Recent Results From The Electric and Magnetic Field Instrument Suite and Integrated Science (EMFISIS) on the Van Allen Probes

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The physics of the creation, loss, and transport of radiation belt particles is intimately connected to the electric and magnetic fields which mediate these processes. A large range of field and particle interactions are involved in this physics from large-scale ring current ion and magnetic field dynamics to microscopic kinetic interactions of whistler-mode chorus waves with energetic electrons. To measure these kinds of radiation belt interactions, NASA implemented the two-satellite Van Allen Probes mission. As part of the mission, the Electric and Magnetic Field Instrument Suite and Integrated Science (EMFISIS) investigation is an integrated set of instruments consisting of a tri-axial fluxgate magnetometer (MAG) and a Waves instrument which includes a tri-axial search coil magnetometer (MSC). These wave measurements include AC electric and magnetic fields from 10Hz to 400 kHz.

We present a variety of studies that have been undertaken by members of the EMFISIS investigation team and other radiation belt scientists. These studies include work on electromagnetic ion cyclotron waves, magnetosonic equatorial noise, chorus emissions and plasmaspheric hiss. We show examples of plasmapause identification and variation determined by the upper hybrid resonance, low frequency ULF pulsations, and the correlation of whistler mode chorus with the energetic particles which drive the waves as well as those which receive energy from the waves. We also show examples of wave generation mechanisms including locally generated plasmaspheric hiss at some of the lowest frequencies ever reported, as well as wave properties derived from the measurements including wave vector direction, polarizaion, Poynting flux direction, and the wave ellipticity.