

Quasilinear theory of the expanding box model for proton cyclotron and parallel firehose instabilities

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It is generally believed that the temperature anisotropy-driven kinetic instabilities play an important role in regulating the measured proton temperature anisotropy in the expanding solar wind. Linear and quasi-linear theories as well as numerical simulations in uniform plasmas are often employed in order to understand the properties of locally excited instabilities. However, since the solar wind itself expands in inhomogeneous interplanetary plasma, the effect of the expansion on the kinetic instabilities should be taken into account. In this study, we present quasilinear theory of the expanding box model to investigate how the solar wind expansion affects proton cyclotron and parallel firehose instabilities in the expanding solar wind.