MAGNETOSPHERIC RESONANCE AND AURORA

FAST Data-Model Comparison

—— DATA  From a FAST satellite pass over a 13-minute periodically reforming auroral arc imaged at Gillam. CANOPUS magnetic, optical and radar data exhibit a coincident 1.3-mHz "resonant" toroidal pulsation. The East-West magnetic field of the pulsation is evident in FAST data (panel 1). An “electrostatic shock” forms in the North-South electric field at this altitude (panel 2). Downward electron energy flux (panel 3) and upward field-aligned current (panel 4) are signatures of the arc-related inverted V precipitation structure, which is collocated with an upflowing ion beam, flanked to the north and south by downward suprathermal electron currents.

—— MODEL  Synthetic data from a virtual satellite, traversing a simulated, 88 s fundamental-mode, field line resonance layer straddling a dipole L=7.5 magnetic shell. The plasma is inhomogeneous, sustains anomalous resistivity where the parallel current becomes supercritical, and admits the finite electron inertia and ion Larmor radius. The simulated, instantaneous parallel potential drop is compared with the measured electron energy flux in panel 3 where positive/negative represents the integrated downward/upward parallel electric field at the satellite.