



## Electrostatic waves induced by ion beam driven nonlinear Alfvén waves

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Energetic ion beams can be produced in various astrophysical plasma environments. These beam ions can generate plasma instabilities. The linear and nonlinear property of these instabilities due to a tenuous energetic ion beam were studied in detail before. However, previous numerical simulations often adopted relatively short spatial scales. In this study, hybrid simulations of a very large system are conducted to investigate instabilities due to tenuous beam ions. It is found that non-linear MHD waves produced by such a beam may naturally lead to the generation of electrostatic waves. The property of such waves will be thoroughly discussed.