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CASSINI-CDA's hunt for exogenous dust around Saturn: confronting modeling with data

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We present a progress report on the analysis of the CASSINI-CDA (Cosmic Dust Analyzer) data set to constrain the in-fall of exogenous dust into the Saturn's system. Measuring the flux of particles not gravitationally bound to Saturn provides a crucial constraint on ring evolution scenarii. The constant rain of dust particles, probably rich in carbonaceous and silicate material, should darken the bright surface of icy ring particles and the darkening rate can be envisioned as a clock ticking since the ring formation. However, the rings still appear very young in a sense that ring particles seem to be made of nearly pure water ice. While mechanisms of 'auto-regeneration' have been proposed, the current in-fall rate of dust is a missing parameter for evolutionary models of the rings.

We screen the CASSINI-CDA dust detector data set obtained in the past 6 years for particles whose impact detection characteristics would suggest an exogenous signature. Dust particles not gravitationally bound to Saturn fall into two broad categories: particles of interplanetary (IDPs) or interstellar (ISDs) origin. To support data analysis, we present dynamical modeling within Saturn's Hill's sphere of various IDP expected populations (Kuiper-Belt origin and long period type comets) to predict the expected behavior of these particles along Cassini trajectory and the detection likelihood constrained by the reconstructed CDA pointing profile.