OBSERVATIONS OF VARIATIONS IN SIGNAL STRENGTH OF COSMIC RADIO NOISE FROM SOUTHERN AND NORTHERN HEMISPHERES

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ABSTRACT
It highlights the latitudinal and longitudinal variations in the signal strength of cosmic radio noise with ten different riometer stations. Ionospheric D-region absorption of cosmic radio noise by riometer is a signal loss relative to the QDC. According to corrected geomagnetic coordinates, all ten stations are divided in the Polar, sub auroral and mid latitude stations in both hemispheres. The cosmic noise detected by riometers shows seasonal variability. Therefore, study of QDC is important for the study of cosmic noise absorption (CNA) relative to the power of cosmic noise signal received under quiet ionospheric conditions. In the present study, we made average of 5 days per month, with $\Sigma Kp \leq 3$. In this chapter, we have studied the variation in the maximum, minimum, range of signal strength. Time interval between maximum and minimum signal strength are also mentioned.

Keywords: Riometer, Quiet Day Curve, Ionosphere etc.

Introduction

The Quite Day Curve (QDC) pattern of cosmic noise power is a function of sidereal time [1]. Our Milky Way galaxy is the main source of it. Kraus [2] reported that, the solar noise at frequencies around 30 MHz during the times of high solar activity, such as near the maximum of the solar cycle, generally much greater than at solar minimum. This can make a significant difference to the quiet day curves.

A QDC fixed for particular period of time [3]. Heisler R. and Howler G. L. [4], Lusignan [5], and Mitra A. P. Shain C. A. [6] suggested that at for QDC is different for different senons. The seasonal variability due to magnetic disturbances or may be due to the solar activities. So, study of QDC plays important role in ionospheric physics. QDC obtained with different methodologies by various authors [2-4, 6-13]. latitudinal features of absorption excursion observed by M. Lunetta et al. [14].

Various methods are available for study of QDC. In present paper, we have reported the latitudinal and longitudinal variation of QDC of different ten stations of northern and southern hemisphere. Up to our knowledge, this will be first report. signal strength according to Kp index [15-16] here we used data only (Kp ≤ 3). If burst

Sr. No.	Station Name	Geomagnetic Latitude Corrected Geomagnetic Coordinates (CGM)	Geomagnetic Longitude Corrected Geomagnetic Coordinates (CGM)	Region	Location
1	Mawson, Antarctica	70.39° S	90.80° E	Polar latitude	Southern hemisphere
2	Davis, Antarctica	74.72° S	101.03° E		
3	Casey, Antarctica	80.63° S	158.40° E		
4	Dawson, Canada	58.48° N	209.43° W	Sub auroral latitude	Northern hemisphere
5	Fort Simpson, Canada	56.71° N	194.04° W		
6	Fort Smith, Canada	55.33° N	185.34° W		
7	Rabbit Lake, Canada	53.82° N	177.20° W	Mid latitude	
8	Pinawa, Canada	45.87° N	169.32° W		
9	Abisko, Sweden	65.43° N	101.14° E	auroral latitude	
10	Ivalo, Finland	65.28° N	108.07° E		

occurred a peak is observed in QDC pattern [17]. The present paper reports the signatures of seven northern riometer stations and three southern stations.

Table 1 List of riometers whose data is used for this paper

Data Acquisition and Analysis

All riometers operates on 30 MHz. Table 1 indicates riometer stations with latitudinal and longitudinal variations. Riometer is very sensitive noise-measuring device [18].In this paper we have taken 3 days with $\Sigma Kp \leq 3$ for the years 2009 (of NORSTAR riometer), 2010 (of SGO riometer) and 2011(of Australian Antarctic riometer). 5 days average taken for each month. Table 1 gives latitude and longitude information. Figure 1 and 2 represents the monthly geomagnetic variations of cosmic radio noise with latitudinal and longitudinal variations, QDC over selected ten stations from northern to southern hemisphere, respectively. The gap in the month of September (figure 3.1) at NORSTAR riometers is due to unavailability of data sets.

