Effect of nonlinear circularly polarized waves on linear instabilities triggered by an alpha particle beam

Gomberoff, L.

It is shown that nonlinear left-hand polarized waves can either stabilize or destabilize linear right-hand polarized instabilities triggered by an alpha particle beam in a magnetized electron proton plasma. For differential alpha particle speeds above the threshold for instability the destabilization depends upon the plasma $\beta_i = v_{th.i}/v_A$, where $v_{th.i}$ is the thermal velocity of the i plasma component and v_A is the Alfvén velocity. For any given finite-amplitude wave frequency, there is always a β_i value such that above this value the system is destabilized further. For drift alpha particle speeds well above the instability threshold the destabilization can occur for any β_i. It is also shown that the presence of the large-amplitude wave can trigger purely electrostatic ion-acoustic instabilities. The unstable waves are supported by the proton core. Copyright 2006 by the American Geophysical Union.