



Life at the edge of Saturn's Roche Limit

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Abstract

Saturn's rings and its cohort of small satellites form a single system that exchange angular momentum and material. It has been recently shown (Charnoz et al., 2010) that the population of Saturn's small moons is extracted from the material of the massive ring system, via the coupling of the ring's viscous spreading and transfer of angular momentum from the disk to newly formed aggregates. The direct implications of this process are (1) the confinement of the ring system (2) the apparition of a dusty ring near the Roche Limit and (3) a radial sorting of the small moon's mass.

In addition, Salmon et al. (2010), has shown that a self-gravitating disk that is viscously spreading develops naturally an outer disk in which Q (Toomre's parameter) is constant around 2, due to the strong diminution of angular-momentum transfer when $Q > 2$. Such a structures seem very well in agreement with the existence of the current A ring.

With this set of constrains we will try to infer the current production rate of small moonlets at the ring's edge. We will also explore the consequences on the evolution of the F ring, in particular concerning its collisional evolution and production of dust, in order to infer an age for its constituent material. In addition, we will investigate the long-term evolution of the moonlets system and their connection with the system of mid-size icy satellites.