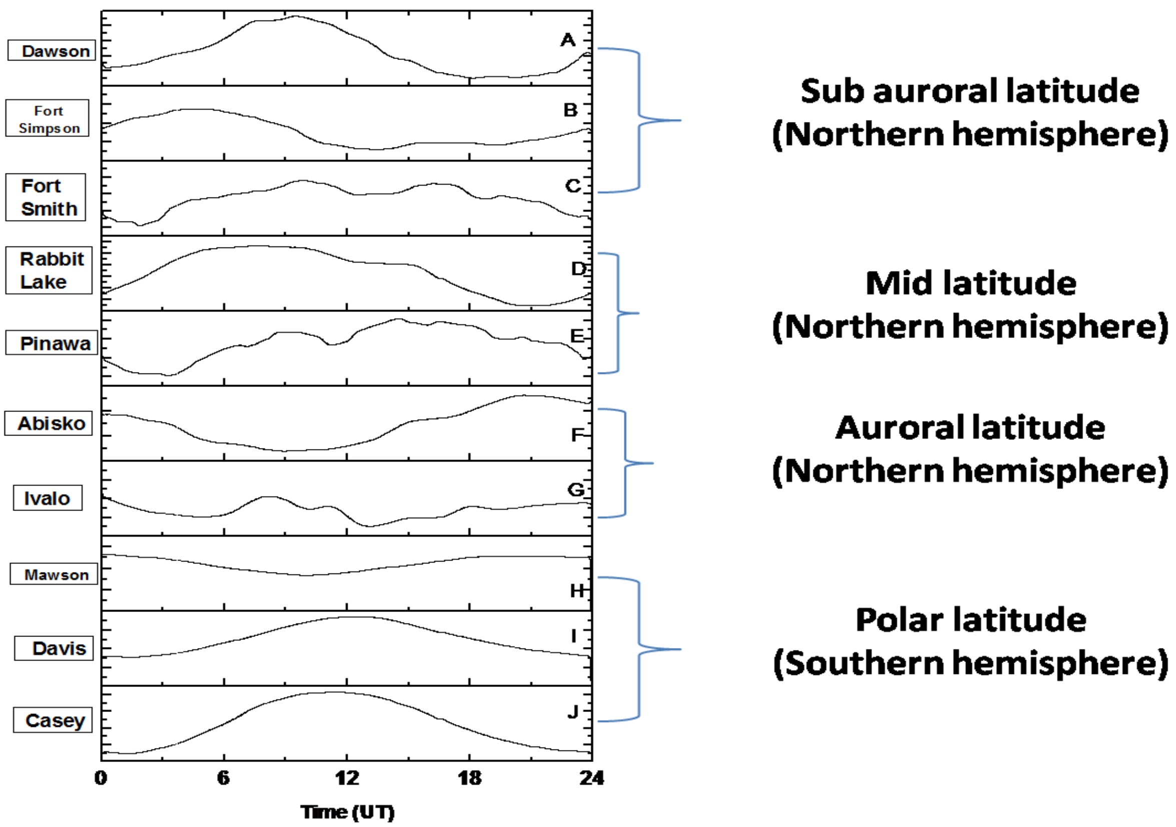
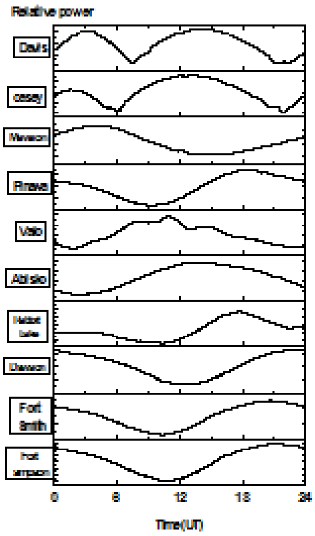
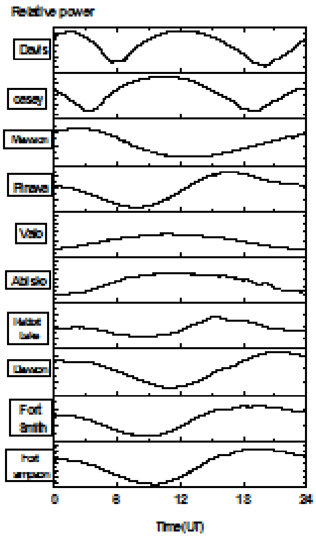


