

Interactive comment on “Energetic electron enhancements under radiation belt ($L < 1.2$) during nonstorm interval on August 1, 2008” by Alla V. Suvorova et al.

Anonymous Referee #1

Received and published: 19 February 2019

General Comments:

This manuscript reports a series of >30 keV electron flux enhancement events that happened at $L < 1.2$ observed by POES satellites, and massive related observations from THEMIS, ground magnetometer, ACE, etc. These events are likely to be a subset of the events analyzed in Suvorova (2017) and this study is a follow-up work related to Suvorova (2017). In the present study, the authors propose that the magnetic perturbation near the magnetopause causes a mixture of magnetosheath plasma and magnetospheric plasma to precipitate in high latitude (high L regions) which further induce a large transient electric field that could transport the electrons to $L < 1.2$. However, there

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is no solid evidence reported to prove that the flux enhancements at $L < 1.2$ are caused by magnetic perturbation near the magnetopause, nor analysis on the possibilities that this proposed chain of processes could work. The reviewer suggests to at least add in some more solid arguments or simulation results to prove that the proposed processes are reasonable before the paper can be published. The reviewer also suggests the authors to be more concise on some part of the paper, to avoid extra confusions of the readers.

Specific Comments:

1. The authors presented the >30 keV electron flux measurements by POES satellites in Figure 1. In Figure 1, it is clear that electron fluxes are enhanced in the quasi-trapped region (outside of SAA), but the fluxes in SAA that are more stably-trapped almost remain the same. The authors refer to those events as injections in many places in the paper (e.g., line 202, 208). However, if those electrons are injected from higher L , they are supposed to become more 90 degree peaked in pitch angle, which means they are more likely to be stably-trapped and more enhancements in the SAA region are expected. From Figure 1, the slot region is not filled, which is supposed to be seen in an typical injection event that penetrates down to $L=1.2$. In fact, previous studies such as Li et al (2017, titled “Measurement of electrons from albedo neutron decay and neutron density in near-Earth space”) reported events that enhanced stably-trapped electrons are observed due to geomagnetic activities while the quasi-trapped electron fluxes stay the same. Moreover, people would easily link the enhancements in the quasi-trapped electrons to enhanced pitch angle scattering. The authors should show more detailed observations of these events and explain why these events are injections. The author should also specify the looking direction of the detector in the caption of Figure 1.

2. As is stated in the general comments, the authors have not present any solid evidence that the electron enhancements at $L=1.2$ could be caused by magnetic perturbations near the magnetopause which is at quite large L . Only coincidences in time are

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shown in the present study. The reviewer suggests to show more solid arguments or some simulation results to prove this possibility. In Li et al (2017), which is mentioned above, they also state that the large electric field can only cause an L shell distortion of 0.01 and this process is energy-dependent. Please comment on it and the possibility that the electric field moves the electrons to $L < 1.2$ in this case.

Here are some other comments:

3. In Table 1, the authors list a series of flux enhancement events observed by POES. The author should specify the criteria used to select those events, and show some detailed electron flux profile of those events, such as how long the enhancements last, specific L shell of each event or how many data points are included in each event. The reviewer also suggests to use more commonly used names for POES satellites such as POES-15/18... instead of P2/P5...
4. Line 210-227: the authors intend to prove that each flux enhancement event is individual and not caused by any other event, for example, F2 is not caused by F1. However, this analysis is based on the presumption that the event is really transient. The authors should show some evidence to argue such as F1 could not have been enhanced 100 min before the observation of F1. Also, please explain why this is important. The reviewer does not find it very essential to the analysis later and suggests to be more concise on this problem.
5. Line 227: Please specify if these events are a subset of Suvorova (2017) event list. If so, the authors should make a clarification before stating that the characteristics agree with those in Suvorova (2017), otherwise it is misleading.
6. Figure 3: Since the authors show that L1 is not a preferable location for observations of the magnetic perturbations as compared to Themis, this figure is not necessary. The reviewer suggests to combine some of the information in Figure 3 into Figure 4 and be more concise on the text as well, in order to help the readers to focus on the important part, Themis observations.

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7. Line 611: Please use explicit number of the latitude of throat aurora instead of “lower latitude” here. It is misleading because this study is talking about phenomena at $L=1.2$ (<30 deg in latitude), while the throat aurora in a series of Han et al papers is still located at >70 deg in latitude (or please correct this number).

Interactive comment on Ann. Geophys. Discuss., <https://doi.org/10.5194/angeo-2019-5>, 2019.

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