

Parametric decays, stabilization effects, and electrostatic instabilities due to finite-amplitude Alfvén waves in a fast solar wind-like plasma

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The effects of a finite-amplitude Alfvén wave in a plasma system with a proton and an alpha-particle beam, are studied. The system is described by a fourteenth-order polynomial providing, thereby, many decay channels for the finite-amplitude Alfvén wave. Apart from the parametric decays, the finite-amplitude wave affects very drastically the stability properties of the linear system. It is shown that the large-amplitude waves can either stabilize or destabilize further linear magnetosonic and ion-cyclotron instabilities like in the case of one ion beam. However, as opposed to the case of one ion beam, for large enough amplitude of the finite-amplitude wave, the effect on the linear system is always stabilizing. The finite-amplitude waves can also trigger nonlinear purely electrostatic ion-acoustic-like instabilities. However, in the present case, even forward propagating Alfvén waves can destabilize electrostatic waves supported by the beams, something that does not happen when there i