Rapid Variations of Energetic Electron Pitch Angle Distributions and Associated Wave Emissions

*James L Roeder[1], Joseph F. Fennell[1], David Schriver[2], Nicole Echterling[2]

1. The Aerospace Corporation, Los Angeles, CA USA, 2. University of California, Los Angeles, CA USA

Injections of energetic electrons into the inner magnetosphere are a common feature of spacecraft observations. The electron flux rises very rapidly and then recovers smoothly to the pre-event level over a period of several hours. Recent high resolution angular measurements by the Magnetic Electron and Ion Spectrometer (MagEIS) instrument on the Van Allen Probes have observed rapid variations in the recovery of the electron pitch angle distributions at energies in range 20-100 keV. These features can take several forms, one of which is peaks in narrow ranges of pitch angle that occur quasiperiodically every few minutes. In many cases, these electron flux bursts appear to correlate with simultaneously detected plasma wave emissions. Fennell et al. [J. Geophys. Res., 2014] reported one such event in which several flux bursts were highly correlated with upper band whistler-mode chorus waves. One difficulty with identifying and cataloging these events is the obscuration of the rapid variations by the slow trends of the background plasma. Algorithms are being developed to detrend the electron flux by subtracting out this slowly varying background and revealing the rapid burst features. Use of this procedure shows that the rapid variations in pitch angle distributions are a common feature of substorm-generated electron injections in the inner magnetosphere. Over 400 such events have been identified with more 3000 individual pitch angle featured detected. The characteristics of the bursts and associated waves are being cataloged, including the energy and pitch angle of the electron bursts, the anisotropy of the background plasma, the wave frequency and mode, the observation location, and the geomagnetic conditions during the events.

Keywords: Plasma waves, Energetic electrons, Substorm particle injections

