Space weathering effects on space dust dynamics (part I)

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Résumé

Classical celestial mechanics is founded on the law of gravity. Actual space science applications require the inclusion of non-gravitational effects. In the artificial satellite problem atmospheric drag, solar radiation pressure are most commonly used in the modeling of spacecraft orbits. Additional forces need to be taken into account for even smaller bodies, i.e. debris and dust. The interplay of them with the solar wind and solar photons induce new perturbing forces that will alter the dynamics in comparison to the viewpoint of classical celestial mechanics. Since space debris may appear with high area-to-mass ratios the interaction with space plasmas need to be included as well due to the presence of the (inter-)planetary magnetic field. Most fore-mentioned non-gravitaitonal forces are important in the better understanding of space weather. This session is devoted to the role of space weathering effects on perturbed Keplerian motions with applications to dust and space debris dynamics in the vicinity of the Earth and the Heliosphere. We will derive and investigate the equations of motions for space dust in the Newtonian, Gaussian, and near Hamiltonian framework by means of numerical simulations, and analytical estimates, i.e. perturbation theory in nearly-integrable, nearly-dissipative dynamical problems.

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