Geophysical Research Abstracts
Vol. 13, EGU2011-10842, 2011
EGU General Assembly 2011

A systematic magnetic storm effect on the electron energy spectra of the Earth's radiation belt at L< 3.5

Jean Andre Sauvaud (1), Dominique Delcourt (2), Martin Walt (3), and Umran Inan (4)

(1) IRAP, University of Toulouse/CNRS, Toulouse, France (sauvaud@cesr.fr), (2) LPP-CNRS, Ecole Polytechnique, Palaiseau, France, (3) STARlab, University of Stanford, USA, (4) University of Stanford, USA/Koç University, Istanbul, Turkey

In systematic correlation with magnetic storms, the Earth's radiation belts, as seen from the low altitude polar satellite DEMETER, exhibit the development of energy structures made of multiple strong peaks in the energy spectra of energetic electrons. These structure are best seen on East and West sides of the South Atlantic Anomaly, where the satellite can probe particles coming close to the Earth's atmosphere. During storm time, inside the inner radiation belt (L=1.25-1.6), the electron energy spectra at a given location is showing up to 10 narrow peaks at energies from 70 keV to 1 MeV. At higher L shells (2.6-3.2) similar structures with up to 12 energy peaks are detected between 200 keV and 2.5 MeV. The spectrograms as a function of L show that the electron energy in each peak decreases with increasing L. Both energy structures are extremely well related to magnetic storms and can be detected soon after the arrival of dense plasma clouds on the magnetosphere. We interpret these observations as resulting from the sudden compression of the magnetopause and from the associated resonance of drifting electrons with ULF waves associated with the compression. Coherent ULF waves can indeed produce electron energy peaks; here we invoke waves (T=45-600 s), of high azimuthal order to produce multiple spectral peaks just inside the outer electron belt and suggest that a similar process is at work at lower L shells. We present numerical simulations supporting these conclusions and show that the observed energy bands are a systematic characteristics of the disturbed radiation belts.