

Generation mechanism of nonthermal particles in the distant magnetotail: Geotail observation

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In the Earth's magnetotail, it is known that nonthermal particles which do not fit into the Maxwell distribution function are often observed. Some candidates like magnetic reconnection or turbulent acceleration have been suggested for the generation mechanism of these nonthermal particles. However, it still remains unsolved which mechanism plays an important role in the magnetotail where magnetic reconnection often takes place and at the same time, magnetic turbulence is quite strong.

We fitted the three-dimensional velocity distribution function observed by Geotail satellite to the kappa distribution: the distribution based on Maxwell distribution function with long tail which is expressed by power law in the high energy regime. We calculated the density, velocity, temperature and power law index by using the fitting method.

By statistical study of the plasma sheet, we have shown that the power law index is harder in the distant magnetotail than that of the near Earth's region. This suggests that the energy density of nonthermal particles is quite dominant (up to 40% of the total energy density) in the distant tail. We will also report on the result of the event study for both earthward/tailward flow events and discuss the generation mechanism of nonthermal particles in the distant magnetotail.