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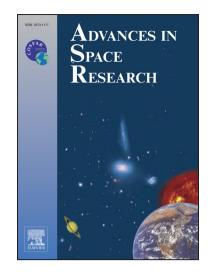
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## **ACCEPTED MANUSCRIPT**

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

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#### **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 8<sup>th</sup> and 9<sup>th</sup> 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.

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