Numerical study of nonlinear interaction between Kinetic Alfvén waves and magnetosonic waves in plasma

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This paper presents the model equations governing the nonlinear interaction between kinetic Alfvén wave (KAW) and magnetosonic wave in the plasmas (having $\beta \gg m_e / m_i$ known as kinetic Alfvén waves (KAWs); here $\beta = 8\pi n_0 T / B_0^2$ is thermal to magnetic pressure, n_0 is unperturbed plasma number density, $T(= T_e \approx T_i)$ represents the plasma temperature, and $m_e(m_i)$ is the mass of electron (ion)). The nonlinear dynamical equation satisfies the modified Zakharov system of equations (MZSE) by taking the non-adiabatic response of the density in the form of magnetosonic wave. We have solved this system of equation by numerical simulation and observed that the system becomes turbulent as it evolves. The localized magnetic filamentary structures are found in solar wind at 1AU. Magnetic power spectra at different time and spectral index are calculated. The relevance of the present investigation to recent solar wind turbulence observations by *Cluster* are pointed out. In the present paper two types of scaling $k^{-3.4}$ and $k^{-3.6}$ have been observed. The chaotic behavior of the localized structures and steeper spectra (of power law k^{-S}, $5/3 \le S \le 5.3$) can be responsible for plasma heating and particle acceleration in solar wind.