Developing an improved understanding of Earth's outer radiation belt electrons with combined observations from Van Allen Probes, MMS, and Arase

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In this presentation, we focus on two aspects of Earth's outer radiation belt electrons: acceleration due to interactions with whistler-mode chorus waves and losses due to magnetopause incursions and outward radial transport. Using a combination of energetic electron intensities and wave data from NASA's Van Allen Probes and MMS missions plus JAXA's Arase (ERG) mission, we evaluate evidence of local acceleration and losses to outward radial transport based on phase space density and multipoint wave analysis. A telltale sign of local acceleration due to interactions between 100s of keV electrons and chorus waves within the heart of the outer radiation belt is a growing peak in electron phase space density for those energies and pitch angles affected by the acceleration. Sometimes that peak in phase space density might occur beyond the apogee of the Van Allen Probes orbit, but MMS and Arase data can be used to disambiguate dominant acceleration processes for such cases. Losses to the magnetopause and from outward radial transport also result in distinct features in the time history of radial distributions of electron phase space density. Again, with their apogees extending to higher L-shells (including into the magnetosheath for MMS), MMS and Arase can supplement the Van Allen Probes dataset by directly observing evidence of these processes beyond Van Allen Probes apogee. In this presentation, we showcase several examples of these processes using multipoint data from these missions.

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