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Dynamics of dust in Saturns outer magnetosphere

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Since July 1st 2004, the Cassini spacecraft has been exploring the Saturnian system, which is distinguished by a pronounced ring system. In particular, Saturn's diffuse E ring is the largest planetary ring of the solar system ranging from 3(Saturn's radius $= 60\,330$ km) to approximately Titan's orbit. The vertical ring thickness is 8 000 km at Enceladus orbit. The ring is not only remarkable for its size but also for its narrow particle size distribution. As the particle size distribution is due to grain dynamics, knowledge of the dynamical properties of the ring particles is essential for understanding the ring formation and evolution.
Here, we present model calculations for dust grains ejected at Enceladus' south pole into the ring. We show that only grains started at least $20\mathrm{ms}^{-1}$ faster than the moon's three-body escape speed do not re-collide with Enceladus during their first orbit and thus be able to populate the ring. Our numerical results match the CDA data reasonably well. In particular, our findings explain the vertical extent of the ring as derived from the in-situ observations. We also justify the apparent missmatch between the in-situ and remote sensing data. Furthermore, we present simulations of the long-term evolution of E ring particles started at Enceladus. In particular the dynamical selection process responsible for the grain-size distribution and the sinks of the ring particles are discussed.