Generation Mechanism of Whistler Mode Chorus Emissions

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Close examination of whistler-mode chorus emissions reveals that
a chorus emission is a coherent monochromatic wave typically with a fast rising tone.
The frequency of the emission increases rapidly along with growth of
the wave amplitude. We first consider the generation mechanism of
whistler-mode chorus emissions. The essential mechanism of
the frequency change is critically related to the inhomogeneity of
the geomagnetic field in the equatorial region. The rising tone emission
is only possible when the coherent wave propagates away from the equator
interacting with a sufficient flux of counter-streaming resonant electrons.
Depletion of the resonant trapped electrons from the wave phase space
results in formation of an electromagnetic electron hole, which give rise
to a transverse resonant current causing both wave growth
and frequency increase.
The wave growth of a rising tone can elongate the nonlinear trapping zone,
which works as an effective wave train that guides a fraction of the resonant
electrons moving toward the equator.
We will present a recent simulation result varifying the generation mechanism.