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Investigation of the day-night asymmetry of whistler-mode chorus distributions with observations from the THEMIS spacecraft

Wen Li (1), Richard Thorne (1), Jacob Bortnik (1), Yukitoshi Nishimura (1,2), and Vassilis Angelopoulos (3)

(1) Atmospheric and Oceanic Sciences, University of California, Los Angeles, Los Angeles, United States (moonli@atmos.ucla.edu), (2) Solar-Terrestrial Environment Laboratory, Nagoya University, Nagoya, Japan., (3) Earth and Space Sciences, University of California, Los Angeles, Los Angeles, United States

Whistler-mode chorus waves are receiving increased scientific attention due to their important roles in both acceleration and loss processes of radiation belt electrons. A global survey of whistler-mode chorus waves is performed using filter bank data of wave magnetic field from the THEMIS spacecraft with 5 probes in near-equatorial orbits. Our results confirm earlier analyses of strong dependence of wave amplitudes on geomagnetic activity, confinement of nightside emissions to lower magnetic latitudes, and extension of dayside emissions to higher latitudes. An important new finding is the higher occurrence rate of chorus on the dayside at $7< L <9$, compared to the confinement within 8 R_E on the nightside with the lower occurrence rate, showing strong day-night asymmetry of the chorus distribution. A statistical survey of electron distributions (0.5-100 keV) near the equatorial plane is also performed using data obtained from the ESA instrument onboard the THEMIS spacecraft in order to investigate optimum conditions for the whistler-mode chorus excitation. On the nightside, large electron anisotropies and intense chorus emissions indicate remarkable consistency with the confinement within 8 R_E, which is also highly dependent on the magnetic activity thus resulting in lower occurrence rates. Furthermore, as injected plasma sheet electrons drift from the midnight through dawn toward the noon sector, their anisotropy generally increases and peaks at $7< L <9$ on the dayside, due to combined effects of drift-shell splitting and scattering by waves, thus leading to higher occurrence rates on the dayside. In order to further understand the day-night asymmetry of chorus distribution, by using THEMIS burst data, we also investigate wave polarization properties, including wave normal angles and Poynting fluxes, which would determine whether chorus waves propagate away from or toward the equator. The investigation of several factors responsible for day-night asymmetry of chorus distributions will provide a major advance in understanding characteristics and generation of dayside and nightside chorus waves.