N-BODY MODELS OF AGGREGATION AND DISRUPTION

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N-body simulations, in which the equations of motion of N self-gravitating particles are solved approximately over discrete intervals in time, have been used for many years to model complex phenomena related to both aggregation and disruption of small solar system bodies. Examples include planetesimal growth leading to planet formation, asteroid family formation, and the formation of binary asteroids following collisional or rotational disruption of a larger body. Direct simulation permits investigation of collective behaviour, such as gravitational reaccumulation of fragments following catastrophic disruption (possibly leading to the formation of binary or higher-order systems), that would otherwise be difficult to predict. As algorithms and hardware have improved, so have the detail and realism of the simulations. This review will summarize the major types of N-body simulations that have been employed to study the evolution of small solar system bodies, with an emphasis on recent developments that have led to the most sophisticated models yet of asteroid family formation. New capabilities include modeling the gravitational and collisional evolution of complex shapes with variable tensile and shear strength.