

Abstract Submitted
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Effects of discrete stochastic charging of dust grains in protoplanetary disks¹ K. S. ASHRAFI, S. ESPARZA, C. XIANG, L. MATTHEWS, A. CARBALLIDO, T. HYDE, Center for Astrophysics, Space Physics and Engineering Research, Baylor University, One Bear Place 97310, Waco, Texas 76798-7310, B. SHOTORBAN, Department of Mechanical and Aerospace Engineering, University of Alabama-Huntsville, Huntsville, AL 35899 — The stochastic nature of grain charging can play a significant role in the development of dust aggregate structure when the grains have a small charge. In this work, we use a model of discrete stochastic charging to calculate time-dependent electric charging of dust aggregates. We compare the electron and ion currents to micron and submicron aggregate grains, which consist of spherical monomers, to the currents to spherical grains of equivalent mass. The average charge and charge distribution are compared for aggregates composed of different monomer sizes. The aggregate morphology (whether the grain is compact or porous) affects the amount of charge collected and the available surface area for recombination on dust grains. Thus, the aggregate morphology as well as the dust fraction can affect the overall ionization balance in a plasma. The implications of our results for non-ideal magnetohydrodynamics in protoplanetary disks are briefly discussed in terms of the effect of disk ionization fraction and chemical networks.

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