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The role of EMIC waves in radiation belt dynamics

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Electromagnetic ion cyclotron (EMIC) waves are believed to be important for influencing the dynamics of relativistic electrons in the outer radiation belt through a Doppler shifted cyclotron resonance, including changes in electron pitch-angle distributions and electron scattering loss into the atmosphere. Theory predicts that regions of enhanced cold dense plasma density embedded in relatively low background magnetic field (such as the outer plasmasphere or plasmaspheric plumes) should aid EMIC wave growth. Also, enhanced plasma density lowers the energy threshold for electrons that can resonantly interact with EMIC waves down to less than 1 MeV and can be potentially important for loss of radiation belt electrons. However, so far there has been limited direct experimental evidence supporting this hypothesis. Our recent observations on the Van Allen Probes in conjunction with numerical modeling of electron pitch-angle distributions showed that EMIC waves do interact with radiation belt electrons, however this interaction is limited to very energetic ($\sim$ several MeV) particles and does not affect the core distribution. Up to this point, the relative importance of EMIC waves in the dynamics of the radiation belts remains unresolved and their properties, especially in the inner magnetosphere need further experimental and theoretical examination. In this talk, we will focus on these Van Allen Probes results and will address outstanding questions related to EMIC wave role in relativistic electron loss in the outer radiation belt.