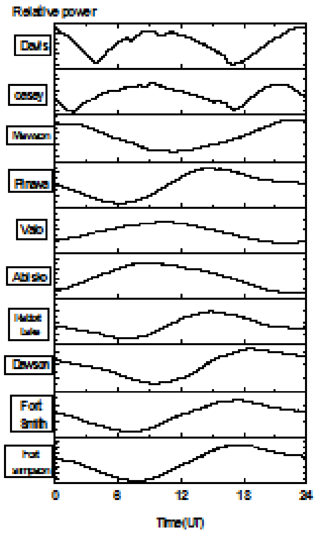
Figure 01 Variation of cosmic radio noise signal pattern of ten northern (7 stations) and southern (3 stations) hemispheres



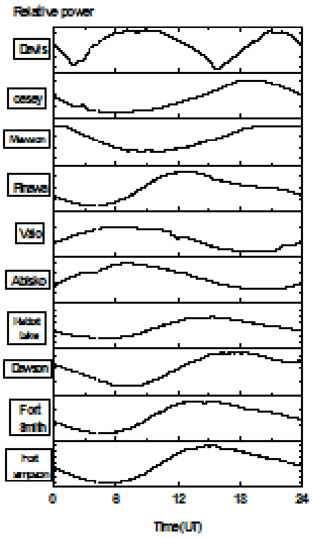
January



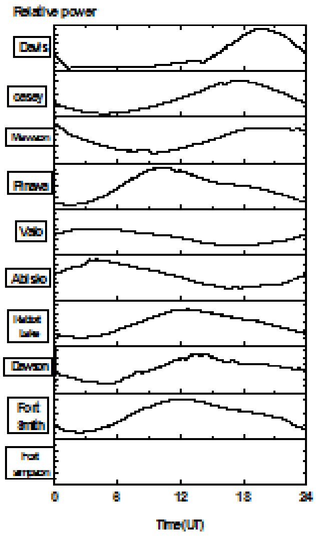
February



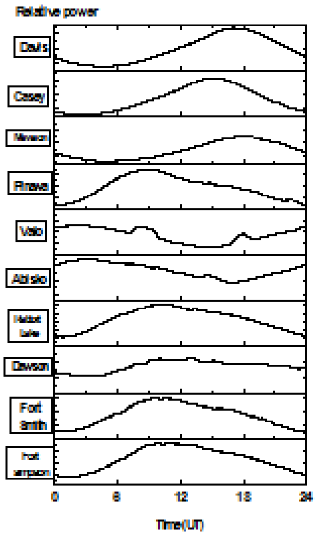
March



April



May



June

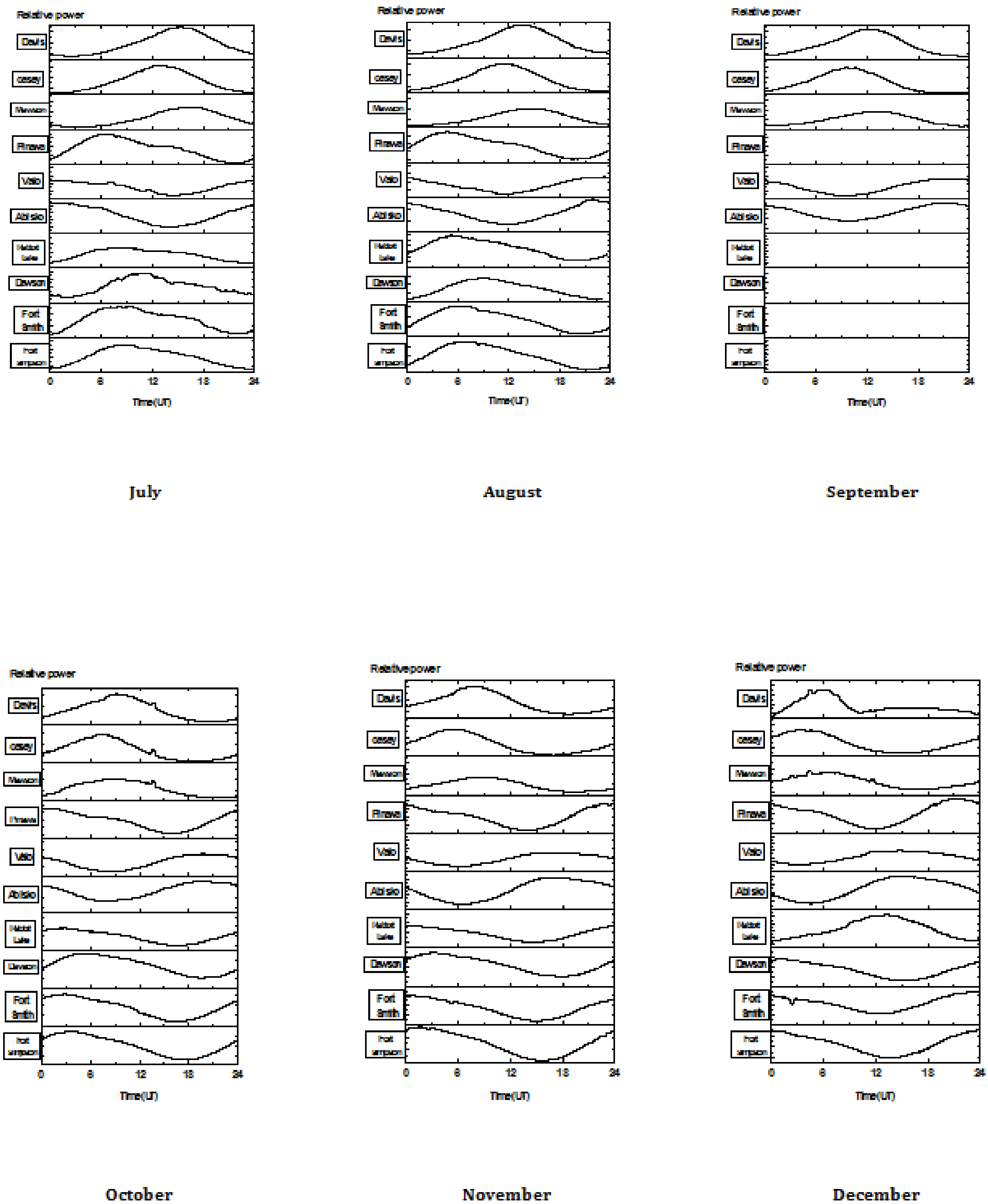


Figure 02 Latitudinal (Geom.) variations in the QDC of cosmic radio noise recorded in southern and northern hemisphere.

Result and Discussion:

It is clear from the plot that during November, December and January, Mawson suffering from maximum sunshine this illuminated by solar UV throughout the day, whereas during May, June and July it suffering from maximum darkness indicating that the ionosphere over Mawson does not receive any solar UV radiation. During the months February, March, April and August, September, October Ivalo station experiences local sunrise and sunsets (Figure 2).

3.7 Conclusions

In polar latitudinal stations Davis and Mawson, the alteration observed in the monthly plot of maximum signal value. Mostly it is observed in winter season, whereas, monthly plot of minimum value of the signal showed similar patterns at that particular time interval. The latitudinal variation in pattern of QDC of cosmic radio noise in southern and northern hemispheres, itself, will explain the idea related to the nature of the curve before actual installation of riometer. Data of few days, after the installation, will give idea about the successful rometer installation.

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