WAVE EFFECTS IN THE STORMTIME RING CURRENT-PLASMASPHERE COUPLING

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During the magnetic storm of June 5, 1991 Combined Release and Radiation Effects (CRRES) and Defense Meteorological Satellite Program (DMSP) satellites observed a rich variety of wave phenomena. These were simultaneous with enhanced fluxes of low-energy (¡ 1 keV) electrons and ions in the region of ring current/plasmasphere overlap and the conjugate topside ionosphere. Strong electron cyclotron harmonic waves correlated with the soft electrons at the edge of the plasma sheet. Earthward of the plasma sheet boundary, ULF electromagnetic wave-structures with spatial wave-lengths 500 to 1000 km and magnitudes of 1-3 mV/m dominated. The CRRES plasma wave instrument revealed enhanced lower hybrid and whistler (chorus mode) waves embedded within the ULF wave-structures. The latter seemed to modulate also the plasmaspheric density.

The inner edge of the ring current was located about 2 R_E Earthward of the plasma sheet boundary. Near the inner edge, the strongly-structured meridional component of the electric field reached a maximum of 4 mV. Here, the wave activity was dominated by lower hybrid waves, and the electron and ion distributions were dominated by the low-energy particles.

At ionospheric altitudes, the ULF structures produce broad irregular Sub Auroral Polarization Streams (SAPS) with average sunward velocities ¡1 km/s. At about the same time DMSP F8, F9, and F10 indeed observed highly-structured SAPS in the topside ionosphere coincident with precipitating ring current ions, enhanced fluxes of suprathermal electrons and ions, elevated electron temperatures, and deep highly-irregular density troughs. Overall, these events represent the so-called strong wave-SAPS phenomenon [Mishin et al., JGR (2003), 108, 1309, 10.1029/2002JA009793; Mishin et al., JGR (2004), to be published].

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