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Moon-influenced ringlets and edges in Saturn's rings

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Cassini observations during Saturn equinox have revealed a perplexing amount of structure at the B ring edge. It is still a matter of ongoing debate just how much of the observed structure is intrinsic to the rings and how much is attributable to the influences of ring-moons. We have analyzed ring edges and ringlets in order to disentangle the question of the structure's origin using primarily Cassini UVIS data. Among others objects of study include the Maxwell ringlet in the C ring (which does not have a ring-moon associated resonance), the Titan ringlet (Titan 1:0 ILR), the Huygens ringlet (weakly associated with the Mimas 2:1 ILR), and the outer B ring edge (Mimas 2:1 ILR).

The Maxwell ringlet exhibits a clear m=1 pattern consistent with a freely precessing ringlet; the Titan and Huygens ringlet have pattern speeds slightly faster than the free precession expected at their location. While the Maxwell ringlet has a clearly linear radius-width-relation consistent with uniform precession, neither the Huygens nor Titan ringlet do. The later also show much stronger deviations from a single m-mode shape of their edges, suggestion non-trivial contributions from the ring-moons.

Saturn's outer B ring edge is the most prominent of the moon-influenced ring edges. Voyager 2 imaging provides a previously unpublished, nearly 270deg azimuthal coverage and high-resolution images that show a dominant m=2 pattern as well as local disturbances similar to those reported in Cassini imaging (Spitale and Porco, 2010). The shape of the edge is clearly dominated by the influence of the moon Mimas while its orientation seems to librate following Mimas' orbital changes.