

RPI sounding as IMAGE skims the plasmopause: Ne from direct & ducted echoes and plasma resonances

R. F. Benson, P. A. Webb (NRC), J. L. Green, S. F. Fung
NASA/Goddard Space Flight Center
Greenbelt, Maryland

B. W. Reinisch, X. Huang
Center for Atmospheric Research
University of Massachusetts, Lowell
Lowell, Massachusetts

D. L. Carpenter
STAR Lab
Stanford University
Stanford, California

In early January 2003 the Radio Plasma Imager (RPI) on the Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) satellite performed numerous soundings in the plasmopause region as the outbound IMAGE skimmed along the dawn-side plasmopause boundary. Under these conditions it is possible for the electron cyclotron frequency at the satellite to decrease by an order of magnitude, while the electron plasma frequency fluctuates by less than 50%, over a 3/4 hr time interval along the IMAGE orbit. These values can be accurately determined from the RPI-stimulated electrostatic-wave plasma resonances and electromagnetic-wave cutoffs. The soundings in this region reveal a striking sequence of short-range diffuse echoes and long-range discrete echoes. These echoes have been interpreted as direct signal returns from the nearby plasmasphere and guided signals along the magnetic-field direction from the distant denser plasma region below the satellite, respectively [Reinisch et al., GRL, 28, 1167, 2001; Fung et al., Adv. Space Res., 30, 2259, 2002, Carpenter et al., JGR, in press, 2003]. The latter have been used to determine the electron-density (N_e) distribution along the magnetic-field direction [Reinisch et al., GRL, 28, 4521, 2001] and to make N_e contours along the orbital path [Nsumei et al., JGR, in press, 2003]. Here we present results using plasma resonances and both the diffuse and discrete echoes to obtain local and remote N_e information during outbound IMAGE dawn-side plasmopause skimming conditions.