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Statistical Analysis of EMIC waves and Particle Fluxes using POES and Van Allen Probes

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Electromagnetic ion cyclotron (EMIC) waves are waves generated through cyclotron instability and propagate at frequencies near the ion cyclotron frequency. These waves are frequent during geomagnetic storms and significantly impact the dynamics of particles in the magnetosphere. Wave-particle interaction can lead to the acceleration and scattering of charged particles. Therefore, the presence of these precipitating particles may indicate the presence of EMIC waves. However, other processes are known to also cause precipitation, such as ULF waves.

By examining in situ data during POES and Van Allen Probe conjunctions, characteristics of the plasmasphere, magnetosphere, particle fluxes, and EMIC waves are investigated. We conduct a statistical analysis of particle flux under varying conditional limitations associated with the presence or lack of EMIC waves and geomagnetic storms. We use the two sample Kolmogorov-Smirnov test to check multiple null hypotheses and aim to answer increasingly more complex questions as we test our methods and follow assumptions.

Preliminary results showed a statistical difference between the particle flux observed when there are EMIC waves and when there are no EMIC waves during storm times. We discuss new results, possible implications, and next steps.