detecting systems using sensitive SIS (Superconductor-Insulator-Superconductor) mixer may provide new opportunities for precise observation of ClO in the atmosphere [1]. The Superconducting Submillimetre-Wave Limb-Emission Sounder (SMILES) was installed to the Japanese Experiment Module (JEM) of the International Space Station (ISS) in September 2009. The SMILES project is a collaboration of the National Institute of Information and Communications Technology (NICT) and the Japan Aerospace Exploration Agency (JAXA). The aims of the SMILES project are:

- i) Demonstration of super-conductive SIS mixer for submillimeter-wave limb emission sounding in space cooled down to 4K using a mechanical cooler.
- ii) Sensitive measurements of global distribution of atmospheric composition.

SMILES observes atmospheric composition and isotopes such as O₃, ClO, H³⁵Cl, H³⁷Cl, upper tropospheric humidity, BrO, HOBr, HOCl, HO₂, H₂O₂, HNO₃, CH₃CN, SO₂, and ozone isotope species in the altitude region from the upper troposphere to the mesosphere with a precision of a few percent. SMILES observes day and night profiles of ClO in the altitude range 20-65km between 65N and 38S. We have been analyzing the ClO observations. We will present the recent status of the analysis with respect to the NICT research level-2 data product, give an error estimation, and provide early comparison/validation results from comparisons with global measurements from Odin/SMR and MLS.

Keywords: Submillimeter-wave, Limb emission observation, ClO, Atmospheric composition, Stratosphere, Climate change.

References

- [1] NASDA. JEM/SMILES Mission Plan, Version 2. 1. NASDA/CRL, November 2002. [online]. Available: <http://smiles.tksc.nasda.go.jp/document/indexe.html>.