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Unusual Density Waves in the Cassini Division of Saturn's Rings

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Abstract

We identify three unusual density waves in Saturn's Cassini Division, using occultation observations from the Cassini RSS and VIMS instruments. In the inner Cassini Division, we identify outward-propagating density waves with wavenumber m=1 located near 118050 km (W118.05), 118400 km (W118.40), and 118530 km (W118.53). From Cassini ISS images taken at low ring opening angle, we find evidence for vertical structure in these waves, which we speculate may be driven by perturbations from nearby ringlets interior to the waves. In the outer Cassini Division, we identify a slightly less-prominent wave structure near 120200 km (W120.20) between the Laplace and Bessel gaps that is the first known example of a standing wave in a planetary ring system. It appears to be the coaddition of an outward-propagating m=1 density wave, perhaps driven by the nearby Laplace ringlet, and its reflection at the inner edge of the Bessel gap.