



Electron Acceleration by Double Layer in the Earth's Outer Radiation Belt

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Huge numbers of double layers have been observed by the electric field experiment on the Van Allen Probes in conjunction with relativistic electron acceleration in the Earth's outer radiation belt. For one case with adequate high time resolution data, 7000 double layers were observed in one minute. Lower resolution data surrounding this one minute showed that this event lasted for six minutes. The generation of double layers (and electron holes) is connected to large amplitude whistler waves. Double layers effectively interact with radiation belts electrons. Quasi-periodic double layer structures change the electron pitch angle distributions, especially for low energies (~ 1 keV). Large amplitude electric field perturbations provide non-linear resonance trapping of electrons into the double layer effective potential during its growth and effective acceleration of trapped electrons occurs in the non-homogeneous magnetic field. One possibility is that the double layers accelerate electrons to hundreds of keV where they serve as the seed population for relativistic acceleration by coherent, large amplitude whistler mode waves.