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Dayside chorus waves under quiet solar wind conditions: PENGUIn/AGO and THEMIS conjugate observations

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桂華 邦裕 [1*], Louis J. Lanzerotti[1], 三好 由純 [2], Maria Spasojevic[3], Vassilis Angelopoulos[4], Andrew J. Gerrard[1], Jeongwoo Lee[1], Kyungguk Min[1], Jacob Bortnik[5], Wen Li[5], 西村 幸敏 [5]
Kunihiro Keika[1*], Louis J. Lanzerotti[1], Yoshizumi Miyoshi[2], Maria Spasojevic[3], Vassilis Angelopoulos[4], Andrew J. Gerrard[1], Jeongwoo Lee[1], Kyungguk Min[1], Jacob Bortnik[5], Wen Li[5], Yukitoshi Nishimura[5]

[1] ニュージャージー工科大学, [2] 名古屋大学太陽地球環境研究所, [3] スタンフォード大学, [4] カリフォルニア大学ロサンゼルス校, [5] カリフォルニア大学ロサンゼルス校
[1]New Jersey Institute of Technology, [2]STEL, Nagoya Univ., [3]Stanford Univ., [4]IGPP, UCLA, [5]DAOS, UCLA

We study simultaneous observations of chorus waves in the magnetosphere and VLF waves in Antarctica on the dayside at high L-shells (L>7) under quiet solar wind conditions, using in-situ observations by THEMIS and ground-based VLF observations at automatic geophysical observatories (AGO) in Antarctica in the PENGUIn project. The scientific goal of this research is to identify where in magnetic latitude (MLAT), magnetic local time (MLT), and radial distance (or L-value) quiet-time dayside chorus waves can be preferably generated.

On 26 July 2008, the VLF receiver at the AGO P2 station (AP2: MLAT = -76.6 deg.) detected the intensification of VLF signals at the frequency range of 0.5-1.0 kHz between ~1400 and ~1700 UT. At the AGO P3 station (AP3: MLAT = -83.63 deg.), VLF signals increased at the 0.5?1.0 kHz frequency range between ~1400 and ~1800 UT; the increase rate was smaller than at AP2. The fluxgate magnetometer data confirmed that AP2 and AP3 were equatorward of the open-closed boundary.
During these intervals, THEMIS A, D, and E traveled in an outbound path at L = 7-10 and MLT = 11.5?13h. Both THEMIS A and D were magnetically conjugated to AP2 between ~1600 and ~1700 UT and to AP3 between ~1430 and ~1530 UT. THEMIS E was conjugated to AP2 between ~1530 and ~1630 UT. THEMIS A registered wave intensification at the frequency of 0.3 to 0.4 fce between ~1330 and ~1600 UT, where fce is the local electron gyrofrequency. THEMIS A wave burst data available during two intervals at ~14UT confirm that the waves were circularly right-handed polarized. Filter bank data from THEMIS D and E show wave intensification in the 287-1240 Hz band at ~1230 - ~1530 UT and ~1430 - ~1630 UT, respectively.

Using the above-mentioned conjugate observations, we examine spatial distributions of chorus wave power and properties with respect to L and MLT. Our preliminary results imply that chorus wave power was more enhanced around noon than the dawn and dusk sides. We discuss what process(es) can explain such non-uniform wave power distributions under quiet solar wind conditions resulting in steady-state magnetospheric conditions, by simulating motion of energetic electrons in realistic 3D magnetic field and global convection electric field models. The simulation will also enable us to examine where in MLAT chorus waves are preferably generated.

Keywords: dayside chorus, conjugate observations, THEMIS, Antarctic research