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Fine Particle Charging Rate Limit Modification to Grain Dynamics in Abrupt and Gradual Inhomogeneities JEFFREY WALKER, MARK KOEPKE, West Virginia University, MICHAEL ZIMMERMAN, Johns Hopkins University, WILLIAM FARRELL, NASA Goddard Space Flight Center, VLADIMIR DEMIDOV, West Virginia University, Wright Patterson Air Force Research Laboratory — Gyro-phase drift is a guiding center drift that is directly dependent on the charging rate limit of dust grains. The effect of introducing a gyro-phase-dependence on the grain charge leads to two orthogonal components of guiding-center drift. One component, referred to here as grad-q drift, results from the time-varying, gyro-phase angle dependent, in-situ-equilibrium grain charge, assuming that the grain charging is instantaneous. For this component, the grain is assumed to be always in its in-situ-equilibrium charge state and this state gyro-synchronously varies with respect to the grain's average charge state. The other component, referred to here as the gyro-phase drift, arises from any non-instantaneous-charging-induced modification of the grad-q drift and points in the direction associated with increasing magnitude of in-situ-equilibrium charge state. Gyro-synchronous grain charge modulation may arise from either abrupt or gradual inhomogeneity in plasma conditions. This work assesses the feasibility of observing gyro-phase drift in Auburn's MDPX, and how gyro-phase drift might be used to test dust grain charging models in an experiment.

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