Flux Enhancement of Energetic Particles in the Near-Earth Region: GEOTAIL-HEP Observation.

Tomoaki Hori[1], Kiyoshi Maezawa[2], Yoshifumi Saito[3], Toshifumi Mukai[3]

[1] Department of Physics,Nagoya Univ., [2] Dept of Physics, Nagoya Univ, [3] ISAS

Flux enhancements of energetic (>80 keV) ions in the Earth's magnetosphere were studied using the energetic particle data obtained by the HEP-LD instrument onboard the GEOTAIL spacecraft.It was found that the dispersed events are distributed preferentially on the dusk side in the near-tail plasma sheet (-30Re<X<-12Re), while are found at all local time sectors in the near-Earth region (R<12Re).On the other hand, the dispersionless events can be found only on the nightside, never found on the dayside. Contrary to the dispersed events, Its occurrence rate has a peak around local midnight and decreases rapidly away from the midnight.

Flux enhancements of energetic (>80 keV) ions in the Earth's magnetosphere were studied using the energetic particle data obtained by the HEP-LD instrument onboard the GEOTAIL spacecraft. It is known that energetic ions are frequently observed in the plasma sheet on both dayside and nightside and that its particle flux intensities are enhanced with geomagnetic activity. Relatively sudden increases in flux of energetic particles often can be classified whether they have a energy-dispersed property or not: some events show a energy-dispersed flux enhancement (dispersed events), and some do not accompany such a property but fluxes of energetic particles with different energies are enhanced simultaneously (dispersionless events). In order to examine properties of those two kinds of flux enhancement, we visually inspected the HEP data during Jan.,1996 - May.,1998 and then identified 106 ion dispersed events and 100 ion dispersionless events. First we analyzed spatial distributions of those events in the magnetosphere. It was found that the dispersed events are distributed preferentially on the dusk side in the near-tail plasma sheet (-30Re<X<-12Re), while are found at all local time sectors in the near-Earth region (R<12Re). Examining a local time dependence in detail, however, shows that the dispersed events relatively rare at the noon and midnight sectors as compared to the dawn and dusk sectors.

On the other hand, the dispersionless events can be found only on the nightside, never found on the dayside. Contrary to the dispersed events, Its occurrence rate has a peak around local midnight and decreases rapidly away from the midnight to both dawn and dusk. Since dispersionless properties of flux enhancements mean that particles forming the flux enhancement have been transported from its source site very close to there, this result indicates that the source of the energetic ions is located (or formed) around the midnight sector in the near-Earth plasma sheet. We also investigated correlation of a dispersionless flux enhancement with a substorm. It was found that most (92) of the events occur in the course of substorm activity determined from magnetograms on ground stations. And to examine a detail timing difference between dispersionless flux enhancements and substorm onsets, we compared start times of the flux enhancements with pi2 onset times corresponding to the substorms. The result is that most of dispersionless flux enhancements occur within +/- 5 minutes from pi2 onsets, and the average value of time delay is +3.6 minutes (that is, flux enhancements occur 3.6 minutes after substorm onsets on average). There exists several events preceding the corresponding substorm onsets, while a few events delayed more than 10 minutes from substorm onsets.