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Science Highlights from the RBSP-ECT Particle Instrument Suite on NASA's Van Allen Probes Mission

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The NASA Van Allen Probes mission includes an instrument suite known as the Radiation Belt Storm Probes (RBSP) - Energetic Particle, Composition, and Thermal Plasma (ECT) suite. RBSP-ECT contains a well-proven complement of particle instruments to ensure the highest quality measurements ever made in the radiation belts and the inner magnetosphere. The coordinated RBSP-ECT particle measurements, analyzed in combination with fields and waves observations and state of-the-art theory and modeling, provide new understanding on the acceleration, global distribution, and variability of radiation belt electrons and ions, key science objectives of NASA's Living With a Star program and the Van Allen Probes mission. The RBSP-ECT suite consists of three highly-coordinated instruments: the Helium Oxygen Proton Electron (HOPE) spectrometer, the Magnetic Electron Ion Spectrometer (MagEIS), and the Relativistic Electron Proton Telescope (REPT). Collectively these three instrument types cover comprehensively the full electron and ion spectra from one eV to 10's of MeV with sufficient energy resolution, pitch angle coverage and resolution, and with composition measurements in the critical energy range up to 50 keV and also from a few to 50 MeV/nucleon. All three instruments are based on measurement techniques proven in the radiation belts, then optimized to provide unambiguous separation of ions and electrons and clean energy responses even in the presence of extreme penetrating background environments. In this presentation, we summarize overall ECT science goals and then show scientific results derived from the ECT suite on the dual Van Allen Probes spacecraft to date. Mission operations began only in late October 2012, and we have now achieved significant results. Results presented here will include substantial progress toward resolving primary Van Allen Probes science targets, such as: the relative role of localized acceleration versus transport-generated particle acceleration; the role of plasma electron temperature anisotropies, whistler waves, and radiation belt electron variability; global characteristics of outer zone electron drift loss to the magnetopause; the role of storms, substorms, and ion composition in radiation belt dynamics, both in terms of sources and sinks; new physical perspectives on inner zone and slot protons and electrons; and, how plasmasphere properties control or influence radiation belt behavior.