



The Case of the Curious Corrugation in the C ring

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Cassini images of Saturn's C ring taken near equinox have revealed a previously unseen pattern of sinusoidal brightness variations extending from the inner edge of the C ring (74,500 km from Saturn center) all the way out to the ramp between the B and C rings (92,000 km from Saturn center). This pattern first became clearly visible in images taken when the sun was only a few degrees from Saturn's ring plane, so these brightness variations most likely represent a vertical corrugation in the C ring. A similar corrugation was previously observed in the adjacent D ring, which was interpreted to be the result of differential nodal regression of the ring-particles' orbits after the entire D ring acquired a small inclination relative to Saturn's gravitational equator in the 1980s (Hedman et al. 2007, Icarus). Comparisons of the corrugations in the D and C rings suggest that both are part of a single structure with a common origin. The corrugation's radial wavelength increases continuously with distance from the planet through both the D and C rings, ranging from roughly 30 km in the D ring to about 80 km in the outer C ring. Indeed, this entire corrugated structure is consistent with what one would expect from differential nodal regression of an initially inclined ring that existed sometime in the 1980s. If this is correct, then much of the C ring would need to have become slightly tilted relative to Saturn's gravitational equator about 25 years ago, meaning that a significant disturbance to either the ring itself or some component of Saturn's gravity field occurred during this time.