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Abundance of Small Particles in Saturn's Rings from Cassini UVIS and VIMS Stellar Occultations

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The Cassini Ultraviolet Imaging Spectrograph (UVIS) and Visual and Infrared Mapping Spectrometer (VIMS) have each observed ∼100 stellar occultations of Saturn's rings. The different wavelengths of observations (0.15 microns for UVIS and 2.9 microns for VIMS) and the small field of view for VIMS mean that light diffracted by particles smaller than ∼1 cm in diameter is not replaced by diffraction from neighboring particles in VIMS data, while all lost diffracted light in UVIS observations is replaced by light diffracted from particles in its much larger field of view. Thus differential optical depths between the two instruments can be used to measure the population of sub-cm particles across the rings at high spatial resolution (∼ 1 km). In the A and B rings the canted elongated self-gravitating clumps of particles known as self-gravity wakes make the measured optical depth dependent on viewing geometry. In those regions, unless both VIMS and UVIS observe the same star at the same time, the differential optical depth must be included as a parameter in a geometric model of the self-gravity wakes such as in Colwell et al. (2006, Geophys. Res. Lett. 33, L07201, doi:10.1029/2005GL025163), Colwell et al. (2007, Icarus, 190, 127-144), and Hedman et al. (2007 Astron. J. 133, 2624-2629). In the C ring and Cassini Division the optical depth is not dependent on viewing geometry so observations from both instruments can be directly compared. In addition there are a handful of occultations where both instruments observe the same star. We present our findings which show a significant population of sub-cm particles in the outer A ring, with an increasing fraction as the ring edge is approached. In addition, the size of the smallest particle decreases in the outer A ring.