STRATOSPHERIC OZONE ISOTOPES OBSERVED BY AIR-BORNE AND SPACE-BORN SUBMILLIMETER-WAVE HETEROFYNE RADIOMETRY: A SENSITIVE STUDY

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The variation of the isotopic composition of a species in the Earth atmosphere provides us the information on the history of the air masses, because the isotope enrichment or depletion reflects the chemical and physical processes. Since the discovery of the heavy isotope enrichment of ozone in the stratosphere in 1981 considerable progress has been made in understanding the processes that control the isotope enrichment based on atmospheric observations, laboratory experiments, and so on. However, the exact mechanism for the effect remains uncertain and accurate sequentially observations of ozone isotopomer at global scale are still very sparse. Further improvements of measurement precision can be obtained by making use of the new technological development of high-precision submillimeter-wave heterodyne radiometry based on sensitive SIS detector technology. The airborne ASUR instrument (Airborne SUB-millimeter SIS Radiometer) observed lines of asymmetric-18 ozone in the frequency region of 645 GHz with this technology since 1994. The JEM/SMILES instrument (Japanese Experiment Module / Superconducting sub-MILLimeter Limb Emission Sounder), to be installed on the International Space Station in 2007, will measure several ozone isotopomer in the stratosphere at global scale from space using very similar frequency bands. An error analysis including the most typical systematic errors is performed.