A synthetic picture of the plasma and magnetic field in the near-earth plasma sheet during substorms

Aoi Nakamizo[1]
[1] STEL, Nagoya Univ

The magnetospheric substorm is the fundamental but unsolved problem in the solar-terrestrial physics. In particular, we have no definitive answer for the generation mechanism of the substorm-FAC that is consistent with various key observations. Based on the analysis of the GEOTAIL/MGF, LEP and EPIC data, we have suggested that MHD slow mode is a primary process as the non-Alfvenic (non-convective or compressional) motion in the earth's magnetotail and proposed a generation mechanism of the substorm-FAC by the slow-Alfven mode coupling, that is, the generation of the substorm-FAC coupled with the change of diamagnetic currents associated with the growth and decay of the high-plasma pressure region in the near-earth plasma sheet ($<$8 Re).

Recently, it is reported that plasmas at the geosynchronous orbit around substorm onset behave differently depending on their energy-ranges (Saka, JPGU2009): the flux intensification is seen only in high-energy particles ($>$50 keV) while the flux of low-energy particles ($<$45 keV) is not so changed. This indicates that there is a possibility that we overlook important properties of the plasma, especially in the key region of substorm onset.

In this study, we included the STICS and EPIC data to take into account the contribution of high-energy ions to plasma moments. More specifically, we examined the total (LEP, STICS and EPIC), low-energy part (LEP), and high-energy part (STICS and EPIC) of plasma parameters, in relation to the simultaneous magnetic field observations. We will show analysis results for some substorm events and we will discuss the energy-dependency of plasma behavior in association with the slow mode disturbances.