

CONTROL ID: 1850054

SUBMISSION ROLE: Research Contributed

DATE/TIME CREATED: September 30, 2013, 11:56 AM

TITLE: Orbit evolution of disk-embedded masses: Directly observed in Saturn's rings

ABSTRACT BODY:

Abstract (2,250 Maximum Characters): Disk-embedded masses are thought to exist and evolve in many astrophysical contexts, including protoplanetary and protosatellite disks, stellar debris disks, and galaxies. The only known "ground truth" for these theorized objects is found in Saturn's rings.

The "propeller" moons within Saturn's rings are the first objects ever to have their orbits tracked while embedded in a disk, rather than moving through empty space (Tiscareno et al. 2010, ApJL). The embedded masses are not seen directly; rather, their locations are inferred by means of the propeller-shaped disturbances they create in the surrounding ring material (Tiscareno et al. 2006, Nature). Their observed orbits are primarily Keplerian, but with clear excursions in longitude on the order of ± 0.15 degrees longitude for the largest and best-studied example, and \pm several degrees longitude for others.

Most theories that have been proposed to explain the non-Keplerian motion of propeller moons rely on gravitational and/or collisional interactions between the moon and the surrounding disk, and thus hold out the prospect for directly observing processes that are important in other astrophysical disk systems. The different models make different predictions, and future data will likely distinguish among them.

The Cassini spacecraft, currently orbiting Saturn, is monitoring the propeller moons whenever possible. We will report the latest results of that observing campaign.

Contributing Teams:

PRESENTATION TYPE: Research Contributed

CURRENT * SESSION TYPE: Contributed Oral Session

AUTHORS (FIRST NAME, LAST NAME): Matthew S. Tiscareno¹, Allegra E. Moran¹

INSTITUTIONS (ALL): 1. Cornell Univ., Ithaca, NY, United States.

AUTHORS/INSTITUTIONS: M.S. Tiscareno, A.E. Moran, Cornell Univ., Ithaca, New York, UNITED STATES;
