

Density structures induced by small moonlets in Saturn's dense rings

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We used the method of local box simulations to investigate the density perturbations in a planetary ring as a consequence of the presence of an embedded small moonlet. We verified the formation of a S-shaped density structure (propeller interfered with wakes) predicted by Spahn and Sremcevic, Astron. Astrophys. 358 (2000), 368, and Sremcevic et al. MNRAS 337 (2002), 1139, which scales in radial direction with the Hill radius and in azimuthal direction with the mass of the satellite over the viscosity of the ring material. The results may be used to detect small embedded satellites in Saturn's rings in the Cassini imaging data (ISS) and in the occultations carried out by the ultra-violet- spectrometer Cassini (UVIS). In case of a detection the theoretical scalings enable estimates for the mass of the embedded body as well as for the viscosity of the surrounding ring material. Furthermore, detections of other moonlets than Pan might provide implications for an origin of Saturn's rings by a catastrophic disruption of parent bodies.