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Intergrain forces in low Mach-number plasma wakes[1] IAN HUTCHINSON, MIT — Mutual interaction of dust grains depends upon their wake. How that wake and the intergrain forces evolve from the oscillatory structure at sound-speed plasma flow velocity to the symmetric shielding at zero flow, is here studied computationally. Rigorous simulation of interactions of two negatively charged grains smaller than the Debye length has been carried out using the Cartesian-coordinate Oblique-boundary Particle and Thermals in Cell (COPTIC) code, covering a wide range of subsonic plasma flow velocities. In plasmas with temperature ratio $T_e/T_i = 100$, it is found that a single grain's oscillatory wake disappears for flow Mach numbers (M) less than approximately 0.3, which is the parameter regime where Landau damping is expected to be strong. Neutral collisions suppress potential oscillations above $M = 0.3$, but not the trailing attractive potential peak caused by ion focussing. The transverse (grain-aligning) force on a downstream particle in the wake of another is obtained rigorously from the code in three-dimensional simulations. It shows general agreement with the force that would be deduced from the single-grain wake potential gradient. Except for relatively large grains in the nonlinear collisional regime, the grain-aligning force is very small for slow flow.

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