

Problems:

- Consider only electron and ion collection currents. How does the equilibrium potential of dust grains depend on the mass of the plasma ions? (assume $T_e = T_i$)
- How does the charging time depend on the radius of a particle?
- What do you expect happens to the charging equations in regions with high dust density?
- Can you write a trajectory integrator to follow the path of an ion in the magnetic field of a centered, aligned dipole? What happens if you include the gravity of the planet? Co-rotational electric field? Increase the mass of the ion?
- What happens to the dispersion relations $\omega(k)$ of your favorite plasma wave in regions with increasing dust density?

References:

- 1) Bliokh et al., *Dusty and Self-Gravitational Plasmas in Space*, Kluwer, 1995
- 2) Shukla and Mamun, *Introduction to Dusty Plasma Physics*, IOP 2002
- 3) Horanyi et al., *Dusty Plasma Electrodynamics in Saturn's Magnetosphere: Expectation for Cassini*, *Rev. of Geophys.*, 2005
- 4) Mendis and Horanyi: *Dusty Plasma Electrodynamics in Comets: Expectation for Rosetta*, *Rev. of Geophys.*, 2013