Progress on Understanding Chorus Emissions From Data Of The Electric and Magnetic Field Instrument Suite and Integrated Science (EMFISIS) on the Van Allen Probes

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Abstract

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 key wave-particle interaction important to both acceleration and loss in the radiation belts is the of whistler-mode chorus interacting with energetic electrons. To measure this important radiation belt interaction, the two-satellite Van Allen Probes mission utilizes one of the most complete sets of measurements ever made in the inner magnetosphere. 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 allow sophisticated diagnosis of a variety of features important for whistler-mode chorus including wave normal direction, direct waveform capture of the full electric and magnetic vector fields to investigate individual chorus elements, and determination of the key background parameters of plasma density and background magnetic field. Examples are shown of these measurements as well as progress on understanding aspects of chorus emission such as the gap at one-half the electron cyclotron frequency, comparison with the electron measurements in the energy range important for generation of chorus emission, and comparison with electrons that are energized by chorus.

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