Chaos and Multisability studies of longitudinal shocks in dusty plasma

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In present paper, collisional dusty plasma containing charged dust grains, ions and electrons is studied. Dust-dust and dust-ion collisions are taken into account. Using the reductive perturbation technique (RPT), modified Korteweg-de Vries Burgers (m-KdVB) equation is derived and it's solution is studied to understand the behaviour of shocks and solitary waves in this dusty plasma. To predict the state of system, non-linear dynamical systems are studied, which are sensitive to initial conditions and hence there can be exponential growth of small uncertainties. In many aspects of plasma dynamics, nonlinear dynamical systems theory is crucial and can lead to chaotic trajectories, which can degrade plasma confinement. The effect of random disturbances on a system can cause chaotic dynamics to emerge. Random perturbations occur in nature all the time, and they are created by random external fields, random inhomogeneities, and nonstationary media. And to study the feedback effect caused by electrons produced by ionization of electrons, ionization instability is being studied. Our study has importance in various astrophysical aspects like in Mar's and Earth's ionosphere, meteor shower, comet's tail, magnetic resonance etc.

References

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