

## Exogenous dust delivery into the Saturnian system and the age of Saturn's rings

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### Abstract

Even 450 years after Galileo Galilei's discovery of Saturn's rings, their origin and evolution is still not known. The rings are the brightest of the four ring systems of the solar system and have at least the mass of the moon Mimas[?]. Interactions with Saturn's moons and viscous spreading of the ring material seem to imply a ring age of about a tenth of the age of the Saturnian system of about 4.5 billion years[?, ?]. A young ring age is problematic because the disruption of a Mimas-sized body or a comet in the Roche zone of Saturn would result in a ring with a much larger rock content than observed today[?, ?, ?]. The unique ring color resulting mainly from the pollution of the ring material with interplanetary meteoroids provides a key for constraining the ring age[?, ?, ?].

Here we report on the first direct measurements of the meteoroid flux into the Saturnian system by Cassini's Cosmic Dust Analyzer (CDA). We measured the impact speed vectors of 133 extrinsic micrometeoroids  $\geq 2\mu\text{m}$  and determined their orbital elements. We determined the mass flux into the Saturnian system to be  $10^{-18}\text{kg/m}^2\text{s}$ . This finding suggests a ring exposure time of 4.5 billion years and is in support of an early ring generation from a proto-Titan during the formation of the Saturnian system[?].

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