

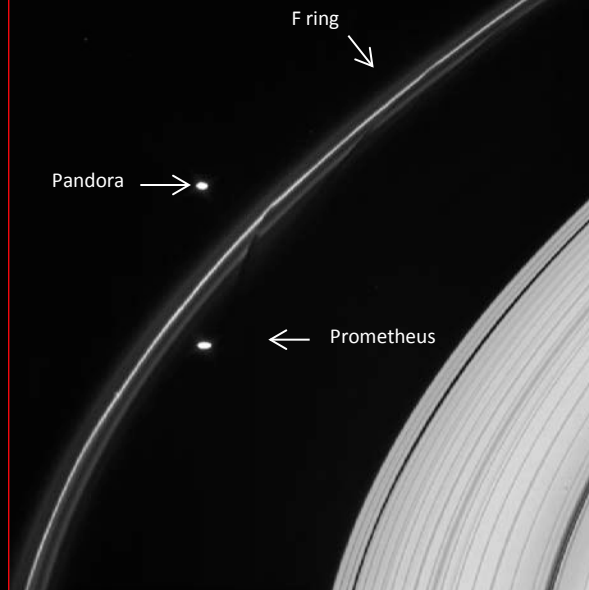
Saturn's F Ring: A Calm Core in the Midst of Chaos

Long-term stability of the narrow F ring core (**center**) has been difficult to explain. Prometheus and Pandora each stir the region into a chaotic state in which orbits of particles and moonlets sporadically change in unpredictable ways. This has complicated the tracking of small objects occasionally seen in the region for the last decade.

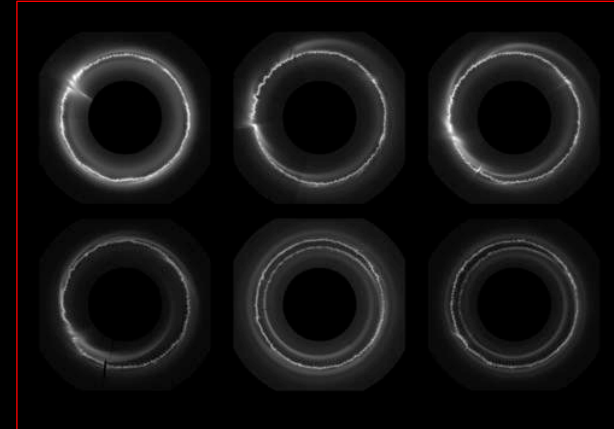
However, at select, very narrow locations, orbits of particles can remain essentially constant for long periods of time because Prometheus' perturbations at one encounter are promptly cancelled at the next encounter. *The long-lived F ring core lies precisely at one of these locations.*

Cassini scientists have generated numerical integrations of tens of thousands of test particles over tens of thousands of Prometheus orbits to map out the effect. Findings show that one novel kind of "antiresonance" with Prometheus alone, with no help from Pandora, can help the ring particles maintain stable orbits.

Prometheus and Pandora, create chaotic lumps and tendrils in the ring. They also are responsible for narrow stable zones including the F ring core.



Computer simulations (**lower right**) reveal the presence of narrow, stable zones (the icicle-like clusters of points). These stable zones are slightly offset from traditional gravitational resonances with Prometheus and Pandora (triangle and square symbols). The orange, dotted line shows the observed location of the F ring core, lying in one of the theoretically stable zones. A question remains, why only this one?



These top-down views (**above**), with Saturn removed from the images, show both the stability of the F ring core and the chaos of the ring's edges.

