

## Convective Amplification of EMIC Waves From Ring-distribution Protons in the Inner Magnetosphere: Implications for the Van Allen Probes\*

The growth of electromagnetic ion cyclotron waves (EMIC) due to a ring distribution of Hydrogen ions is examined. Though these distributions are more commonly implicated in the generation of equatorial noise, their potential for exciting EMIC waves is considered here. It is shown that since the ring distribution is non-monotonic in perpendicular velocity, the amplification achieved by this instability is greater than bi-Maxwellian distributions for typical anisotropies, because the waves can maintain resonance over a much longer part of its trajectory. For ring speeds ( $V_r$ ) close to the Alfvén speed ( $V_A$ ), the growth rate is maximum at parallel propagation but decreases less rapidly towards oblique angles compared with a bi-Maxwellian. Additionally there can be a second peak approximately at  $(k_{\perp} c / \omega_{pH})(V_r / V_A) \sim 2.3$  for ring speeds about the parallel thermal speed. Strong wave gain is achieved for moderate ring speeds ( $V_r \sim V_A$ ). A ring density to background plasma density of a few percent is sufficient to achieve moderate gain. The gain is also shown to increase with L-shell since the perpendicular wavenumber does not rise as rapidly along the raypath as compared with smaller L. The analysis suggests that EMIC wave activity should be closely associated with equatorial noise.

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