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Dynamics of bounded self-organized dust flow in a complex plasma[1] MODHUCHANDRA LAISHRAM, DR. DEVENDRA SHARMA, PROF. P. K. KAW, Inst for Plasm Res — Micron sized, highly charged, dust particles constitute a complex medium that exhibits fluid-like behavior when suspended in a quasineutral plasma either using electrostatic levitation or under the micro-gravity conditions. Although the dust particles interact strongly via a partially screened Coulomb force, when subjected to drivers like plasma drag, thermophoratic force or gradients of plasma parameters, the dust fluid is driven to non equilibrium states and develops self organized flows representable by the standard hydrodynamic model [1]. The present analysis of self organized dust flow formations uses 2D fluid dynamics to recover the analytic dependence of the observables like flow shear at a curvilinear boundary and corresponding Reynolds number on the conventional dust transport coefficients for a bounded dust medium subjected to a volumetric drive. In the linear limit of the 2-dimensional Navier-Stokes flow regime of the medium, the effective boundary layer width is recovered to scale with the dust kinematic viscosity μ as $\delta r \approx \mu\ 1/3$, while the effective Reynolds number follows $Re \approx \mu\ -2/3$ [2]. At relatively higher Reynolds number the dust flow structures show signatures of nonlinear effects requiring extension of the 2D fluid analysis to the nonlinear regime.
1. Laishram, Sharma, and Kaw, Phys.of Plasma 21 073703(2014)
2. Laishram, Sharma, and Kaw, Phys. Rev. E 91 063110(2015).

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