Journal of Research and Review in Science Vol 2, November 2001. pp. 46-47

DIURNAL INFLUENCE OF SEASONING VARIATION OF DAYTIME FO F2 DURING MINIMUM AND MAXIMUM SOLAR ACTIVITY

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ABSTRACT

The seasonal variation of the daytime f_0f_2 is investigated to verify its diurnal dependence during different epochs of the solar cycle. The results of the harmonic analysis carried out show that the daytime f_0f_2 is predominantly semi annual for the hours of the day considered during both maximum and minimum solar activity.

1.0 INTRODUCTION

In an earlier paper (Somoye, 1998), it was reported that the seasonal variation of f_0E showed diurnal dependence during maximum solar activity (1995) as different harmonic components predominated at 0900 hours, 1200 hours, 1500 hours and 1800 hours. During the minimum solar activity of 1964 however, the semi – annual component was found to predominate at all these hours indicating lack of diurnal dependence of f_0E seasonal variation during minimum solar activity. It is desirable to know if daytime foF_2 behaves like f_0E during both maximum and minimum solar activity.

2.0 SOURCE OF DATA AND METHOD OF ANALYSIS

The f_0E median values of November 1957 to October 1958 (at 1200, 1500 and 1800 hours) used for the period of maximum solar activity and the f_0F_2 median values of November 1963 to October 1964 (at 1200, 1500 and 1800 hours) used for the period of minimum solar activity are collected from the ionospheric observatory at Ibadan

The median values of f_0F_2 are used since it has been found (Somoye, 1984) that there is no significant difference between the median values and the means of f_0F_2. The median values are readily available in the ionospheric bulletins.

Harmonic analyses are performed on the median values of f_0F_2 at 1200hours, 1500 hours and 1800 hours for the months of November 1957 to October 1958 and for the months of November 1963 to October 1964. The results are shown in the table below.

3.0 RESULTS AND DISCUSSION

The table of results shows that the semi – annual components is predominant during both periods of solar activity at all the hours considered. This result may seem to show that f_0F_2 annual variation consists of two seasons since 4 – monthly harmonic components and the 3 – monthly harmonic component are much smaller than the semi annual component. A predominant 4 – monthly harmonic components would have properly suggested the similarity of the equinoxes and the dissimilarity of the solstices, which are actually expected to be dissimilar except for places that are very much near the equator. This would represent the division of the year into seasons by Bandyopadhay and Montes (1963). The predominance of the 3 – monthly harmonic component would have shown the dissimilarity of the equinoxes as well as that of the solstices since that result will indicate four difference seasons. This would have made the division of the year into season by Ojbuehi and Onwumechili (1964) correct.

The similarity of the solstices and of the equinoxes as the case may be are necessary for seasonality of f_0F_2 annual variation. The similarity will reveal the predominance of the semi – annual component while the dissimilarity will reveal the [illegible] monthly harmonic component as being predominant.

TABLE

1957/58				1963/64		
	1200 HRS	1500HRS	1800 HRS	1200 HRS	1500HRS	1800 HRS
Annual Component Amplitude (MHz)	0.31	0.79	0.33	0.22	0.37	0.71
Phase (°)	- 65.43	- 68.1	- 5.27	35.8	- 21.9	33.9
Semi - Annual Component Amplitude (MHz)	0.94	0.80	0.48	0.51	1.13	1.32
Phase (°)	54.9	80	- 83.0	23.0	53.2	- 21.3
4 - months Component Amplitude (MHz)	0.36	0.18	0.17	0.10	0.14	0.36
Phase (°)	74.0	- 84.8	- 61.0	58.9	21.04	- 40.8
3 - months Component Amplitude (MHz)	0.14	0.10	0.20	0.34	0.08	0.30
Phase (°)	- 48.2	85.3	- 47.4	42.6	12.0	- 34.0

A correlation analysis carried out indicates the similarity of the solstices and that of the equinoxes at the Ibadan station during 1957/58, the average correlation coefficient being 0.67 for the solstices and 0.69 for the equinoxes. This is perhaps due to the fact that the Ibadan station is in the neighbourhood of the magnetic equator being 3.0 south of the magnetic equator.

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