VARIABILITY PARAMETERS FOR FOF2 AT EQUATORIAL LATITUDES

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Abstract:

This paper presents a study of the parameters implemented to characterize the variability of the equatorial ionosphere. It covers six years of high, moderate and low solar activity epoch at two equatorial stations next to the magnetic equator.
The result shows that, the foF2 density function is almost closed to a normal distribution that is some time flattens out with increases solar activity. The mean and median difference is about few percentage of the mean. Regardless the solar epoch, only few values are out of the range -4 to +4% mainly observed at nighttime. The lower deciles and quartiles to median ration show higher value during daytime and lower value for the nighttime hours. The contrary is observed with the upper deciles and quartiles ratio to median. The decile to median ration agrees well with the ITU variability index model during the daytime and differs from the night time values.

1. Introduction

There were a quite number of studies that have proved the performance and abilities of the International Reference Ionosphere (IRI) used to reproduce the characteristics of the ionosphere at specified location and time. However, due to the lake of data availability in the African continent, on which the IRI model is based, there still remain shortcomings in the model result for the African sector. It is well known that, the ionosphere is subject to a huge variation of wide range of times scale, and from hours to year as well as for solar epoch. Variability is then a key parameter of the ionosphere that is not currently incorporated in the IRI. This paper presents the studier of variability parameters based on seasonal foF2 deduced from the routinely scaled ionograms.

2. Data used and method of analysis

Ionosonde data from Korhogo (dip .67 S) in Cote-d’Ivoire and Ouagadougou (dip 5.9N) in Burkina Faso two equatorial stations are used for the present study. The seasonal effects are investigated by using data from three months defined as follow. March Equinox is represented by February, March, and April. June solstice by May, June and July. September equinox by August, September and October. December solstice for November, December and January. The years covered by this study and the seasonal sum of Ap index are given in table 1. Due to the difficulties to have data from the same years for both stations, we have selected years of comparable solar activity in both station. The foF2’s are routinely scaled parameter. This study covers three epochs of solar activity that are high, moderate and low. From table 1, we observed that the June solstice 1991 and 2000 are the most active season for Ouagadougou and Korhogo respectively. Meanwhile, June solstice 1985 and December solstice 1995 are the less active seasons for Ouagadougou and Korhogo respectively. It is important to noticed that, for all season, we have remove all

Following Kouris and Fotiadis (2002), Fotiadis et al, (2004) who used the median (X50), the upper/lower quartiles (X25, X75) and/or deciles (X10, X90) to represent the monthly data scattering, we have defined the variability parameters who will be used as variability index as follows

R1 = (Xm-X50)/X50

R2 = X25/X50

R3 = X10/X50

R4 = X75/X50

R5 = X90/X50

R6 = ((X50-X25)-(X75-X50))/X50 where Xm is the mean

It’s important to note that for the seasonal we have exclude the number of available value data less than 20 per hour.