Observations and Modeling of Fast Solitons in Quasi-parallel Bow Shocks

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Using Cluster measurements made in quasi-parallel bow shocks we have analyzed properties of nonlinear soliton-like structures embedded in widespread electromagnetic turbulence. The structures are identified as fast alfvenons propagating with speeds faster than the local Alfvén speed. They represent large amplitude compressions or rarefactions of the magnetic field being in phase with structures of plasma density. The observations are modeled both analytically and with time-dependent simulations based on two-fluid equations. We discuss the results in the context of recent results related to Orbital Angular Momentum (OAM) of electromagnetic fields and its relation to plasma structuring.