**Response to Referee comments**

**Name of manuscript:** South Atlantic Anomaly during ascending and maximum phase of solar cycle 24

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

We thank Nonlinear Processes in Geophysics for an experience in improving the journal. The comment has been read and taken consideration discreetly. The following summarize the effort the author take in answering the comment.

**Comments from Referee 1:**

**(1) Comments from Referee 1:**

This is a repeat of the analysis of Nasuddin, K. A., Abdullah, M., and Abdul Hamid, N. S.: Characterization of the South Atlantic Anomaly, Nonlin. Processes Geophys., 26, 25–35, https://doi.org/10.5194/npg-26-25-2019, 2019 with all its problems, inconsistencies and poor understanding of the magnetic field, but with a longer time-series. The authors essentially posit that the long correlation time ("persistant") of the geomagnetic time series recorded within the South Atlantic Anomaly is somehow related to the weaker magnetic field. This is entirely untrue - it is related to the source during quiet time and geomagnetic storms, namely the ring current at low latitudes (not the ionosphere like at high latitudes). This is not mentioned once in the entire manuscript. The ring current changes slowly, is relatively distant (∼6 Re) and has a long response and recovery time. At high latitudes and under the equatorial electrojet (like AAE and TAM) there are additional proximal current systems which do change rapidly and reduce the correlation time ("antipersistant"). This is the reason - not the main field strength. How hard would it have been to look at another low latitude sector, like Guam in the Pacific and that area which has a similar spread of geomagnetic ground stations? You would have easily disproved your own point. All observatories at the same latitude experience similar external fields e.g. Cox, G. A., Brown, W. J., Billingham, L., & Holme, R. (2018). MagPySV: A Python package for processing and denoising geomagnetic observatory data. Geochemistry, Geophysics, Geosystems, 19, 3347– 3363. https://doi.org/10.1029/2018GC007714 The work is full of basic errors and shows a real lack of understanding about the Earth’s magnetic field. For example, the authors state the SAA is due to the dipole being offset from the axis. This is completely untrue - the SAA is due to the large reversed flux patch on the core-mantle boundary. Look for references from Gubbins from as far back as the 1980s or or Metman et al (2018, PEPI) for examples of what causes the SAA and it’s variation.

Please also note the supplement to this comment: https://npg.copernicus.org/preprints/npg-2020-15/npg-2020-15-RC1-supplement.pdf

**(2) Author’s response:**

The author have studied the comment given by referee :-

1. The ring current

* The author has explained in the journal in the Result and Discussion section and summarized in the Conclusion section about the ring current. The author also explains the ring current and SAA region and its tendency to be persistent and elaborate it. For the explanation of the ring current is in line 281 till line 288 page 13 in the journal.

1. Equatorial electrojet

* The author explains on the EEJ and the station near EEJ in line 315 till line 319 page 14 and page 15 in the journal.

1. South Atlantic Anomaly

* Regarding the South Atlantic Anomaly, the author believe based on study the Van Allen radiation belts are in proportional about the Earth’s magnetic axis, which is tilted with respect to the Earth’s rotational axis by an angle of roughly 110. Due to the asymmetry arising, the inner Van Allen belt is closest to the Earth’s surface over the south Atlantic Ocean that it dips down to 200 km in altitude. The author hope to explain the existence of the SAA region based on this study. Further elaboration can be explain in the Response to Referee comments 1-Supplement.