

NUMERICAL MODELING OF CHORUS PROPAGATION AND
CHORUS-DRIVEN PRECIPITATION MICRO-BURSTS

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We obtain realistic wave parameters of individual chorus elements at every point along a specified magnetic field line using a combination of experimental data from the POLAR and CLUSTER satellites, and numerical ray tracing using the Stanford VLF ray tracing code. Following from previous studies, we assume that chorus is generated near the magnetic equatorial plane with the wave normal pointed at the Gendrin angle, and include the effects of Landau damping upon the wave using suprathermal electron distributions from the POLAR/HYDRA instrument. Results of the propagation study show that chorus waves typically propagate to latitudes of $20^\circ - 30^\circ$ before being damped by 10 dB, in agreement with satellite observations that typically show chorus propagating away from the equator. By varying the magnitude of the suprathermal fluxes, we show that chorus waves may be extinguished anywhere from a latitude of 10° for high fluxes, to experiencing a complete magnetospheric reflection for very low fluxes.

We then use the calculated wave characteristics to integrate the non-linear, relativistic equations of motion describing a large number of energetic electrons for gyroresonance modes $m = -5$ to $+5$ resulting in a set of pitch-angle changes describing the scattering of the particles. The set of pitch-angle changes is then combined with typical energetic electron fluxes obtained from the AE8 model to obtain the differential number flux of chorus-driven microburst precipitation. The calculated values are finally cast in a suitable form and compared to experimental observations of chorus-driven microburst events taken aboard the SAMPEX satellite to show good agreement between data and theory.

Abstract Submission Form

2004 National Radio Science
Meeting

Abstract: bortnik15985

Date Received: September 30, 2004

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2. H - Waves in Plasma
3. (a)
4. I - Invited Paper
5. No special instructions