PHYSICAL PROCESSES LEADING TO HARD ELECTRON FLUXES FROM MAGNETIC STORMS

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An integrated picture of the sequence of complex physical processes thought to be responsible for the creation of MeV electrons following the main phase of geomagnetic storms is described. Plasma sawtooth injection events during periods of sustained southward IMF inject energized plasma into the inner magnetosphere from the nightside plasma sheet. The injections are driven by substorms and magnetically characterized as dipolarization events in which low energy (< 300 keV) electrons are convected to the inner magnetosphere. Storms selected by the GEM community for coordinated studies are used to show the characteristics of substorm injections. For example, the 4 Octorber 2000 storm has a eight well diagnosed substorms before the main phase of the ring current signal Dst reaches its minimum of 280nT. Details of electron orbits and the their energy gain for ensembles of electrons are shown using the Li et al. model for the dipolarization fronts. The second stage of the process that takes electrons from 100-300 keV to a few MeV is potentially the stochastic heating from the chorus of whistlers measured in a wide range of MLT and L shells during the decaying phase of the storms. We describe the Summers model for the diffusive energization that produces a hard electron flux a few days after the main phase of the storm. The role of the lower frequency EMIC waves in emptying the electron loss cone is noted as an important aspect of the system.

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