ELF/VLF wave generation associated with magnetospheric compression: conjugated observations from satellite- and subauroral ground-based instruments.

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On February 2012, during the VLF-CHAIN campaign a VLF loop antenna was installed at the Athabasca University Geophysical Observatory in Alberta, Canada. The receiver, located at subauroral latitudes (ATH, 54.7N, 246.7E, L=4.3), has continuously monitored ELF/VLF emissions since September 2012. We found a rare conjugate event of ELF/VLF waves between ATH and the RBSP-B satellite, which was associated with strong magnetic compression.
On December 23, 2014 at 11:17 UT (03:17 MLT), both ATH and RBSP-B observed a chorus-like burst centered at ~2.5 kHz showing discrete elements and lasting approximately 3 minutes. This emission was observed 2 to 3 minutes after an intense sudden commencement (SYM-H amplitude ~63 nT) caused by the enhancement of solar wind speed (~330 to ~420 km/s) and dynamic pressure (~2 to 6 nPa) during northward IMF. The increasing magnetic field on the dayside, caused by the compression of the magnetosphere, lead to betatron acceleration of plasma-sheet electrons and thus enhancement of the temperature anisotropy. This anisotropy regulates electron cyclotron instability and in turn, generates whistler-mode plasma waves.
We use survey and burst mode electric and magnetic field data from RBSP-B, combined with electron fluxes and density, to discuss the characteristics of the waves. We found that wave vectors are highly oblique and frequency dependent (lower k-vector with higher frequencies). We also found that the Poynting vector was anti-parallel to the field line, directed southwards, away from the magnetic equator. Even though this emission was associated with a slight increase of the electron fluxes between 75 to 743 keV (due to the adiabatic compression), it did not cause local relativistic electron acceleration.
All-sky and horizon imagers located at ATH allow investigation of the relationship of the compression with auroras.

Keywords: ELF/VLF, magnetospheric compression, conjugate event, subauroral latitudes

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