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Comparison among Three Charge Models for Dust Grain Transport in an Abrupt Inhomogeneity JEFFREY WALKER, No Company Provided, MARK KOEPKE, West Virginia University, MICHAEL ZIMMERMAN, Johns Hopkins University, WILLIAM FARRELL, NASA, VLADIMIR DEMIDOV, West Virginia University, Air Force Research Laboratory — The trajectory of a dust grain, radius a, is modeled semi-analytically for an abrupt inhomogeneity, and it is shown that the guiding center drift is sensitive to grain charging rate. For an abrupt inhomogeneity, two neighboring regions are characterized by two respective sets of plasma parameters and corresponding in-situ equilibrium charge states. The grain charges or discharges with each gyro-excursion between regions at a characteristic charging time τ_{ch}. We assess grain transport due to guiding center drift for the Orbit Motion Limited, Patacchini-Hutchinson electron current, and Gatti-Kortshagen ion current charging models for a given set of plasma parameters. The three models yield different guiding center drift magnitudes, demonstrating that charge models can be in principle be discriminated under certain conditions. Neutral drag force, or Epstein drag, is included in our analysis, and it is assumed that the perpendicular dust grain velocity is small with respect to the thermal speed of neutrals. The application of these theoretical results to dust confinement and model validation in the Auburn Magnetized Dusty Plasma Experiment is assessed through theory and simulation.

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