

Modeling Meteor Flares for Spacecraft Safety

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1 Abstract

NASA's Meteoroid Environment Office (MEO) is tasked with assisting spacecraft operators and engineers in quantifying the threat the meteoroid environment poses to their individual missions. A more complete understanding of the meteoroid environment for this application requires extensive observations. One manner by which the MEO observes meteors is with dedicated video camera systems that operate nightly. Connecting the observational data from these video cameras to the relevant physical properties of the ablating meteoroids, however, is subject to sizable observational and theoretical uncertainties. Arguably the most troublesome theoretical uncertainty in ablation is a model for the structure of meteoroids, as observations clearly show behaviors wholly inconsistent with meteoroids being homogeneous spheres. Further complicating the interpretation of the observations in the context of spacecraft risk is the ubiquitous process of fragmentation and the flares it can produce, which greatly muddles any attempts to estimating initial meteoroid masses. In this talk a method of estimating the mass distribution of fragments in flaring meteors using high resolution video observations will be discussed. Such measurements provide an important step in better understanding of the structure and fragmentation process of the parent meteoroids producing these flares, which in turn may lead to better constraints on meteoroid masses and reduced uncertainties in spacecraft risk.