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Effects of geomagnetic storms in the inner and outer radiation belts as observed by PROBA-V/EPT

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The Energetic Particle Telescope (EPT) is a high time-resolution (2 sec.) spectrometer which was launched in May 2013 onboard of the PROBA-V satellite of ESA. This energetic particle detector is presently still operating at the altitude of 820 km on a LEO polar orbit and it has provided continuously for already more than 5 years valuable flux data for electrons - in 7 energy channels (0.5 – 8 MeV), protons - in 11 channels (9.5 – 248 MeV), and helium ions - in 11 channels (38 -900 MeV). The detailed observations of EPT confirm that the fluxes of outer belt electrons drop drastically and abruptly during the main phase of geomagnetic storms. Later, the fluxes of relativistic electrons generally reach values orders of magnitude larger than their pre-storm intensities. Furthermore, the EPT measurements clearly confirm that following geomagnetic storm events the outer belt fluxes slowly decrease with a time constant ranging between 3 and 18 days. The positions of the maximum flux of relativistic electrons shift toward the Earth during the enhanced geomagnetic activity events. The fluxes of particles in the inner radiation belt defining the South Atlantic Anomaly at LEO, can also be significantly affected by geomagnetic activity. Electrons with energy < 1 MeV are injected during geomagnetic storms and the L-shell of the electron flux peak in the outer belt shifts inward with a high dependence on the electron energy. MeV electrons can also be injected, but only during the most severe storms like the one of March and June 2015, as well as September 2017. With the new high resolution EPT instrument, we have studied the dynamics of relativistic electrons up to 2 MeV in the inner radiation belt, revealing how and when such electrons are injected into the inner belt and how long they reside there.