Observations of simultaneously occurring ULF and Ion Cyclotron Waves by the GOES-16 satellite magnetometer and particle detectors at geostationary orbit

Paul Loto'aniu
University of Colorado, CIRES, CIRES, Boulder, United States of America (paul.lotoaniu@noaa.gov)

The GOES-16 spacecraft, launched in November 2016, is the first of the GOES-R series next generation NOAA weather satellites. The spacecraft has a similar suite of space weather instruments to previous GOES satellites but with improved magnetometer sampling rate and wider energy range of particle flux observations. Presented are observations of simultaneously occurring Pc 4/5 ULF waves and electromagnetic ion cyclotron (EMIC) waves with a discussion on the relationship between the two wave modes including possible generation mechanisms. The waves were also observed in the particle data and we discuss both adiabatic and non-adiabatic wave-particle effects. Relativistic electron fluxes showed strong adiabatic motion with the magnetic field ULF waves. Estimates of Pc 4/5 ULF wave m-numbers suggest they were high, while ring current energy ion fluxes showed ULF variations with non-zero phasing relative to magnetic field ULF wave. This suggests ULF wave drift resonance with ring current ions. In one event we observed EMIC variations in the ion fluxes around energies that can drift resonate with simultaneously observed Pc 5 waves, suggesting that one particle population may be responsible for generating and/or modifying both observed Pc 5 and EMIC waves. ULF variations were also observed in electron/ion fluxes at lower energies down to 30 eV. We looked into ULF bounce resonance with 30 eV electrons, but the resonance condition did not match the observations. We will also discuss future plans to expand this study of ULF waves and wave-particle interactions using the two newest GOES satellites.

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