

Electrostatic Waves in the Earth's Magnetotail and in Comets, and Electromagnetic Instabilities in the Magnetosphere and the Solar Wind

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The role of electrostatic ion-beam instabilities in the generation of the broadband electrostatic noise in the earth's magnetotail and in electrostatic bursts in comets is discussed. The theory of electromagnetic ion-cyclotron instabilities in multicomponent plasmas is reviewed by using the semicold approximation. The method is applied to ring current proton precipitation and to the generation of electromagnetic ion-cyclotron waves at the geostationary altitude. The semicold approximation is also applied to the propagation of electromagnetic ion-cyclotron waves in the solar wind. It is shown that due to the large proton thermal anisotropy observed in the core of the proton distribution function in the fast solar wind, strong electromagnetic ion-cyclotron waves can be generated. It is also shown that the waves can resonate with the alpha particles which, as a result of the resonant interaction, can be accelerated to velocities well in excess of the proton bulk velocity, provided that in