Spatial/temporal changes of the energy spectrum of the outer belt electrons during magnetic storms

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After the disappearance of the relativistic electrons at the magnetic storm main phase, an increase in the flux occurs. The return flux is evident at first in a low L-shell (3-4) region, which propagates to higher L shells. Based on Akebono (EXOS-D) observations demonstrate that there is a systematic tendency in the spectrum from 300 keV to 2.5 MeV; i.e. both decay and growth are severer for higher energy electrons and time delay of recover is apparent for higher energy electrons. On the contrary, fast recover is made for lower energy electrons.

Source particles which are effectively supplied due to the enhanced electric field during magnetic storm main phase may be accelerated up to ~MeV range by some processes within outer radiation belt.

Once a major magnetic storm takes place, the relativistic electrons in the outer radiation belt disappear entirely. After the disappearance of the relativistic electrons which can last as much as one day, an increase in the flux occurs and sometimes exceeds the pre-storm levels. The return flux is evident at first in a low L-shell (3-4) region, which propagates to higher L shells. Based on Akebono (EXOS-D) observation, an investigation has been made on the spectrum characteristics of the relativistic electrons. Results demonstrate that there is a systematic tendency in the spectrum from 300 keV to 2.5 MeV; i.e. both decay and growth are severer for higher energy electrons and time delay of recover is apparent for higher energy electrons. On the contrary, fast recover is made for lower energy electrons. We have also studied a correlation of the electron flux increase and the IMF Bz polarity as well as the polar cap index during the storm recovery phase. Results demonstrate that a large flux enhancement occurred when the IMF was southward and the PC index was quite large. Source particles are effectively supplied due to the enhanced magnetic activity and they may be accelerated up to ~MeV range by some processes within outer radiation belt. We will discuss possible mechanism to increase outer belt electrons during the storm recovery phase.

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