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Dust Observations by the Radio and Plasma Wave Science Instrument During Cassini's Grand Finale

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Dust particles in the Saturn system can be detected by the Cassini Radio and Plasma Wave Science (RPWS) instrument via antenna voltage signals induced by dust impacts. These impact signals have been simulated in the lab by shooting dust particles onto a Cassini model with electric field antennas. Before the end of mission, Cassini shifted to high inclination orbits with periapsis in the gap between the D ring and Saturn's atmosphere for 22 orbits (Grand Finale orbits). This region is populated with dust particles of previously unknown amounts and size distributions. In-situ measurements by RPWS helped quantify the hazards posed to the spacecraft and instruments onboard. RPWS dust measurements can be made regardless of the spacecraft attitude, for example, during the first proximal orbit when the High Gain Antenna (HGA) was pointed toward the ram direction. During the Ring Grazing orbits, RPWS measurements have been shown to be consistent with the Cosmic Dust Analyzer (CDA), the dedicated dust instrument onboard Cassini. The Grand Finale orbits data revealed a surprisingly low density of dust larger than 0.1 micron and a rich variety of plasma waves in the planet's upper ionosphere. Close inspection of the waveforms indicates a possible dependence of the impact signal decay time on ionosphere plasma density, which showed large variations from orbit to orbit.