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Interactive comment on “The transient variation of the complexes of the low latitude ionosphere within the equatorial ionization anomaly region of Nigeria” by A. B. Rabiou et al.

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1. ANONYMOUS REFEREES COMMENT

Dear Editor, I have reviewed the discussion paper “The transient variation of the complexes of the low latitude ionosphere within the equatorial ionization anomaly region of Nigeria” by Rabiou et al. submitted for possible publication in Nonlinear Processes in Geophysics (NPG) and found it unacceptable for publication in NPG. The paper studies using Lyapunov exponents and Tsallis entropy the day to day variations in 2011 of the chaoticity and dynamical complexity of the ionosphere over Nigeria. My major concern is that there is a very high degree of similarity with their previous work recently

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published in NPG (Ogunsua et al., 2014) that studied using the same methodology and techniques the chaoticity and dynamical complexity (as before) of the ionosphere over the same region during quiet and disturbed days of the same year (the similarity report of the present paper resulted in a similarity index of 52% with just one source, i.e., their previous NPG work!). There is nowhere apparent in the paper (abstract, discussion, conclusions) the differences or the improvements from their previous publication in the same journal (apart the fact that in 2011 they used 3 stations and now 5 and they now deal with the day to day variation instead of quiet and disturbed days that they considered before). For instance, I have found around 10 references in the text to be missing from the References' list that I was able to find in the paper by Ogunsua et al. (2014)! Another major issue to me concerns their time series analysis using the Tsallis entropy. I was unable to find the Tsallis q index value they used to calculate the corresponding entropy. My guess is that they have used the q value of 2 indicated by Anastasiadis et al. (2005). However, in the references they have cited there is a methodology to infer an optimum q value for the problem in hand. Even that would have been some improvement from their previous published work but it is missing.

2. AUTHORS RESPONSE

In response to the Anonymous Referees report #3 we appreciate his/her efforts to understand what the Authors of the paper are presenting. This report responds to the issues raised by the referees which include (1) The appearance of similarity between the new paper and Ogunsua et al., (2014) (2) The optimum value of Tsallis entropy q index used in this work. (3) The error in references, which involves the references found in Ogunsua et al. (2014) that were not included in the new paper. We respond by saying that the understanding shown by the writer of the referees report #3 is not in line with the focus of the work. The Authors will like to react to the fact that the paper appearing to be similar to the previous one, is important for the research at hand based on the fact that the findings in this paper is a follow up to the research from the previous paper. However the research concepts and focus are totally different.

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The previous paper considered different geographical conditions by looking at the 5 international most quiet day and international most disturbed day classification while in this case the day to day variations are being considered which help understand the ionospheric response in quiet, relatively disturbed and storm. Here we'll use this opportunity to show that the day to day variation is not the same as the most quiet and most disturbed day classification as they can be applied to test and reveal different things in the variation of the upper atmosphere. This day-to-day variations have been found to reveal majorly different things that were not revealed in the previous paper, these include the wavelike patterns revealing troughs during equinoxes resulting from effects of solar activities on the ionosphere in the entire year, it was pointed out that this drop in values at equinoxes are based on self organization phenomenon (SOC) that could occur in the upper as described by (Consolini, Chang et al.). Although the part of the methodology that is concerned, with computation of the nonlinear parameters might be similar It does not mean that the focus of the paper is the same. We cannot change the nonlinear analysis techniques. After the nonlinear analysis were carried out the results were further analyzed to show some clarity in the ionospheric response in terms of the variations of this parameter. The results in this present work differs completely form the previous work as it does not only revealed the unstable day to day transient variation of the chaoticity and dynamical complexity of the ionosphere but it also shows a seasonal trend of variation the even requires more studies. Therefore final assessment of result is different in this paper compared to Ogunsua et al. (2014). Hence the authors are considering further the sensitivity of the ionosphere to daily changes in the internal dynamics and in different external factors. All these result cannot be put together in the same paper as there will be a lumping up of different ideas and concepts which might distastefully destroy the notion of building one research upon another. The Authors will like to point out to the anonymous referee that methodologies of different papers can be slightly similar but the papers could come with different concepts and focus such that the two papers can examine different behavior or responses of a system being studied as the case may be. Also the same set of data could be used to examine different

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responses of a system to the same phenomena. On the second point the authors only pointed out the relationship between Tsallis entropy and Lyapunov exponent and the relationship between the q index and Lyapunov exponent to justify the essence of using the two parameters comparatively this was written in Ogunsua et al 2014 due to the referee's recommendation, which we have found to be very useful more on the optimum value of q index can be found in different texts and references specializing in the area as cited. It should be hereby noted that this work is mainly based on its application the responses to these parameters, which have been shown in the work. Therefore it will not dwell too much on the methodology of optimum value of q index as the references like Anastasiadis et al., 2005 has been cited in the paper to help the reader. Similar things compared to Ogunsua et al. 2014 were reproduced in some areas of this new paper to re-establish the fact that both quantities can be used as indices to explain the processes and dynamics of the ionosphere and its reaction to the external influences. To be able to establish this completely, several tests using similar analytical techniques should be carried out using different concepts that have been studied before or looking at different behaviours ranging from transient to seasonal behaviours and other responses of the ionosphere before it can be totally established that the two parameters can be used as indices for continual interpretation of the ionospheric processes and dynamics. And this new paper written as a follow up to Ogunsua et al. 2014 is another step in that direction. The Authors will hereby maintain that the claims in report #3 are not enough for the anonymous referee to make such statement on the acceptability of the paper. The authors will however take note of the indication of the optimum value of Tsallis entropy used even though the main idea behind this work is to see the ionosphere dynamical response, using these parameters were being established. Secondly, the references will be carefully checked and corrected appropriately by the authors. All needed adjustments will be applied where necessary.

3. AUTHOR'S CHANGES IN THE MANUSCRIPT

Authors will disclose the optimum value of the q index used for computations in this

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work. But this is subject to the editor's recommendation however we strongly believe that this is not the main focus of the paper. The authors will also like to state the every other addition or removal of texts based on this reviewers comment will be subject to editor's recommendation, even though referees view does not align with the focus of the paper.

Interactive comment on Nonlin. Processes Geophys. Discuss., 1, 1855, 2014.

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