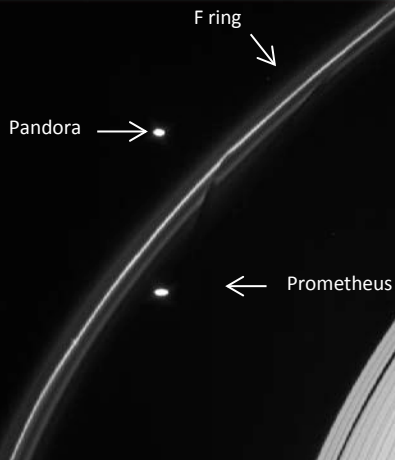


Saturn's F Ring: A Calm Core in the Midst of Chaos

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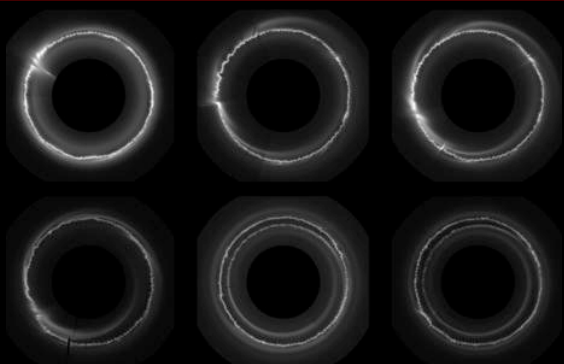
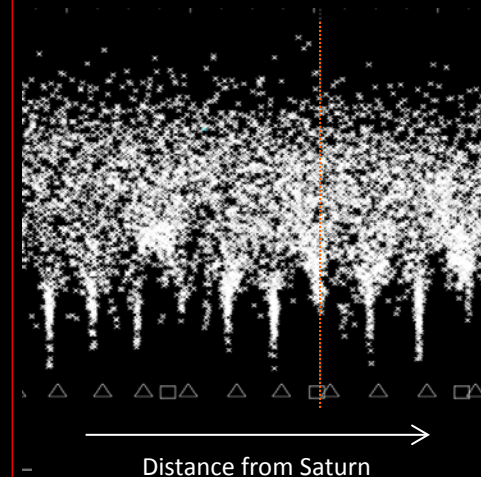
Prometheus and Pandora, create chaotic lumps and tendrils in the ring. They also are responsible for narrow stable zones including the F ring core.



The long-term stability of Saturn's narrow F ring core has been difficult to explain, but new models show that there are several high-stability points within a very chaotic region.

- 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 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 during the next encounter.
- Cassini scientists generated numerical integrations of 10000s of test particles over 10000s of Prometheus orbits to map out the effect. Findings show that one novel kind of "anti-resonance" with Prometheus alone, with no help from Pandora, can help the ring particles maintain stable orbits.

Computer simulations 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, with Saturn removed from the images, show both the stability of the F ring core and the chaos of the ring's edges.