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Whistler-mode chorus enhancements and anisotropic electrons in the Jovian inner magnetosphere

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We reveal a close relationship between enhancements of whistler-mode chorus and development of energetic electron anisotropies in the Jovian inner magnetosphere by conducting a statistical survey of both wave and particle observations of the Galileo spacecraft. We studied the spatial distribution of intense chorus emissions in the Jovian magnetosphere and identified 104 chorus enhancements by analyzing plasma wave data in the frequency range from 5.6 Hz to 20 kHz obtained from the entire Galileo mission in the inner Jovian magnetosphere during the time period from December 1995 to September 2003. Enhanced chorus emissions with integrated wave power over 10ˆ-9 (V/m)ˆ2 were observed around the magnetic equator in the radial distance range from 6 to 13 R_J. A survey of energetic particle data in the energy range of 29 to 42 keV reveals that all of the identified chorus events were observed in the region of pancake pitch angle distributions of energetic electrons. Using empirical plasma and magnetic field models, we estimate that the ratio of the electron plasma frequency to the electron cyclotron frequency in this region is in the range from 1 to 10 which is suitable for efficient whistler-mode wave generation. The present study reveal the statistically significant correspondence between intense chorus and flux enhancement of energetic electrons having pancake pitch angle distributions in the Jovian magnetosphere.

Keywords: Jovian inner magnetosphere, whistler-mode waves, energetic electrons, Galileo observations