COMPARISON OF ELECTRIC FIELD MEASUREMENTS OF TWO STREAM WAVES IN THE AURORAL AND EQUATORIAL ELECTROJETS

Pfaff, R. F.
NASA/Goddard Space Flight Center

Detailed wavevector electric field and plasma density measurements of plasma instabilities have been carried out on NASA rocket experiments launched into the auroral electrojet from Esrange, Sweden and Poker Flat, Alaska, and from Alcntara, Brazil in the unstable daytime equatorial electrojet. Nearly identical instrumentation on both sets of experiments included multiple boomlength spatial filters and multiple baseline spaced electric field receivers to determine the wavelength and phase velocities of the plasma waves. We utilize these measurements to compare the wavenumber spectrum and phase velocity of the primary two-stream (Farley-Buneman) waves observed in the two electrojet systems. In particular, we compare the observed two-stream waves driven by DC electric fields of 10-15 mV/m at the equator with the auroral two-stream waves driven by DC electric fields that ranged between 30 and 110 mV/m. In general, the rocket measurements reveal phase velocities below the ExB velocity, peak wave power near 10 m, and 948;E E. In the auroral zone, the observed two stream spectra often display a double-peaked spectrum in the uppermost altitudes of the unstable electrojet region, that may result from ion magnetization effects at the higher altitudes within the unstable region. The data also address the generation of secondary plasma waves including the efficiency of the wave coupling mechanisms to generate non-linear short-scale modes and turbulence. Finally, the data provide limits important to theories of plasma heating by the two stream waves. The data from both experiment groups are interpreted within the framework of current theories of both linear and non-linear two-stream instability physics.

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1. (a)
Robert Pfaff
NASA/GSFC
Code 696
Greenbelt,, MD
20771 USA
Robert.F.Pfaff@nasa.gov

(b) 301-286-6328

(c) 301-286-1648

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3. (a)

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