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TITLE: The discovery and dynamical evolution of 'Peggy', an object at the outer edge of Saturn's A ring (*Invited*)

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ABSTRACT BODY: Images obtained by the Cassini Imaging Science Subsystem (ISS) in April 2013 have revealed the presence of an unusual object orbiting close to the outer edge of Saturn's A ring. The object, nicknamed "Peggy", is perturbing local ring material and can be detected in ISS images as far back as early 2012. The presence of the object is usually indicated by a localised, ~10 km, discontinuity or clump in the ring although the object itself has not been resolved and is likely to have a radius <1km. Several images show evidence of the "mini-jet" phenomenon observed in Saturn's F ring [1] and this is consistent with low velocity (~5 m/s) collisions between "Peggy" and nearby ring material. Images obtained at opposite ansae of the same orbit have a different appearance suggesting that the morphology of the structures created by "Peggy" may depend on orbital phase. This is in agreement with the known perturbing effect of embedded objects close to the outer edge of a ring. Searches for similar objects in the Cassini image archive have shown that "Peggy"-like objects are rare although they have been detected in images as early as 2005. The recent detections show evidence for a change in the object's semi-major axis by ~1.5 km in December 2012, perhaps as a result of a collision. The existence of 100 m-diameter moonlets in the A ring has been inferred from observations of "propellor" structures in the rings [2] and one of these has been observed to be undergoing non-keplerian orbital evolution [3]. "Peggy" could be the typical end product of the dynamical evolution of such a "propellor", caught in the act of escaping from the A ring.

References:

- [1] N.O. Attree, C.D. Murray, N.J. Cooper, and G.A. Williams. Detection of low velocity collisions in Saturn's rings. *Ap. J. Lett.* 755, L27-L31 (2012)
- [2] M. S. Tiscareno, et al. 100-metre-diameter moonlets in Saturn's A ring from observations of "propeller" structures. *Nature* 440, 648-650 (2006)
- [3] M. S. Tiscareno, et al. Physical characteristics and non-keplerian orbital motion of "propeller" moons embedded in Saturn's rings. *Ap. J. Lett.* 718, L92-L96 (2010)