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Cosmic Dust Aggregation with Stochastic Charging¹ LORIN MATTHEWS, CASPER, Baylor University, BABAK SHOTORBAN, University of Alabama in Huntsville, TRUELL HYDE, CASPER, Baylor University — The coagulation of cosmic dust grains is a fundamental process which takes place in astrophysical environments, such as presolar nebulae and circumstellar and protoplanetary disks. Cosmic dust grains can become charged through interaction with their plasma environment or other processes, and the resultant electrostatic force between dust grains can strongly affect their coagulation rate. Since ions and electrons are collected on the surface of the dust grain at random time intervals, the electrical charge of a dust grain experiences stochastic fluctuations. In this study, a set of stochastic differential equations is developed to model these fluctuations over the surface of an irregularly-shaped aggregate. Then, employing the data produced, the influence of the charge fluctuations on the coagulation process and the physical characteristics of the aggregates formed is examined. It is shown that dust with small charges (due to the small size of the dust grains or a tenuous plasma environment) are affected most strongly.

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