

Interactive comment on “South Atlantic Anomaly during ascending and maximum phase of solar cycle 24” by Khairul Afifi Nasuddin et al.

Anonymous Referee #1

Received and published: 6 July 2020

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 ("persistent") 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 ($\sim 6 R_E$) and has a long response and recovery time. At high latitudes and under the equatorial electrojet (like AAE and TAM)

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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>

Interactive comment on Nonlin. Processes Geophys. Discuss., <https://doi.org/10.5194/npg-2020-15>, 2020.

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