Radiation Belt Electron Enhancements: History and New Results from RBSP

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Energetic electron data from low-altitude Earth-orbiting spacecraft show both a long historical record of the Van Allen radiation belts and the specific effects of powerful storms such as the 2003 Halloween storms. The fluxes of 2–6 MeV electrons measured by the Solar, Anomalous, and Magnetospheric Particle Explorer (SAMPEX) from July 1992 to the current time are presented in this talk. Data demonstrate intense electron acceleration events (associated with high-speed solar wind), for example, in 1993–95 for $3 < L < 6$. During sunspot minimum (1996), there were significant electron events only briefly around the spring and autumn equinoxes. The SAMPEX electron data for 2003 and throughout 2004 and 2005 show the shifted position of the outer Van Allen zone and the filling of the slot region ($L< 3$). A persistent new belt of electrons was produced in the wake of the Halloween storms and this was clearly seen for $L < 2$ for several years. We note that SAMPEX data demonstrate that in 2008 and 2009, the radiation belts virtually disappeared due to very weak solar wind driving conditions associated with the recent profound solar activity minimum period. Building on this historical record, we describe the new, exciting results from the Relativistic Electron-Proton Telescope (REPT) instrument that were launched successfully onboard the Radiation Belt Storm Probes mission on 30 August 2012. Key areas of scientific progress using REPT will be addressed. Excellent new data from the twin REPT instruments are available from the initial turn-on (Launch+3 days) of the instruments to the present. Inner and outer zone electron spectra have been compared with model expectations.