Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Charging of aggregates in a plasma with ion flow[1] KYLE DAVIS, LORIN S. MATTHEWS, TRUELL HYDE, Baylor University, CENTER FOR ASTROPHYSICS, SPACE PHYSICS AND ENGINEERING RESEARCH TEAM —
In dusty plasmas spherical dust grains with radii on the order of μms stick together to form aggregates. The aggregates collect ions and electrons from the surrounding plasma, and reach a stable equilibrium charge when the net current to the surface is zero. A previous numerical model, OML_LOS, calculated the charge distribution on the aggregate by dividing the surface into patches and calculating the electron and ion currents incident on each patch using Orbital Motion-Limited (OML) theory. The currents are adjusted by only allowing electrons or ions to hit the patch along open Lines-of-Sight (LOS). It is assumed in this model that the electrons and ions are isotropically distributed and that the trajectories are approximately straight line paths. Here we present a new numerical model for calculating aggregate charge in a flowing plasma. The electron current is calculated using the same method as before, but the dynamics of the ions are calculated explicitly, and the ion current is calculated from ion collisions on the dust surface. Results of this simulation are compared to those from OML_LOS. While the overall charge is found to be in good agreement, the charge distribution differs with changing ion flow velocities, affecting the resultant dynamics of the dust grains.

[1]Support from NSF grant PHY-1707215 is gratefully acknowledged.

Kyle Davis
Baylor University

Date submitted: 10 Jul 2019 Electronic form version 1.4