

Solar Energetic Particles (SEP), Solar Modulation and Space Radiation: New Opportunities in the AMS-02 Era #2

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Solar Wind-Driven Enhancements and Losses of Radiation Belt Particles: Van Allen Probes Observations

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The dual-spacecraft Van Allen Probes mission has provided a new window into megaelectron Volt (MeV) particle dynamics in the Earth's radiation belts. Observations (up to $E \sim 10$ MeV) show clearly the behavior of the outer electron radiation belt at different time scales: months-long periods of gradual inward radial diffusive transport and weak loss being punctuated by dramatic flux changes driven by strong solar wind transient events. Analysis of multi-MeV electron flux and phase space density (PSD) changes during key intervals from March 2012 into 2017 are presented in the context of the first several years of Van Allen Probes operation. These key periods demonstrate the classic signatures both of inward radial diffusive energization as well as abrupt localized acceleration deep within the outer Van Allen zone ($L \sim 4.0 \pm 0.5$). Such results reveal graphically that both "competing" mechanisms of multi-MeV electron energization are at play in the radiation belts, often acting almost concurrently or at least in very rapid succession. They also show in remarkable ways how the coldest plasmas in the magnetosphere intimately control the most highly energetic particles.

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