

Stratospheric ClO observation by JEM/SMILES

SUZUKI, Makoto^{1*}; MANAGO, Naohiro²; MITSUDA, Chihiro³; IMAI, Koji¹; OZEKI, Hiroyuki⁴; SAKAZAKI, Takatoshi⁵; SHIOTANI, Masato⁵

¹JAXA/ISAS, ²Chiba U./CEReS, ³Fujitsu FIP.Corporation, ⁴Faculty of Science, Toho University, ⁵Kyoto U./RISH

SMILES operated on the ISS from Oct. 12, 2009 to Apr. 21, 2010. Since the detector (Superconductor-Insulator-Superconductor: SIS mixer) was cooled down to 4K, SMILES showed system noise figure, $T_{sys} \sim 250K$, or spectral noise floor $\sim 0.4K$, which gave one order better signal to noise ratio compared to previous sub-mm observations from space (Aura/MLS and Odin/SMR).

Aura/MLS have been measuring ClO with a 0.1 ppbv precision at 25-50km altitude. Theoretical precision of SMILES has been reported to be about 0.01 pptv at 30 km. This value can be verified from bin-width of histogram of nighttime ClO, which should be almost zero below 35km at the background atmosphere. We obtained actual bin-width, or ClO random error, to be 0.015 pptv, which is slightly larger than the theoretical value. It has been estimated that

the additional random error might come from IFOV pointing error, a priori pressure error, or baseline fitting error.

In tropical region (N10-S10), difference between day and night profiles was 792 pptv at 25km. This result agreed quite well with reproductive calculated value (nearby 80 pptv) by using Chemical Transport Model (SD-WACCM). On the other hand, in middle latitude (N30-50) during Mar. 13-25, 2010, SMILES value were 712 pptv at 22km, and 352 pptv at 19 km. These value were significantly larger than reported as 10 pptv by airplane and balloon observation in 1986. SMILES mid-latitude value is about 3-7 times higher than the past observation, however, agrees with reproductive calculated value like as tropical region. These discrepancy in the mid-latitude between SMILES and past observation can be explained partly by the historical increase of total Clx from 2.4 pptv in 1968 to the present value, ~ 3.0 ppbv.

Keywords: Chlorine monoxide, Stratosphere, International Space Station, submm, ozone, SMILES