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Heavy Bombardment of the Asteroidal Belt by Little Objects

WING-HUEN IP
Institute of Astronomy, National Central University, Taiwan

There are several reasons to believe that km to sub-km sized objects could have played an important role in shaping the orbital structure and physical properties of the asteroids. First, the building blocks of comets and the Kuiper belt objects could be on the order of a few hundred meters in size because of their origin in gravitational instability of the primordial dust disc in the solar nebula. Random gravitational scattering during formation of Uranus and Neptune could inject these remnants into the inner solar system thus causing a high level of collisional impacts with the asteroids. Second, small pieces of the collisional fragments created in asteroidal breakups would have been selectively moved into orbital resonances with Jupiter as a result of the Yarkovsky effect in a short time scale. In turn, these resonant objects will be perturbed into highly eccentric orbits because of orbital chaos thus acting as very effective interplanetary projectiles. In this work, we explore how would this population of small fragments affect the collisional evolution of the asteroidal belt during the heavy bombardment event