

# ***Interactive comment on “Variability of Relativistic Electron Flux ( $E > 2$ MeV) during Geo-Magnetically Quiet and Disturbed days: A Case Study” by Tulsi Thapa et al.***

**Tulsi Thapa et al.**

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We thank the referee for reviewing our manuscript and for providing positive and detailed suggestions. Our responses are marked in the “red color” font in the text below, in between the reviewer’s comments.

General comments: The authors studied the relativistic electron flux ( $E > 2$  MeV) in the outer radiation belt during four events, three magnetic storms with different intensities and a quiet period, using wavelet transform and cross-correlation. The solar wind parameters and a magnetic storm index have been related to the radiation belt electron flux. The case studies may be interesting although it should be carefully presented and

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explained. The manuscript is not clear in many parts and presents many language issues.

Specific comments: 1. Some parts in the manuscript are confusing as for instance the lines 17-18 and 300-301 do not agree in the statements.

Response: In the revised manuscript, a sentence of Line 17-18 will be replaced with "cross-correlation analysis depicted that the response of relativistic electrons with SYM-H showed good anti-correlation".

2. There are strong conclusions during the manuscript mentioning previous papers although the results do not clearly show it.

Response: We are not sure where the reviewer refers to this comment; however, the additional analysis presented in the revised manuscript might have resolved such issues.

3. The Introduction may be rewritten since it does not really support your work, mainly in lines 50-59. The Van Allen probes are mentioned in lines 50-51 but only GOES data is used.

Response: Thanks for pointing out the problems. The introduction part is revised and will be included in the revised manuscript. Also included in the reviewer's 1 comment.

4. How does your work focus on loss, acceleration and transport of relativistic electrons as mentioned in lines 61-63?

Response: To resolve this issue, we have included additional analysis with the necessary data in the table (2) which will be included in the revised manuscript. (included in a reviewer 1's comment file).

5. You mention that "magnetic storms are not the primary factor that pumps up the radiation belts", but you found a good correlation between electron flux and SYM-H. How do you explain that? Do you think your results support your conclusion?

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Response: Thanks for pointing out flaws. This statement is rewritten in the revised manuscript and in accordance with the conclusion.

6. What do you mean by “different interplanetary structures” in line 145? You only mention high speed streams.

Response: Geomagnetic storms are the consequences of different interplanetary structures like coronal mass ejections, interplanetary coronal mass ejections, high-speed streams, etc. This sentence will be resolved in the revised manuscript.

7. What is the point of using Wavelet transform in your work to support your conclusions?

Response: In order to substantiate the obtained results and for the close inspection of the existing trends of relativistic electrons in six time-series events, the use of wavelet: wavelet power spectrum (WPS) and global wavelet spectrum (GWS) techniques are adopted. These techniques provide an unbiased and true estimation of periodicity as the original signal gets decomposed to several components using continuous wavelet transform (CWT).

Technical corrections: It has been pointed out some corrections, but not everything. You may please check punctuation, space, missing “the”, references, etc. 15: remove and 15: fluctuation or variation? 16: is dependent 15-17: This conclusion is not clear during the manuscript. 17-18: This sentence does not agree with the statement in lines 300-301. 22: electron flux 22-24: The same comment is lines 334-336: You may be clear here that you are relating electron flux with SYM-H. 32-34: . . .(CME), co-rotating interaction region (CIR) and high speed streams (HSS) 34: space before reference 34: add more references related to geomagnetic disturbances during CIR and HSS 36: trapping or loss of high 36: charged 36: particles in the Van Allen radiation belts (remove known as Van Allen belt) 37: space before reference 37-38: This sentence is not clear “There are . . . flux” 38-39: This sentence is not clear “Enhancement. . .atmosphere”, add reference to it. 40-41: The sentence “Magnetic reconnection. .

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.magnetosphere.” has no connection to the entire paragraph. I suggest removing it. 43: ions, protons? Would it be just ions? 44: The outer. . . 48: Replace drags us 43-59: I suggest to rewrite the second part of the paragraph: “The aftermath. . . values.”. You may explain some past results which are important to state your present work.

Section 2: Dataset and Methodology 61:loss, acceleration and transport? 65: dataset 67: Omni web link does not work. Response: link will be replaced as <https://omniweb.gsfc.nasa.gov> in the revised manuscript. 95: Table 96-105: Missing space in title SYM-H value; SYM-H intervals may be rewritten, starting from the lower value to the higher (-50 to 0), choosing the word to or the inequality symbol, not both. 112-114: This sentence should be in the Methodology Section. 118: It is missing unit: -4 nT 119: which may be 121: Why to 2 to 2.5 nPa? At the plot the PSW reaches lower values. 121: solar wind pressure? Which pressure? Dynamic? Thermal? Magnetic? 124-126- Sentence “As the solar wind. . .” is not clear. 126-128- Sentence “Since. . .” is part of the last sentence. Both may be rewritten. 128: fluxes -> flux 131-132: Sentence “As high speed. . .” is not clear. 134: corresponding to the time of minimum SYM-H value. 145: What do you mean by “different interplanetary structures”? It may be clear in the sentence. 146-147: The sequence of panels is the same as explained in Figure 1. 147-148: which indicates the storm is moderate according to . . . . 148: remove [ ] 149 : allows the charged 157: You’d rather rewrite it since accelerate is not a good word here. 158: new paragraph 164: rewrite reference 167: stream 168: storm 168: The higher solar wind speed, the higher 182-183: Sentence “The fluctuation. . .” is not clear. 185: remove [ ] 186-188: Sentence may be rewritten. 190: accelerating is not appropriate here. 191: What is normal? 193: fluxes or flux? 195-205: This discussion should be improved. 215: compression of bow shock? 229-241: This discussion should be improved. 275: Figure 5 should be presented in the same order as the Section, from quiet to super-intense storm. 280: “(refer to . . .)”is not clear. 286: “our work” may not be necessary. 288: for the intense storm 299: greater -> larger 301: The sentence “Hence ..” may be rewritten. 314: events 314: there seems to increase? 320-321: “compressed . . .far” is not clear. 322: and enhancing 326: ‘To

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be ..” is not clear 328: in all 328: the intense 329: The high Psw values lead 334-336: You may be clear here that you are relating electron flux with SYM-H. 336-339: it is not clear. -You did not mention anything about the red dashed line in Figures 2, 3 and 4. -The description of similar figures may follow the same pattern in all the figures and Sections. -You refer to figures as Figures, figures, fig., etc. This should follow the same pattern along the manuscript. - Replace solar wind velocity by solar wind speed.

Thank you for your meticulous details. As suggested by the reviewer we will address all the stated comments and will be placed in the revised manuscript.

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