
RECENT RESEARCH ACTIVITIES

A satellite observation on the atmospheric ozone layer

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The earth system consisting of the atmosphere, the ocean, and the biosphere has been affected by natural and artificial perturbations. Resulting changes in the earth system become obvious in several places and in several parameters. Among those the ozone layer in the middle atmosphere is one of the most important regions to sense such changes. In recent years we have found several important variations in the middle atmosphere including the Antarctic ozone hole, and now we need synthetic understanding and extensive observations for these variations to project the future state of the earth system.

To monitor the atmospheric condition in the middle atmosphere with very high sensitivity Super-conductive Submillimeter-Wave Limb-Emission Sounder (SMILES) was designed on board the Japanese Experiment Module (JEM) of the International Space Station (ISS) as a collaboration project of Japan Aerospace Exploration Agency (JAXA) and National Institute of Information and Communications Technology (NICT). Mission Objectives are: i) Space demonstration of super-conductive mixer and 4-K mechanical cooler for the submillimeter limb-emission sounding, and ii) global observations of atmospheric minor constituents in the stratosphere (O_3 , HCl, ClO, HO_2 , HOCl, BrO, O_3 isotopes, HNO_3 , CH_3CN , etc), contributing to the atmospheric sciences, especially to the ozone chemistry in the middle atmosphere. As a core of the science team we are devoted to this mission.

The SMILES observation is characterized as aiming at variation and its impact of radical species in the stratosphere. Based on its high sensitivity in detecting atmospheric limb emission of the submillimeter wave range, JEM/SMILES will make measurements on several radical species crucial to the ozone chemistry. Some of them have never be seen by any other satellite measurements, and the JEM/SMILES mission will be the first to detect them such as BrO. The SMILES will also try to observe isotopic composition of ozone. Unusually high enrichment in most of the heavy ozone isotopomers in the stratosphere has been puzzling problem, and the JEM/SMILES observation will provide us important findings to work out the puzzle.

As a result of some policy changes a new SMILES science team has been recently established and authorized in JAXA. The SMILES science team has been made up of scientists inside and outside JAXA including overseas scientists. As a consequence of the science team activity we try to form a research core of the earth and planetary atmospheric science in JAXA through coordination with, for example, PLANET-C (Probe of Venus Atmosphere) project. The system detail design and manufacturing of the proto-flight model (PFM) for JEM/SMILES is now being developed, and it is aiming at the launch scheduled in 2009 by the H-II Transfer Vehicle (HTV).

Further information about the SMILES mission including the mission plan can be found at the following URL.

<http://smiles.tksc.jaxa.jp/indexe.shtml>