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Nonlinear Processes in Geophysics
Discussions
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Interactive comment on "Characterization of the South Atlantic Anomaly" *by* K. A. Nasuddin et al.

Anonymous Referee #1

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1 General comments

The South Atlantic Anomaly region is an important part in the earth. To characterize the persistence in the SAA region is important and interesting.
The authors discuss the persistence in the SAA region and outside the SAA region during the active period and normal period, using power-spectral density analysis method. Their findings suggest that the SAA region tends to be persistent during both active and normal period. The persistence may be explained by the earth magnetic field.
The aim, the method and the motivation lie within the nonlinear progress in Geophysics.

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However, there are some deficiencies.
1. I suggest add an example figure of power spectral density in order to see in which frequency range you estimate the slope and whether the oscillations affect the slope estimation. An exact estimation of the slope is quite important to the results and conclusions. To me, the Hurst value=0.06 is really strange.
2. There are still stations which are against your conclusion, like SIT and FCC station. As I see, the results of these two stations are totally different from your conclusion. I suggest add more explanation about that.

2 Specific comments

2.1 Abstract

Line 4, "the data for the occurrence of the active period and normal period…". The data of which variable is not mentioned in the abstract part. And which temporal resolution of the data are you using?

2.2 Methodology

β is estimated by the slope of the power-spectral density function, it must be valid in a certain frequency range. So it is better to present an example figure of a power-spectral density of one station. Then it is much clearer to see how you estimate the slope, which frequency range it is and if the oscillations influence the estimation of the β. Like Figure 2 in Shao and Ditlevsen., 2015, Figure 1-3 in Pelletier and Turcotte., 1997.
Sentence: "If the Hurst exponent is in the range of 0.5-1, it reveals a time series with long-term positive autocorrelation". "In the range of 0.5-1" is not accurate. Does H=0.5

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fall into the range of 0.5-1? Change it to $0.5<H<1$.
"a long-term positive autocorrelation" is not accurate, either. Check it.
Add the explanation of H=0.5.

2.3 Dst index and Kp index for geomagnetic storms

This part should be put in front of the 2.3 part. In 2.3 you have already applied the Dst index to choose the active and normal period.
The title of Figure 3(1), the xlabel means day 1 March to 16 March, not for 11 March.
Figure 3(2), xlabel "Time" means "Time/hour"?
Also check the title of Figure 4(1).

2.4 H-component

The temporal resolution of the data you used is not mentioned in the paper, is it minutely data?
From Figure 5, I can see a diurnal cycle of horizontal intensity (H). Oscillations in the data will lead a peak (See Shao and Ditlevsen., 2016). The peak may influence the Hurst exponent. You can provide an example of power-spectral density and see if the peak fall into the range of slope estimation. If it really affects the slope, you need to remove the diurnal cycle and re-estimate the Hurst exponent.
Line 7, the ssc should be capital letters.

2.5 Results and Discussion

For BLC station, during active period, the minimum Earth magnetic field strength is 58790, but the H(BLC)=0.6466. For SIT station, the minimum Earth magnetic field strength is 55750, but the H(SIT)=0.3517. It is completely different from your result.

I suggest add an explanation about that. And the Hurst exponents of SIT and FCC stations during active period are lower than them during the normal period, which are totally different from other stations. Also an explanation for it.

2.6 Conclusion

Line 5, ‘This is happening in low latitude region.’ You mean the mid latitude region?

2.6.1 Typos

Page 7, line 26,’The explanation on choosing 11 March 2011 compare to other date can be explain more detail. . .’ should be ’be explained’.

3 References

Shao, Z. G., & Ditlevsen, P. D. (2016). Contrasting scaling properties of interglacial and glacial climates. Nature communications, 7, 10951.
Pelletier, J. D., & Turcotte, D. L. (1997). Long-range persistence in climatological and hydrological time series: analysis, modeling and application to drought hazard assessment. Journal of Hydrology, 203(1-4), 198-208.