

Nanodust Released in Interplanetary Collisions

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The lifecycle of NEOs involves a collisional cascade that produces ever smaller debris ending with particles which are small enough (nanoscale) to be removed from the solar system by radiation pressure and electromagnetic effects. The production of those nanoscale particles maximizes in catastrophic collisions. At 1AU, where the relative colliding speed is about 20km/s, such collisions can take place when the mass ratio between the two colliding bodies is up to 10^6 . The released nanodust clouds in collisions perturb the background interplanetary magnetic field and create the interplanetary field enhancements (IFEs). Here, we use interplanetary collision model [Grün et al. 1985] and debris distribution model [Fujiwara et al. 1977] to estimate the interplanetary collision rate and the total debris mass carried by nanodust. The rate and mass are then compared with IFE observations using the following assumptions: (1) the largest particles in the IFEs is ~ 100 nm in diameter; (2) all the collisions take place in the upstream of the spacecraft contribute to the IFE detection rate. We find that to release the same amount of nanodust, the collision rate must be comparable with the observed IFE rate.