Dear Editor,

I have reviewed the manuscript (MS) "Study of the fractality in an MHD Shell model forced by solar wind fluctuations" by Dominguez et al. submitted for possible publication in *Nonlinear Processes in Geophysics (NPG)* and found that it may be acceptable for publication in *NPG* following intermediate revisions. This MS presents a comparison between the fractal dimension of the activity of the magnetic energy dissipation rate obtained in a magnetohydrodynamic (MHD) shell model, which may describe geomagnetic activity, and the fractal dimension of the solar wind forcing expressed through the $v \cdot bz$ fluctuations. However, there is clearly a lack of (a) a discussion of the significance of the herein presented results, along with (b) a comparison with previous studies that simultaneously investigated the complexity between geomagnetic activity and solar wind variations, which point to necessary revisions for this study.

Sincerely,

Comments

1. Introduction
   Other interesting applications of fractal dimension analysis on systems related to geophysical and biological extreme events can be found in Eftaxias et al. (2006, 2008).

   l. 48: please define the abbreviation "MHD" here.

2. Section 2
   l. 75: please define the abbreviation "GOY" here.

3. Results I
   In the right panel of Figures 3, 7 and 10 the fractal dimension curves are provided for the 13 years of solar cycle 23. However, the discrimination between curves corresponding to years of solar minimum and curves corresponding to years of solar maximum is not straightforward. In Figure 3 a couple of curves of solar minimum are mixed with the curves of solar maximum. Why? What are the years of solar minimum represented by these curves? Figure 7 discriminates between curves of solar minimum and maximum in a clearer way and Figure 10 does not discriminate at all. Why is that?

4. Results II
   Figures 5 and 6 compare the variations of fractal dimension between solar wind data and dissipated magnetic energy: the fractal dimension of magnetic energy is higher than the fractal dimension of *VBsouth* during solar maximum. What's the interpretation of this observation? IMHO, it might mean that the complexity of the magnetosphere is higher than the complexity of the corresponding solar wind variations during solar maxima. Why is that? Back in 2006 there has been a study comparing the variations of the Hurst exponent

(i.e., another complexity measure) between a geomagnetic activity index, indicating magnetic storm intensity, and *VBsouth* variations (Balasis et al., 2006). This was done for 2001 a year around solar cycle maximum. It was found that while the magnetosphere is mostly driven by the solar wind the critical feature of persistency (lower complexity) in the magnetosphere is the result of a combination of solar wind and internal magnetospheric activity rather than solar wind variations alone. In that study the degree of complexity between Dst and *VBsouth* was apparently different. In the present study the same seems to hold for the dissipated magnetic energy and *VBsouth*. Please comment upon the past and present findings.

5. Conclusions
   Please provide motivation / rationale for performing this study. What are the differences / improvements between the present study and recent studies on the topic by the same group of authors (e.g. Dominguez et al., 2018)? What is the significance of the obtained results for the Space Weather community? Eventually, please compare your results with other pertinent studies (e.g. Donner et al., 2019).

References

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