

Response to Anonymous Referee #1 comments on “A correlation study regarding the AE index and ACE solar wind data for Alfvénic intervals using wavelet decomposition and reconstruction” by Fernando L. Guarnieri et al.

Anonymous Referee #1

The auroral electrojet (AE) index, first introduced by Davis and Sugiura in 1966, provides a way to monitor the level of geomagnetic disturbances resulting from the electro-jets and can be used as a proxy to specify the state of the magnetosphere. Assuming the existence of non-negligible correlations between the AE index and variations of the z-component (B_z) of the interplanetary magnetic field (IMF), as shown in Guarnieri et al. 2005, the authors present the model for a proxy of AE, here called AE^* , based on the wavelet decomposition of the the solar wind (SW) magnetic field. The data used for the analysis are from the ACE spacecraft (located in L1), however the simplicity of the model allows in principle the application to other SW datasets. Future implementations of the model in codes for the nowcast (and forecast) of the AE index are also envisaged. The results interesting and think the manuscript deserves the publication in NPG after the few remarks reported below will be addressed by the authors.

[Response: We would like to thank the Referee for the constructive comments. We will address below, in blue, the specific remarks.](#)

- From the analysis proposed it comes out that the predictive power of the model depends drastically on the filtering applied to B_z . This is clearly stated in lines 3-4 (pag.6) and 20-22 (pag. 4):

"If one tries to apply equations 1 to 5 to unfiltered B_z data, this may result in a very poor correlation coefficient between the estimated AE^* and the observed AE index"

"With a computer routine , each reconstruction level was tested and it was found that the correlation is high up to level A3 (starting from A10)"

However it is also stated (lines 23-25, pag.4) :

"In this work we used reconstructions from A10 to A3... This decision, as well as other assumptions..., were based on several analyses reported in Guarnieri 2005."

Since the elimination of the high frequencies from the reconstructed signals appears to be a rather crucial step to get good correlations between the model and the original AE index, I think some of the conclusions from Guarnieri 2005 should be discussed here and put in the context of the present paper.

Response: You are correct, the elimination of high frequencies is a crucial step on the method. The classical techniques for filtering may not provide good results due to the presence of “patches” of solar wind with different periodicities. This is a big advantage of the Wavelets filtering process, since the filtering effect is localized to each patch for each periodicity. We have now revised the text to address this. Thank you for the suggestion.

- I strongly suggest to add in the introduction a more detailed description of the AE index and how this is used to characterize the state of magnetosphere and ionosphere and their coupling with the interplanetary medium. I understand it is a well known index in the space weather and ionospheric community but...

Response: Yes, this has been done.

Minor comments:

- I think the first two lines in section 5 should be rephrased:

"Although correlations between AE* and AE as high as 0.90 have been indicated in this paper, there is a question of why values of 1.00 are never reached."

0.90 is actually a very good correlation and indicates that the model works well. On the contrary the scientific intuition would make me think there is something suspicious in a correlation of 100% between any model and observations.

Response: Yes, okay, the sentence has been changed.

- I do like particularly the title, it is long and does not convey immediately the idea behind the paper, though I am fine if the authors prefer to keep it as is.

Response: We are assuming you mean you “do not like” the title. However, discussing with the co-authors we have decided to keep it.