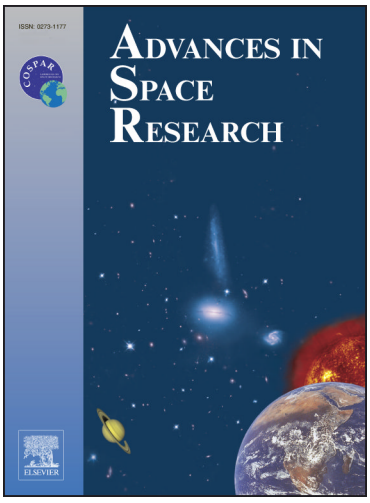

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B.W. Joshua, J.O. Adeniyi, O.A. Oladipo, P.H. Doherty, I.A. Adimula, A.O. Olawepo, S.J. Adebiyi

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Simultaneous response of NmF2 and GPS-TEC to storm events at Ilorin

[1]B. W. Joshua, [2]J. O. Adeniyi, [3]O. A. Oladipo, [4]P. H. Doherty, [3]I. A. Adimula, [3]A. O. Olawepo, [2]S. J. Adebiyi

[1]Department of Physics, Kebbi State University of Science and Technology Aliero, Kebbi State, Nigeria
[2]Department of Industrial Physics, Landmark University, Omu-Aran, Kwara State, Nigeria
[3]Department of Physics, University of Ilorin, Ilorin, Nigeria
[4]Institute for Scientific Research, Boston College

Corresponding Author: B. W. Joshua, Email: benjaminjoshua7@gmail.com, Tel: +234 0806 2427276

Abstract

A comparative study of both TEC and NmF2 variations during quiet and disturbed conditions has been investigated using simultaneous measurements from dual frequency Global Positioning System (GPS) receiver and a DPS-4 Digisonde co-located at Ilorin (Geog. Lat. 8.50^{o} N, Long. 4.50^{o} E, dip. – 7.9^{o}). The results of the quiet time variations of the two parameters show some similarities as well as differences in their structures. The values of both parameters generally increase during the sunrise period attaining a peak around the noon and then decaying towards the night time. The onset time of the sunrise growth is observed to be earlier in TEC than in NmF2. The rate of decay of TEC was observed to be faster than that of the NmF2 in most cases. Also, the noon 'bite-outs', leading to the formation of pre-noon and post-noon peaks, are prominent in the NmF2 structure and was hardly noticed in TEC. Results of the variations of both TEC and NmF2 during the 5 April, 10 May and 3 August 2010 geomagnetic storm events showed a simultaneous deviations of both parameters from the quiet time behavior. The magnitude of the deviations is however most pronounced in NmF2 structure than in TEC. We also found that the enhancement observed in the two parameters during the storm events generally corresponds to decrease in hmF2.

Key words: Ionosphere; Geomagnetic storm; Electron density; Total Electron Content; Digisonde

1. Introduction

Space weather effect on the earth's environment has attracted great attention in the scientific community over the past decades and is still highly pertinent in modern ionospheric research. Among the space weather subjects of research, geomagnetic storm has been of great interest to space scientists and its many effects on space and ground-based technologies have been reported in various papers (Onwumechili *et al.,* 1973; Rishbeth, 1977; Adeniyi, 1986; Mikhailov *et al.,* 1994; Sobral *et al.,* 2001; Fejer, 2002; Sastri *et al.,* 2002; Tsurutani *et al.,* 2004; Liu *et al.,* 2008; Sharma *et al.,* 2012; Joshua, *et al.,* 2014 etc). The response of the ionosphere to geomagnetic induced disturbance, known as ionospheric storm, has very complicated spatial and temporal behavior. This is because during geomagnetic storms, the mechanisms which control the ionospheric electron distribution at different locations change in different ways over a period of time and as a result modify the electron density in the ionosphere. In order to understand the ionospheric behavior during such events, special attention has been paid to the deviation of some ionospheric parameters, particularly the F2 layer peak parameters and the total