A statistical examination of favorable plasma conditions concerning inner magnetosphere EMIC wave excitation

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We examine plasma conditions associated with the excitation of electromagnetic ion cyclotron (EMIC) waves in the inner magnetosphere (L < ~7). Measurements from the Van Allen Probes (r = 1.1 - 5.8 R_e) are used. EMIC wave events were identified from the polarization analysis of high-resolution magnetic field data from the Electric and Magnetic Field Instrument Suite and Integrated Science (EMFISIS) onboard the Van Allen Probes. The time span is from November 2012 to August 2014, which is one complete Van Allen Probes magnetic local time (MLT) precession. Plasma measurements were obtained from the Helium, Oxygen, Proton, Electron (HOPE) instrument. We calculate the observational growth parameter (Σ_h) of the EMIC waves and the theoretical EMIC instability threshold (S_h) to determine if the plasmas are favorable for EMIC wave excitation, i.e., $\Sigma_h - S_h > 0$. Σ_h and S_h are calculated using measurements of the hot (>1 keV) proton anisotropy, parallel hot proton plasma beta, the hot proton density, and the density of electrons. We examine occurrence rates and spatial distributions for the wave-favorable plasma conditions and the ratios of wave vs. non-wave occurrences under these conditions. Plasmas most favorable for EMIC wave generation are primarily observed at the probe apogee (L = ~6). Peak EMIC wave occurrence is found in the afternoon - midnight (1600 - 0100) MLT sectors. This same region coincides with the enhancements of parallel hot proton plasma beta and hot proton density. Hot proton anisotropy measurements peak in the midnight - noon (0 - 1200) MLT sectors.

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