

# Electrostatic ion-acoustic-like instabilities in the solar wind with a backstreaming alpha particle beam

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Nonlinear electrostatic instabilities have been shown to occur frequently and under very different conditions in plasma with two ion beams such as the fast solar wind. These instabilities can be triggered when the phase velocity of electrostatic ion-acoustic waves propagating forward and backward relative to the interplanetary magnetic field overlaps due to the presence of a finite amplitude of circularly polarized wave. The instabilities can be triggered by waves supported by the same ion component, or by waves supported by different ion components. By assuming a beam of alpha particles moving backward relative to the external magnetic field, as observed in some events in the fast solar wind, it is shown that a very small negative drift velocity of the alpha particle beam relative to the core plasma—a few percent of the local Alfvén velocity—can trigger a very rich variety of nonlinear electrostatic acousticlike instabilities. Their growth rates can be rather large and they persist fo