Causal Relationship between Relativistic Electron Acceleration and Microbursts depend on Magnetic Latitude of Whistler Chorus

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We investigate flux enhancement and atmospheric precipitation of relativistic electrons associated with whistler chorus elements propagating along a magnetic field line, by using GEMSIS-RBW simulation code (RBW). The RBW is a test-particle code solving bounce motion of electrons along a field line, parallel propagating whistler chorus, and wave-particle interactions by using the equation of motion. The RBW simulation can calculate scattering processes, not only diffusion process but also nonlinear scattering processes such as phase bunching and phase trapping in coherent whistler chorus. Especially the phase trapping process accelerates electrons from a few hundred keV to a few MeV in a short time scale which is of the order of a second.

By using the RBW simulations we compare simulation results with observations which have discussed in Kurita et al.(GRL 2015). They found that whistler chorus waves responsible for flux enhancement of relativistic electrons involves relativistic electron microbursts simultaneously. Microbursts are a good proxy to indicate that whistler chorus activity actually causes significant variations of relativistic electrons. Our simulations demonstrate that both the relativistic electron flux and relativistic electron precipitation into the atmosphere are more enhanced as the whistler chorus waves propagate more away from the equator. We will discuss dependency of latitude of the whistler chorus on the flux enhancement and precipitation of relativistic electrons.

[1] Kurita, S., Y. Miyoshi, J. B. Blake, G. D. Reeves, and C. A. Kletzing (2016), Relativistic electron microbursts and variations in trapped MeV electron fluxes during the 8-9 October 2012 storm: SAMPEX and Van Allen Probes observations, Geophys. Res. Lett., 43, 3017-3025, doi:10.1002/2016GL068260.