Dynamics of energetic particles in the inner radiation belt during magnetic storms

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The relation between energetic particles in the inner radiation belt and magnetic storms is investigated using the NOAA12 and Akebono satellite data. During the main phase of a magnetic storm, the proton flux enhancementis detected in the inner region of the radiation belt. The present analysis disclosed that the proton enhancement occurs deep in the inner belt almost simultaneously with the increase in the outer magnetosphere. Energetic electron spikes are also detected in the inner radiation belt during the main phase of the magnetic storm. The flux increases up to 10 times with the duration of less than 1 day. This impulsive enhancement is synchronized with the onset of the outer belt electron decrease, but not caused by the transport or injection process from the outer belt.

The relation between energetic particles in the inner radiation belt and magnetic storms is investigated using the NOAA12 and Akebono satellite data. During the main phase of a magnetic storm, the proton flux enhancement in the energy range from 30 -- 80 keV is detected in the inner region of the radiation belt as has been first reported by Frank (1967). The present analysis disclosed that the proton enhancement occurs deep in the inner belt almost simultaneously with the increase in the outer magnetosphere, and its lower boundary is less than L = 2. The time profile of the proton flux variation is quit similar to that of Dst. These suggest that the ring current protons are injected not only in the outer region but also into the inner region of the radiation belt. We suppose that the induced electric field by the ring current variation may be the cause of the proton acceleration in the inner region. Electron spikes in the energy range from 30 to 300 keV are also detected in the inner radiation belt during the main phase of the magnetic storm. The flux increases up to 10 times with the duration of less than 1 day. This impulsive enhancement (electron spike) is synchronized with the onset of the outer belt electron decrease, but not caused by the transport or injection process from the outer belt, indicating the existence of the independent acceleration process.