Nonlinear Processes
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Discussions

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**Interactive
comment**

Interactive comment on "Characterization of the South Atlantic Anomaly" *by* K. A. Nasuddin et al.

K. A. Nasuddin et al.

khairulafifi@siswa.ukm.edu.my

Response to referee comments

Manuscript title: Characterization of the South Atlantic Anomaly

Authors: Khairul Afifi Nasuddin, Mardina Abdullah, Nurul Shazana Abdul Hamid

We like to thank the referee for their comment. We have read and prepare the respond. The summarization of the respond is explain in this attachment.

Referee comment 1

1. General comments

1. I suggest add an example in 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.

Response: We have inserted the periodogram figure in the Results and Discussion section in line 8 page 11 figure 6 for the high latitude region, the periodogram figure for mid latitude region in line 3 page 14 figure 7 and the periodogram for South Atlantic Anomaly region in line 7 page 16 figure 8. The spectral exponent, β for the station in the region can be seen the periodogram figure. An example figure of power spectral density is shown in page 10 line 7 figure 5.

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.

Response: The explanation have been added in the conclusion section line 1 to line 4 page 16 and line 11 to line 14 in page 18.

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?

Response: We have mention the horizontal-component of the Earth magnetic field as the component to be analyze and data sample rate is 1 minute in line 11 and 12 in page 1 in the Abstract section.

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 ïňĄgure 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 inïňĆuence the estimation of the β. Like Figure 2 in Shao and Ditlevsen., 2015, Figure 1-3 in Pelletier and Turcotte.,

1997.

Response: The spectral exponent, β for the station in the region can be seen the periodogram figure. The periodogram figure is inserted in the Results and Discussion section in line 8 page 11 figure 6 for the high latitude region, the periodogram figure for mid latitude region in line 3 page 14 figure 7 and the periodogram for South Atlantic Anomaly region in line 7 page 16 figure 8. The spectral exponent, β for the station in the region can be seen the periodogram figure. An example figure of power spectral density of one station is shown in page 10 line 7 figure 5.

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 fall into the range of 0.5-1? Change it to 0.5<H<1.

Response: We have change it. It is in line 5 page 7.

"a long-term positive autocorrelation" is not accurate, either. Check it.

Response: We have improve the sentence. It is in line 5 page 7.

Add the explanation of H=0.5.

Response: We have add explanation on H = 0.5. It is line 9 and 10 in page 7.

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.

Response: We have place it as suggested by the referee. Section 2.3 Dst index and Kp index for geomagnetic storm period and normal period have been removed to page 7 and section 2.4 Geomagnetic storm period and normal period has been place in page 8.

The title of Figure 3(1), the x label means day 1 March to 16 March, not for 11 March.

Figure 3(2), x label "Time" means "Time/hour"? Also check the title of Figure 4(1).

Response: We have corrected the mistake. Figure 3(1) and figure 3(2) have been corrected based on suggestion. It has been rename as Figure 2 since the arrangement of section 2.3 Dst index and Kp index for geomagnetic storm period and normal period with section 2.4 Geomagnetic storm period and normal period. The correction is in page 7. Figure 3(1) and Figure 3(2) (Previously name figure 4) also been corrected in page 8.

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 inïňĆuence 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.

Response: The data sample rate is 1-minute. An example figure of power spectral density in which frequency range whereby the slope is estimate is shown in page 10 line 7 figure 5. We have change ssc to SSC.

2.5 Results and Discussion

For BLC station, during active period, the minimum Earth magnetic ïňĄeld strength is 58790, but the H(BLC)=0.6466. For SIT station, the minimum Earth magnetic ïňĄeld 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.

Response: The explanation is mention in the results and discussion section for station

BLC in section line 12 to line 19 in page 13. The explanation on SIT and FCC is mention in the line 1 to line 4 page 16.

2.6 Conclusion

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

Response: We have corrected the mistake. It is in line 5 page 18.

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 '.

Response: We have change the sentence to be explained. It is in line 3 page 9.

Please also note the supplement to this comment:
https://www.nonlin-processes-geophys-discuss.net/npg-2018-51/npg-2018-51-AC1-supplement.pdf

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Interactive comment on Nonlin. Processes Geophys. Discuss., https://doi.org/10.5194/npg-2018-51, 2018.