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Dust particles fragmentation and the size distribution of collisionally evolved observable asteroids in the Main Belt

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The collisional evolution of asteroids has been studied numerically by different authors in the last two decades. A number of variables have been taken into account, such as the way km-size monolithic bodies may collide, shatter, eventually reaccumulate to form gravitational aggregates and produce given mass spectrums, the effects of non-gravitational forces like Poynting-Robertson's and Yarkovsky's have been included, and the influence of main mean-motion resonances have been considered too. All those models have typically focused on the collisional response to collisions of km and multi-km-size asteroids and have considered the small end of the population as a mere source of projectiles for them. Unfortunately, no model has worried about the effect of the small-size end of the mass distribution on the rest of the collisional cascade.

Campo Bagatin et al. (Pl. & SPace Sci. 1994 (42), 1092-1097) showed that cutting abruptly the lower size end of a collisional cascade triggers wavy patterns in the final distribution of even multi-km size bodies, but no additional efforts have been made in studying the effects of the characteristics of the small-size end on the rest.

One one hand, the way dust -that is sub-cm particles- are affected by high velocity collisions is not known. Models run up to now have simply not handled them. The few attempts to do that just assigned to dust particles either fixed strengths or assumed the same scaling laws used for much larger bodies. What is the size-distributon -if any- resulting from a collision on any such small paricles? Are the above approximations fine, or do dust particles just produce a limited number of equal sized micro-fragments? Do they shatter at all? On the other hand, a small-size end is indeed present in the asteroid-

dust population. How do these two effects combine and affect the rest of the collisional cascade up to observable-size asteroid distributions?

The model developed in this work performes the collisional evolution of the Main Asteroid Belt taking into account different possible ways in which dust particles may shatter, and accounting for the fact that there is a lower limit for such particles. Non-gravitational forces acting on those particles ar included as well. In this way we investigate if dust fragmentation properties has any effect on larger bodies. Preliminary results of such numerical simulations are presented.