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Trajectory calculations of ion collection rates, forces, and energies on dust particles for finite ion inertia and mobility[1] TOSHISATO ONO, CHRISTOPHER HOGAN, UWE KORTSHAGEN, Department of Mechanical Engineering, University of Minnesota, Twin Cities — Improved understanding of the charging and forces on dust particles near the edge of a plasma sheath are of interest in developing mitigation strategies for dust contamination in semiconductor processing, as particles are observed to be trapped in plasma sheath regions While electron-particle collisions can often be described by the OML model, ion-particle collisions in sheath regions require a distinct modeling approach to quantify. In this work, the ion attachment rate, force, and energy on negatively charged particles are calculated using ion trajectory models accounting for a linear external electric field in the plasma sheath, ion inertia, and finite ion mobility. Results show that increasing ion Stokes number, defining the ratio of ion inertia to gas resistance to motion, decreases the ion attachment coefficients, ion drag forces, and energy transfer rate. Interestingly at the Stokes numbers above unity, ions take orbiting trajectories around particles with finite numbers of rotation before colliding or leaving the domain. While some ions can contribute negative momentum transfer to particles, in all cases, we find that the collection force is positive in the direction of the external electric field

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