Comparing outcomes of asteroid impact simulations to observed main-belt families: Exploring the effects of parent body size and internal structure

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Introduction: Some previous works focused on reproducing the size frequency distribution (SFD) of asteroid families through impact simulations, following the same strategy to compare the SFDs. This strategy, firstly applied by Durda et al. (2007), can also be used to estimate the parent-body diameter of observed asteroid families by plotting the (morphologically matching) modeled SFD and the observed family SFD to the same scale on the same plot. This strategy assumes that impact outcomes based on numerical simulations for targets of a particular fixed size are scalable to the observed families that originated from parent bodies perhaps significantly larger or smaller than those that have been modeled. This approximation appears to be reasonable (to zeroth order) for most observed families. However, it may well break down when the gravitational acceleration of the family's parent body is significantly larger or smaller than our modeled parent body. In this work, we study the range of applicability of such technique comparing the modeled SFDs from impacts simulations for parent bodies with different sizes and internal structures.

Method: We performed new SPH and N-body simulations for targets of 400 km. Here we used the same numerical technique as that in Benavidez et al. (2012) and Durda et al. (2004). Thus, we have a large set of impact simulations for two different sizes (100 and 400 km) and internal structures (monolithic and rubble-pile). These simulations comprise a homogenous set of 600 simulations covering a wide range of impactor diameters, impact speeds, and impact angles.

Results: We will present our preliminary results of this study, addressing the differences presented by cratering events and super-catastrophic impacts. Also, we will include a comparison with asteroid families with large progenitors.

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