

Ice cloud observations by sub-mm limb sounder SMILES - a sensitivity study

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JEM/SMILES, the Superconducting Submillimeter Limb Emission Sounder will be operated as part of the Japanese Experimental Module of the International Space Station from summer 2009. JEM/SMILES has been developed to perform high accuracy observations of trace constituents in the stratosphere, in particular such related to ozone chemistry.

However, applying submillimeter-wave technology information about upper tropospheric ice clouds can also be derived from the measurements as has been demonstrated from Odin/SMR and Aura/MLS data. Compared to these instruments SMILES is expected to exhibit a significantly lower noise level, hence much higher sensitivity to measurement intensity changes, e.g. caused by (thin) ice clouds.

We study the sensitivity of submillimeter-wave limb spectra to ice cloud properties. This includes microphysical (ice content, particle size and shape) as well as macrophysical cloud properties (cloud altitude, geometrical thickness). The sensitivity to cloud properties is analyzed for different atmospheric conditions (tropical, midlatitude, arctic, etc.). Separability of cloud parameters from SMILES spectral measurements is discussed.

To quantify SMILES capabilities concerning ice cloud observations, spectral sensitivity to ice clouds is compared with the error budget of the SMILES instrument.