

Study of Sagdeev solutions and their stability against mutual collisions in the ion-acoustic regime based on fully kinetic simulation

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The Sagdeev pseudo-potential method [3] has been used in studying in a range of plasmas in order to find nonlinear solutions to the system. In this study, we have focused on the collision of these solutions in the ion-acoustic regime. The objective is to establish if the Sagdeev solutions can be considered as proper solitons in a fully kinetic regime [1, 2]. By following their temporal evolutions in the kinetic simulation box, we have tested their stability against mutual collisions. The study utilizes a fully kinetic simulation approach and adopts the Vlasov equation to follow the temporal evolution of plasma constituents. The numerical approach to solve the Vlasov-Poisson set of equation is based on Vlasov-Hybrid simulation (VHS) method which follows phase points trajectories in the phase space and guarantees the positiveness of the distribution function. In order to reproduce the potential profile of the solitons as the initial state of simulations, the Sagdeev pseudo-potential approach is employed numerically. It is shown that the ions' dynamics (specifically the reflected population) have a strong effect on the collision process.

References

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