

30 MHZ IMAGING RADAR OBSERVATIONS DURING THE JOULE CAMPAIGN

Bahcivan, H.¹, Hysell, D.L.², Larsen, M.F.³, Pfaff, R.F.⁴

¹Electrical and Computer Engineering, Cornell University

²Earth and Atmospheric Sciences, Cornell University

³Department of Physics, Clemson University

⁴NASA/Goddard Space Flight Center

This paper presents 30Mhz imaging radar observations of the auroral electrojet made during the Joule campaign conducted at Poker Flat in the spring of 2003. The imaging technique allows for measuring fine structure in the auroral convection pattern by sorting radar echoes into compact range and azimuth cells. Radar imaging thereby allows for the unambiguous association of backscatter spectra with in situ electric field measurements made by rockets in a common volume. Both instrumented rocket paths projected along the magnetic field lines to the E region altitudes fell inside the radar imaging volume. Radar backscatter was observed only along the rocket path segments where the electric field was above a threshold. Both uplegs were active and contained type II echoes. Downleg portions were quiet, with the exception of a brief type I region observed by one of the rockets. We find that type I echoes propagate at the ion-acoustic velocity but are confined to small electron flow angles, regardless of the line-of-sight electron drift velocity. Type II echoes meanwhile follow the ion acoustic speed times the cosine of the flow angle regardless of the line-of-sight electron drift velocity. The ion acoustic speed is common to both echo types, is a function of the electron drift speed, and is given by well known empirical models. The data interpretation is complicated by the large wind velocity variation in altitude as well as by imprecise knowledge of the scattering altitude. Nevertheless, significant discrepancy with some theoretical expectations suggests a revision of the auroral electrojet theories accounting for the coherent scatter spectra.

Abstract Submission Form

2004 National Radio Science Meeting

Abstract: bahcivan19987

Date Received: September 22, 2004

1. (a) Hasan Bahcivan
Cornell University
Frank H.T. Rhodes Hall 306
Ithaca, NY
14850 USA
hb53@cornell.edu
- (b) 607-2558298
- (c)
2. H - Waves in Plasma
3. (a)
4. I - Invited Paper, Program chair: Rob Pfaff and Yakov Dimant
5. No special instructions