

The Complex Structure and Dynamics of the Inner Magnetosphere as Revealed by the Van Allen Probes Mission

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The Van Allen Probes mission (RBSP) was launched just over two years ago with the goal of understanding the complex, coupled dynamics of the Heliosphere-Magnetosphere system. The mission science objectives focus on the processes that control acceleration, transport, and loss of particles in the inner magnetosphere.

The Energetic particle, Composition, and Thermal plasma (RBSP-ECT) suite measures the structure and dynamics of the plasmasphere, plasma sheet, ring current, and radiation belt environments over a broad range of energies. Now, the Van Allen Probes has completed its 2-year prime mission - in which the orbit apogee precessed through all local times - and the satellites have begun their second swing through the night side of the inner magnetosphere. During that time the Van Allen Probes have developed the most complete statistical picture to date, of the inner magnetospheric environment including the plasma conditions, the composition of plasmas and energetic particles in the inner magnetosphere, and the spatial-temporal-energetic structure of the radiation belts.

While the prime mission phase has seen very low solar activity and very few large storms, the Van Allen Probes mission has observed a surprising diversity of activity and dynamics. We have seen that the “classical” two-belt structure is often an incomplete or inaccurate picture. In addition to the occasional presence of multiple belts, at high energies the inner belt has been essentially absent. In contrast we find low energy electron enhancements are frequently observed in the slot region and inner belt region. Both statistically and for individual events the distribution of plasmas, plasma composition, and energetic particles is highly dependent on energy as well as on solar wind driving and geomagnetic activity. In this talk we will review the mission observations to date. We will explore the energy and activity-dependence at different energies for different species. And we will discuss some of the new observations that challenge our conventional wisdom regarding the inner magnetosphere.