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Coupling between EMIC waves, plasma, and energetic particles in the inner magnetosphere: Observations from NASA's Van Allen Probes

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Wave-particle interactions provide a primary source of scattering and energization of energetic electrons in the Earth's radiation belts. Electromagnetic ion cyclotron (EMIC) waves are one intense wave mode observed in the inner magnetosphere that have been shown to contribute to radiation belt dynamics and loss. Using measurements from the dual Van Allen Probes, we investigate the properties and spatio-temporal extents of EMIC waves in the inner magnetosphere. Additionally, in order to understand the drivers controlling these wave characteristic scales, we explore the spatial extents and evolution of plasma structures that may be contributing to wave growth. This is critical both for uncovering the underlying physics behind the wave generation as well as for better predicting where and when waves will be present. Finally, we investigate the effects of EMIC waves on energetic electrons in Earth's radiation belts, via both cyclotron and bounce resonant interactions. These investigations help determine the nature of EMIC wave-particle interactions and both the causes and consequences of EMIC waves as they relate to local particle populations in the inner magnetosphere.