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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.

Alla Suvorova

suvorova_alla@yahoo.com

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Specific Comment 1 by Referee 1

(1.1) 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 quasitrapped region (outside of SAA), but the fluxes in SAA that are more stably-trapped almost remain the same.

Reply:

Actually, electron fluxes did increase in the SAA region. However, the background

fluxes in SAA were already high (several units of 10ˆ5 (cm2 s sr)-1). The fluxes of FEE were mostly less than 10ˆ5 (cm2 s sr)-1. Hence, they produce a little increase of the flux in SAA which is hard to be seen in the logarithmic scale. However, this effect is beyond the scope of our study.

(1.2) 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.

Reply:

In order to clarify this crucial issue we revised Figure 2 (see below) in order to show the time profiles of intensities and L-shells of FEE enhancements. We revised the text accordingly: "Figure 2 and Table 1 present main characteristics of 15 FEE enhancements detected along equatorial passes of POES satellites (P2, P5, P6, P7, P8). We analyze the peak fluxes in the FEE enhancements (time, local time, longitude, and L-shell). " "As seen in Figure 2a,b, the FEE enhancements peak at minimal L-shells, i.e. at the equator. The fluxes decrease quickly with growing L. This pattern corresponds to a fast radial transport (injection) of electrons from the inner radiation belt. Note that pitch-angular scattering of electrons gives different profiles: the fluxes should be minimal and the equator and grow with L-shell."

Concerning to the albedo neutron mechanism. It is impossible to apply this mechanism to the FEE enhancements because of the following well known facts: (1) The fluxes of albedo neutrons at equatorial latitudes are much lower (order of magnitudes) than the fluxes of FEE. (2) During magnetic quiet, the latitudinal profile of secondary particles (generated in decay) is positive, i.e. the flux of secondary particles increases with latitude due to a decrease of the cut-off rigidity of incident cosmic rays. Figure 2 demonstrates totally different pattern.

(1.3) The author should also specify the looking direction of the detector in the caption of Figure 1.

Reply:

In the caption of Figure 1 we add the following sentences: “The electrons are detected in vertical direction. In the forbidden zone, those electrons are quasi-trapped.”

Caption of revised Figure 2:

FEE enhancements on 1 August 2008: (a) fluxes of >30 keV electrons in units (cm2 s sr)-1, (b) L-shell of enhancements, (c) longitude and (d) local time of peak fluxes (black circles). Measurements within the SAA area are indicated by the open circles. Colorful curves denote NOAA/POES satellites: P2 (black), P5 (pink), P6 (red), P7 (blue), and P8 (green). Horizontal dashed line at panel (b) depicts the lower edge of the inner radiation belt. FEE enhancements peak at the equator (minimal L-shells) that indicates a fast radial transport from the inner radiation belt.

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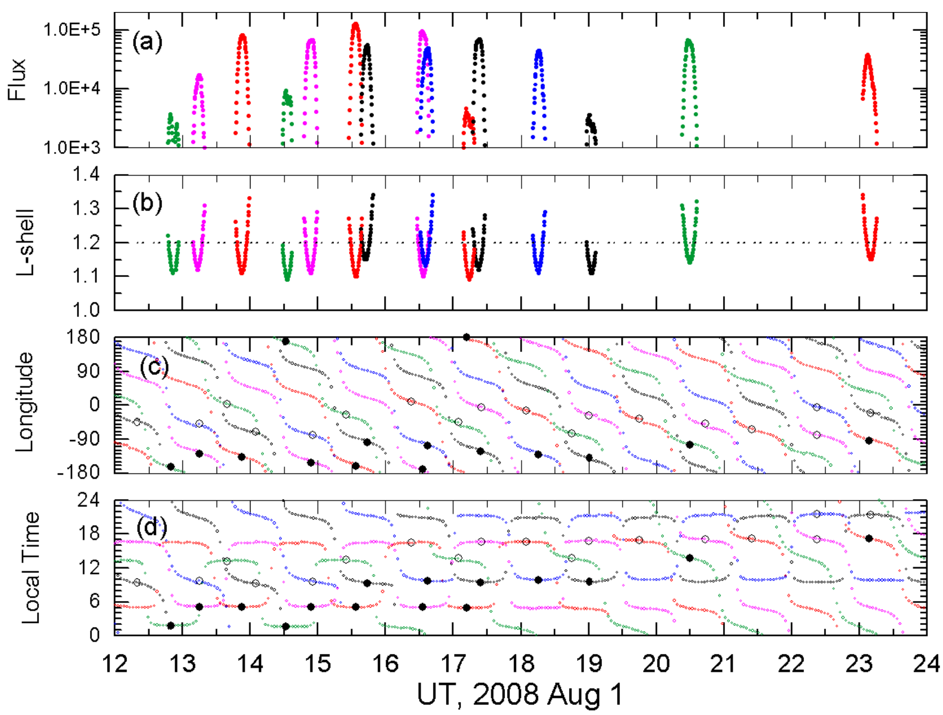

Fig. 1. revised Figure 2