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Recent results from the NASA Van Allen Probes and the NSF FIREBIRD missions

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The NASA Van Allen Probes began its two-year prime science mission phase following its launch into the inner magnetosphere in August 2012. Designed to study and understand radiation belt structure and dynamics ideally to the point of predictability, the dual-spacecraft Van Allen Probes mission comprises a comprehensive suite of charged particle and fields measurements needed to achieve closure on critical science questions. The Radiation Belt Storm Probes ? Energetic Particle, Composition, and Thermal Plasma (RBSP-ECT) suite consists of three primary instrument types that collectively provide clean, robust measurements of the electrons and key ions in the inner magnetosphere, with high energy spectral and pitch angle resolution, spanning energy ranges covering the cold/warm plasmasphere populations, the hot ring current populations, the medium-energy electron seed population, as well as the core relativistic and ultra-relativistic radiation belt populations. The Van Allen Probes orbit near the magnetic equator, optimized for probing the source regions of particle acceleration and the location through which virtually all particles must pass. However, because the atmospheric loss cone is so small at the magnetic equator, even such an ambitious mission cannot completely explore that loss process without additional measurements away from the magnetic equator. In a complimentary fashion, the NSF Focused Investigation of Relativistic Electron Burst Intensity Range and Dynamics (FIREBIRD) mission orbits at low altitudes, measuring radiation belt electrons precipitating into the atmosphere. The twin FIREBIRD spacecraft were launched in late January 2015 when they began probing the spatial-temporal variability of electron precipitation from the radiation belt. In this paper, we provide a summary of the science accomplishments from the combined RBSP-ECT instrument suite and FIREBIRD missions, specifically focusing on radiation belt loss processes.

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