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**Experiments and simulation of dust motion in toroidal dust clouds in a weakly magnetized plasma** ALEXANDER PIEL, TORBEN REICHSTEIN, IRIS PILCH, Christian-Albrechts-University Kiel, Germany — In the presence of a magnetic field, dust clouds of micrometer sized particles can attain a toroidal shape with a dust-free region in the center. We had shown before [1] that the formation of such toroidal clouds can be described by a hierarchical model. In first order, the radial dust confinement is governed by a balance of the electric field force and the radial component of the ion drag force. In second order, the azimuthal component of ion drag that arises from the ion Hall effect is in competition with the weight force and gas friction. Above a threshold, the dust performs an azimuthal motion. Here, we present a refined model for dust confinement and rotation that also accounts for collective forces and inertial effects. The model is presented in two versions, by integrating the equations of motion or by molecular dynamics simulation. The model calculations are compared with experimental results for the inhomogeneous velocity field of the streaming particles.

[1] I. Pilch et al, Phys. Plasmas 15, 103706 (2008)

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