IceCube 883-GHz Cloud Radiometer Experiment

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IceCube is an experiment on a 3U cubesat to demonstrate one of the commercially-developed compact, low-cost 883-GHz radiometers for future cloud sciences and weather observations. The experiment explores a number of new ways to operate the submillimeter-wave sensor in space, including noise source technology for radiometric calibration, spinning cubesat to scan Earth's atmosphere, phase-change materials for thermal stability, and limb observations for improving pointing accuracy. IceCube was successfully released from ISS in May 2017 and has been making cloud observations since June 2017.

Cloud ice plays important roles in Earth's energy budget and cloud-precipitation processes. Knowledge of global cloud ice and its properties is critical for understanding and quantifying its roles in Earth's atmospheric system. Submillimeter wave remote sensing has capability of penetrating clouds and measuring ice mass and microphysical properties, to fill the sensitivity gap between microwave and infrared sensors in measuring ice clouds. In particular, the 883-GHz frequency is a highest spectral window in microwave frequencies with good sensitivity to ice cloud scattering. At this meeting we will present the latest results and analyses from IceCube, and share the lessons learned about cubesat submillimeter-wave cloud observations.

IceCube was developed at NASA's Goddard Space Flight Center (GSFC) and its daily operation is carried at GSFC's Wallops Flight Facility (WFF). The project is supported by NASA's Science Mission Directorate (SMD) and Earth Science Technology Office (ESTO) under the In-Space Validation of Earth Science Technologies (InVEST) program.