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RPWS LP Cold Plasma Results from the Inner Magnetosphere of Saturn

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We present new results indicating that ring-dust is a major plasma source for the magnetosphere of Saturn. This study of the cold plasma near the ring plane of Saturn is based on observations by the Radio and Plasma Wave Science (RPWS) instruments on board the Cassini spacecraft. A dense dust-ring plasma was detected both during the inbound and outbound crossings of the ring plane. The Langmuir probe and plasma emission measurements revealed an increase of the plasma density up to 100 cm^{-3}, and the dense plasma was centred around the maximum count rate of impacting micrometer sized dust particles on the spacecraft. Furthermore the Langmuir probe observations pointed toward a cold plasma population with T_e $\sim$0.5 eV near the ring plane which increased to several eV farther from the ring plane. The ram current to the spherical probe indicated an average ion mass between 20-40 amu, which was confirmed by the INMS instrument, which showed that the dominating ion here was O_2^+. The plasma density decreased to very low values when Cassini passed over (northward) the visible rings of Saturn, which suggest that the ring-plasma is most dense just outside the F ring. The visible rings presumably absorb magnetically mirrored charged particles on conjugate magnetic field lines, and hence the plasma density is low inside the F-ring. Cold plasma from the icy moons and/or plasma sphere (co-rotating) was also detected by RPWS. At least the cold plasma torus of Dione is confirmed, as was indicated from earlier Pioneer and Voyager measurements. The analysis of the obser-

vations is in process and the results are preliminary. Electron temperatures of several eV and a lighter ion composition (presumably water group ions) are indicated. Except during the Saturn Orbit Injection (SOI) spacecraft burn, the spacecraft potential was determined above the rings and elsewhere in the magnetosphere of Saturn. From the information of the thermal plasma and the spacecraft potential we will make an attempt to infer the electric charge of dust particles. For instance, the E-ring particles could be a few Volts negative.