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Electrostatic wave Instabilities driven by counter-streaming electron beams in space plasmas

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Abstract content
 (Max 300 words)

Broadband electrostatic noise (BEN) observed in satellite data is found to be associated with field-aligned electron or ion beams in different regions of the magnetosphere such as the plasma sheet boundary layer (PSBL), bow shock and auroral kilometric radiation (AKR) regions. We consider a four-component plasma composed of drifting (parallel to ambient magnetic field) warm electrons and drifting (anti-parallel to ambient magnetic field) cool electrons and background hot electrons and ions in an attempt to further understand the excitation mechanisms for BEN. Using kinetic theory, electrostatic instabilities such as ion-acoustic, electron-acoustic and counter-streaming beam-resonant instabilities are found to be supported. The dependence of the instability growth rates and real frequencies on various plasma parameters such as cool electron beam speed, number density, temperature and temperature anisotropy, as well as the magnetic field strength are examined. It is found that cool electron beam number density and speed determines which instability can be excited. Using plasma parameters which are closely aligned with the measurements made by the Cluster satellites in the PSBL regions we find that the electron-acoustic and ion-acoustic instabilities could account for the generation of BEN in this region.

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Yes

Level for award
 (Hons, MSc,
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MSc

Main supervisor (name and email)
and his / her institution

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