

JEM/SMILES level2 data processing strategy for retrieval of stratospheric BrO

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Superconducting Submillimeter-wave Limb Emission Sounder (SMILES) is scheduled to be launched in the coming September and to be installed to the exposed facility of the Japan Experiment Module (JEM) on the International Space Station (ISS). It is an unprecedentedly high sensitive sensor, due to a 4K-cooled SIS mixer, to detect atmospheric limb emission of the sub-millimeter wave range. Molecular species to be observed are O₃, ClO, HCl, HNO₃, HOCl, CH₃CN, HO₂, BrO, O₃ isotopes, etc. The JEM/SMILES level2 data processing system for regular products of these trace gases has been being developed at Japan Aerospace Exploration Agency.

The talk will focus on data processing procedure of BrO, which plays an important role in the destruction of stratospheric ozone. The retrieval of BrO vertical profiles requires averaging some individual measurements since its signal strength is relatively weak. The distribution of stratospheric BrO is significantly influenced by diurnal variation. A numerical simulation with the CCSR/NIES chemistry climate model demonstrates that a local minimum appears around 13-14 LT in the middle stratosphere in addition to a simple step-like variation (i.e. steep increase/decrease of BrO at dawn/dusk). The early afternoon minimum is 10-20 % smaller than the morning and evening maxima. It is estimated that averaging about 30 measurements achieves less than 20 % retrieval error in the altitude range of 15-40 km. Observations by SMILES will cover the whole local time during about one month because of the ISS's 51.6-degree inclined orbit. We are planning to provide, therefore, monthly product of BrO in a 1-hour (in local time) x 10-degree (in latitude) grid. The number of measurements to be averaged will exceed 50 in most of the grids. It is expected that such unique characteristics of SMILES observation will promote our understanding of spatial and temporal distribution of stratospheric BrO.