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Nonlinear Coherent Structures of Alfvén Wave in a Collisional Plasma. SAYANEE JANA, Saha Institute of Nuclear Physics, SAMIRAN GHOSH, University of Calcutta, NIKHIL CHAKRABARTI, Saha Institute of Nuclear Physics — The Alfvén wave dynamics is investigated in the framework of Lagrangian two-fluid model in a cold magnetized collisional plasma in presence of finite electron inertia. In the quasi-linear limit, the dynamics of the nonlinear Alfvén wave is shown to be governed by a modified Korteweg-de Vries Burgers (mKdVB) equation. In this mKdVB equation, the electron inertia is found to act as a source of dispersion and the electro-ion collision serves as a dissipation. In the long wavelength limit, we have also investigated wave modulation characteristics of the nonlinear Alfvén wave. The dynamics of this modulated wave is shown to be governed by a damped nonlinear Schrödinger equation (NLSE). These nonlinear equations are analysed by means of analytical and numerical simulation to elucidate the various aspects of the phase-space dynamics of the nonlinear wave. Results reveal that nonlinear Alfvén wave exhibits shock, envelope and breather like structures. Numerical simulations also predict the formation of Alfvénic rogue waves, rogue wave holes and giant breathers. These results could be useful for understanding the salient features of the Alfvénic magnetic field structures from observational data in very low-βmagnetized collisional plasmas in space and laboratory.

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