Interaction of single-layer plasma crystals with upstream charged particles

V. NOSENKO, C.-R. DU, S. ZHDANOV, H.M. THOMAS, G.E. MORFILL, Max Planck Institute for extraterrestrial Physics — In experiments with single-layer plasma crystals, one often observes extra particles outside of the main layer after injecting particles into plasma. Those particles, which can be agglomerates or contamination, sometimes move at a high speed and disturb the lattice. When the extra particle speed is higher than the sound speed of the lattice, the disturbance forms a Mach cone. The Mach cones and wakes associated with extra particles moving beneath the lattice layer are well studied. In the present work, we study for the first time the interaction of a single-layer plasma crystal with charged extra particles located above it (upstream of the flow of ions) [1]. Upstream extra particles tend to move between the rows of particles in the crystal, accelerate to supersonic speeds, and excite attraction-dominated Mach cones and wakes in the crystal. We attribute the particle - lattice layer attraction to the ion wake formed underneath the upstream extra particle.