

Accepted Manuscript

Low Latitude Ionospheric TEC Responses to Dynamical Complexity Quantifiers during Transient Events over Nigeria.

Ogunsua Babalola

PII: S0273-1177(17)30626-9
DOI: <http://dx.doi.org/10.1016/j.asr.2017.08.031>
Reference: JASR 13387

To appear in: *Advances in Space Research*

Received Date: 25 January 2017
Revised Date: 18 August 2017
Accepted Date: 26 August 2017



Please cite this article as: Babalola, O., Low Latitude Ionospheric TEC Responses to Dynamical Complexity Quantifiers during Transient Events over Nigeria., *Advances in Space Research* (2017), doi: <http://dx.doi.org/10.1016/j.asr.2017.08.031>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Low Latitude Ionospheric TEC Responses to Dynamical Complexity Quantifiers during Transient Events over Nigeria.

Ogunsua Babalola¹

¹Space Research Laboratory, Department of Physics, Federal University of Technology, Akure, Nigeria.

ABSTRACT

In this study, the values of chaoticity and dynamical complexity parameters for some selected storm periods in the year 2011 and 2012 have been computed. This was done using detrended TEC data sets measured from Birnin-Kebbi, Torro and Enugu global positioning system (GPS) receiver stations in Nigeria. It was observed that the significance of difference (SD) values were mostly greater than 1.96 but surprisingly lower than 1.96 in September 29, 2011. The values of the computed SD were also found to be reduced in most cases just after the geomagnetic storm with immediate recovery a day after the main phase of the storm while the values of Lyapunov exponent and Tsallis entropy remains reduced due to the influence of geomagnetic storms. It was also observed that the value of Lyapunov exponent and Tsallis entropy reveals similar variation pattern during storm period in most cases. Also recorded surprisingly were lower values of these dynamical quantifiers during the solar flare event of August 8th and 9th of the year 2011. The possible mechanisms responsible for these observations were further discussed in this work. However, our observations show that the ionospheric effects of some other possible transient events other than geomagnetic storms can also be revealed by the variation of chaoticity and dynamical complexity.

Key words: Chaos; Dynamical Complexity; Transient events; Ionosphere.

1.0 Introduction

The time series can represent the measurement of the processes and dynamics of natural systems. In most cases it reveals the nonlinear nature of the system. Most of these processes can best be studied using the nonlinear approach (Hegar *et al.*, 1999; Unnikrishnan, 2010 and Ogunsua *et al.*, 2014). The natural system in itself being unique requires a real test of nonlinearity to show the true nonlinearity of its processes and dynamics. This is based on the established understanding that most systems are mainly not totally deterministic but has interplay between determinism and stochasticity, as in the case of the ionosphere (Hegar *et al.*, 1999; Unnikrishnan, 2010). It is therefore of great importance to measure the degree of the systems dynamical reactions to stochastic influences.

Corresponding Author: iobogunsua@futa.edu.ng

Phone number: +2347030342010

Download English Version:

<https://daneshyari.com/en/article/8132101>

Download Persian Version:

<https://daneshyari.com/article/8132101>

[Daneshyari.com](https://daneshyari.com)