Development of the automatic observation system for VLF/ELF waves at subauroral latitudes

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One of the mechanisms of pulsating aurora is that VLF/ELF waves generated around magnetic equator modulate particle precipitation through wave-particle interaction. In this model, correlations between pulsating auroras and VLF/ELF waves observed at ground are expected. Indeed, examples of such good correlations were reported before (Tsuruda et al., 1981).

In those days, however, all data were in analog recordings. It was difficult to analyze the frequency characteristics and wave forms in detail. Thus, we made a campaign observation of high-time resolution measurements of auroras and VLF/ELF waves at Athabasca (54.72N, 246.69E, MLAT=61.3) and Fort Vermillion (58.38N, 243.99E, MLAT=64.5), using two loop antennas and several auroral cameras for February 16-26, 2012.

The amount of VLF/ELF wave data obtained from this campaign is enormous, because the sampling rate of the wave data is 100kHz. The purpose of this study is to develop automatic software to visualize the wave characteristics. We put instrument name, date, time, sampling frequency, number of channels and site name into the name of data files. We visualize the data as high-resolution dynamic spectra to find interesting events. These procedures are automated using Linux shell commands. In this presentation we will show these procedures and preliminary results obtained from this campaign at subauroral latitudes.

Keywords: subauroral latitudes, pulsating aurora, VLF wave, ELF wave, automatic observation system, high-time resolution