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Relativistic electron precipitation during geomagnetic storm time in the years 2006-2010

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The processes leading to acceleration or loss of relativistic electrons in the magnetosphere during geomagnetic storm time have yet to be fully understood, and whether a geomagnetic storm will lead to enhanced or depleted fluxes of relativistic electrons can not be known in advance. Relativistic Electron Precipitation (REP) can penetrate deep into the atmosphere and influence composition and dynamics. To study the effect of REP upon the atmosphere, the energy and intensity of the electrons need to be accurately represented. We use satellite measurements of electrons with energies E>300 keV and E>1000 keV to study the behaviour of these electron populations during geomagnetic storms. We use the MEPED detectors on board the POES satellites NOAA-17, NOAA-18, MetOp-02 and NOAA-19, where the vertical telescope measures precipitated flux, and the horizontal telescope trapped flux at satellite altitude (ca 850 km). Using a newly developed technique, we can derive the flux of electrons depositing their energy in the atmosphere from the pair of detectors on each satellite. 75 isolated storms were identified in the period 2006-2010. The storms include both typical CME driven storms, and weak long duration storms driven by CIRs. Each storm was divided into pre-storm phase, main phase and recovery phase, and the flux of relativistic electrons was monitored through the storms. By combining the measurements from several satellites, we obtain a close to global view of the relativistic electron fluxes, enabling us to study the relationship between the REP and different geomagnetic indices and solar wind drivers.