

Nonlinear evolution of envelope-modulated Alfvénic turbulence in expanding accelerating solar wind plasmas

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It is well known that low-frequency Alfvénic turbulence is ubiquitously observed in solar wind plasmas. There is great interest in nonlinear evolution of the Alfvénic turbulence, since the observational studies clarified that the Alfvénic turbulence disappears with the increasing heliocentric distance and the fully-developed turbulence becomes dominant. Although most past studies on Alfvénic turbulence assume uniform background plasmas and magnetic fields, the effects of inhomogeneity may not be negligible in the inner-heliosphere, in which several future spacecraft missions are planned. It is important that even if the wave reflection due to the inhomogeneity is negligible, the inhomogeneity of background plasmas and magnetic field may affect the nonlinear interaction among waves through contraction and reflection of the waves and the radial dependence of the background parameters such as the Alfvén velocity and the ion cyclotron frequency. In the present study, the nonlinear evolution of low-frequency, quasi-parallel propagating Alfvénic turbulence is studied by using the two-dimensional hybrid accelerating expanding box model. The dependence of the nonlinear evolution of Alfvénic turbulence on the effects of the inhomogeneity is discussed.

Keywords: solar wind, Alfvénic turbulence, ion kinetics