Pre-College Students Contribute to the Cassini-Jupiter Millennium Flyby

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The flyby of the Cassini spacecraft past Jupiter in December 2000 provided a unique opportunity to study Jupiter's radiation belts with high spatial resolution using a passive microwave radiometer that was built into the Cassini Radar Instrument. In a coordinated series of space-based and ground-based observations, named the Cassini–Jupiter Microwave Observing Campaign (Cassini-JMOC), Jupiter was observed at radio wavelengths during the Cassini encounter from November 2000 through February 2001. Cassini-JMOC has two objectives: (1) use ground-based observations to achieve in-flight calibrations of the Cassini radar receiver and thereby enhance the Cassini science at Saturn and Titan; (2) use the Cassini radar receiver to map Jupiter's synchrotron emission at a frequency above 10 GHz and thereby derive the spatial distribution of very high energy electrons (>20 Mev) for the first time. In addition to the scientific objectives, the project included an educational component which allowed middle-school and high-school students to participate in the ground-based observations and data analysis.

This paper reports the C-JMOC observations supported by NASA's Deep Space Network (DSN) antennas at Goldstone, California. Precision measurements of Jupiter's flux density relative to Venus and to a selection of radio sources were made in order to derive an accurate flux density for Jupiter at the spacecraft frequency (13.780 GHz). Precision measurements were also made at 2.3 GHz to monitor the time variability of the synchrotron emission from the Jovian radiation belts. These data, merged with the ongoing NASA/JPL Jupiter Patrol, are being analyzed to determine the intensity of the synchrotron emission at the time of the spacecraft observations and throughout the C-JMOC observing period.

A large percentage of the Goldstone observations were conducted by middle-school and high-school students from classrooms across the nation. The students and their teachers are participants in the Goldstone-Apple Valley Radio Telescope (GAVRT) science education project, which is a partnership involving NASA, the Jet Propulsion Laboratory and the Lewis Center for Educational Research (LCER) in Apple Valley, CA. Working with the Lewis Center over the Internet, GAVRT students conduct remotely controlled radio astronomy observations using 34-m antennas at Goldstone.

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