Energy dependence of relativistic electron variations in the outer radiation belt during the recovery phase of magnetic storms: Arase/XEP observations

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1. Motivation

What is the relative contribution of two candidate processes of relativistic electron's acceleration (solar wind conditions, CIR/CME, plasma sheet condition, etc.)?

2. EXTREMELY HIGH-ENERGY ELECTRON EXPERIMENT (XEP)

Arase (ERG) was launched on December 20, 2016 from Uchinoura Space Center.

2.1. Arase (ERG) satellite

- Orbit:
  - Apogee: about 33,200 km
  - Perigee: about 300 km
  - Apogee: 113 min
  - Perigee: 113 min
  - Period: 2.2 MeV Tsukuba Space Center

2.2. Instrument

- MEP (Maxwell Electric Potential)
- Scintillator (1 MeV)
- XEP (700 keV - 20 MeV electron)
- GLE (1.8 MeV)
- XEP (1.8 MeV)

3. Observation

XEP observations (20170320 - 289 days) L > 3

- Ch0 (400 keV)
- Ch1 (100 keV - 2 MeV)
- Ch2 (1 keV - 100 keV)
- Ch3 (500 keV - 2 MeV)
- Ch4 (2 MeV - 20 MeV)
- Ch5 (20 MeV - 200 MeV)
- Ch6 (200 MeV - 2 MeV)
- Ch7 (2.2 MeV)
- Ch8 (2.2 MeV)

4. Summary

- XEP has observed more than 3 geomagnetic storms.
- The results for analyzed 6 events are summarized as below:

<table>
<thead>
<tr>
<th>Date</th>
<th>GEI index</th>
<th>Storm type</th>
<th>XEP observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017/12/22</td>
<td>200 +</td>
<td>CIR</td>
<td>Timing no energy dependence Peak location: outside</td>
</tr>
<tr>
<td>2017/12/31</td>
<td>CIR</td>
<td>CIR</td>
<td>Timing no energy dependence Peak location: inside</td>
</tr>
<tr>
<td>2018/4/4</td>
<td>400 +</td>
<td>CME(0)</td>
<td>Timing no energy dependence Peak location: inside</td>
</tr>
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<td>2017/12/5</td>
<td>1250 -</td>
<td>CME(0)</td>
<td>Timing no energy dependence Peak location: inside</td>
</tr>
<tr>
<td>2017/7/13</td>
<td>1420 -</td>
<td>CME(0)</td>
<td>Timing no energy dependence Peak location: inside</td>
</tr>
<tr>
<td>2017/12/22</td>
<td>200 -</td>
<td>CIR</td>
<td>Timing no energy dependence Peak location: inside</td>
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