Abstract

The aim of this thesis is to analyze the evolution and propagation of shock waves in nonlinear inhomogeneous plasma having a sheared flow in the direction of the magnetic field. We take finite-Larmor radius effect into account by using the nondiagonal pressure tensor in the equation of motion for ions. This shear flow gives rise to dissipation and the presence of trapped electron population results in the fractional nonlinearity. A modified nonlinear shock equation is obtained, and is referred to as the Schamel-KdVB equation. The solution of which is obtained by using the slightly modified tangent hyperbolic method. Effect of different parameters like temperature, density gradient, number density and shear velocity etc. on the shock wave profile is investigated. This theoretical model is used to study ICME-driven shocks in the atmosphere of Mars and other planetary atmospheres. Data is taken from the observations made by Mars Atmosphere and Volatile EvolutioN (MAVEN) spacecraft launched in 2013 by NASA and has been in orbit around Mars since 2014.