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Transport and acceleration of plasma sheet electrons to geostationary orbit (Invited)

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Transport and acceleration of the electrons with energies less than 200 keV from the plasma sheet to geostationary orbit were investigated. These electron fluxes constitute the seed population for the high energy MeV particles in the radiation belts and are responsible for hazardous phenomena such as surface charging. We modeled several quiet and storm events, when the presence of isolated substorms was seen in the AE index. We used the Inner Magnetosphere Particle Transport and Acceleration Model (IMPTAM) with the boundary at 10 Re with Tsyganenko and Mukai moment values for the electrons in the plasma sheet. The output of the IMPTAM modeling was compared to the observed electron fluxes in ten energy ranges (from 5 to 50 keV) measured onboard the AMC 12 geostationary spacecraft by the CEASE II ESA instrument and to LANL data from MPA and SOPA instruments. The behavior of the fluxes depends on the electron energy. IMPTAM model, driven by the observed parameters such as IMF By and Bz, solar wind velocity, number density and dynamic pressure and the Dst index, was not able to reproduce the observed peaks in the electron fluxes when no significant variations are present in those parameters. The variations of the observed fluxes during this non-storm period are due to substorm activity. We introduced the substorm-associated electromagnetic fields by launching several electromagnetic pulses at the substorm onsets during the modeled period. The substorm-associated increases in the observed fluxes can be captured by IMPTAM when substorm-associated electromagnetic fields are taken into account. Modifications of the pulse model used here are needed, especially related to the pulse front velocity and arrival time.