



## Comet fragmentation as a source of the zodiacal cloud

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Models of the thermal emission of the zodiacal cloud and sporadic meteoroids suggest that the dominant source of interplanetary dust is Jupiter-family comets (JFCs). However, comet sublimation is insufficient to sustain the quantity of dust presently in the inner solar system. It has therefore been suggested that spontaneous disruptions of JFCs may supply the zodiacal cloud.

We present a model for the dust produced in comet fragmentations and its evolution, comparing with the present day zodiacal cloud. Using results from dynamical simulations we follow individual JFCs as they evolve and undergo recurrent splitting events. The dust produced by these events is followed with a kinetic model which takes into account the effects of collisional evolution, Poynting-Robertson drag, and radiation pressure. This allows us to model both the size distribution and radial profile of dust resulting from comet fragmentation. Our model suggests that JFC fragmentations can produce enough dust to sustain the zodiacal cloud. We also discuss the feasibility of comet fragmentation producing the spatial and size distribution of dust seen in the zodiacal cloud.

By modelling individual comets we are also able to explore the variability of cometary input to the zodiacal cloud. Comets are drawn from a size distribution based on the Kuiper belt and fragment randomly. We show that large comets should be scattered into the inner solar system stochastically, leading to large variations in the historical brightness of the zodiacal light.