

サブストーム開始に伴う磁気圏近尾部の電場・ 磁場揺動の変化

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Variations in the electric and magnetic field fluctuations in the near-Earth magnetotail associated with substorm onsets

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In our previous study, we have statistically investigated variations in the plasma flow, the north-south magnetic field, the total pressure, the dawn-dusk electric field, and the energy (Poynting, kinetic and thermal) and mass fluxes in the Earth's magnetotail associated with substorm onsets, which were determined from the Pi 2 pulsation on the ground. We concluded that the magnetic reconnection takes place first around $(X, Y) = (-19, 6)$ Re a few minutes before onset, and then the dipolarization around $X = -10$ Re and substantial plasmoid evolution around $X = -28$ Re start simultaneously at onset.

In the present study, selecting 342 substorm events from the Pi 2 pulsation and using GEOTAIL data, we have statistically investigated variations in fluctuations of the electric and magnetic fields at various regions in the near-Earth magnetotail associated with substorm onsets.

The dawn-dusk electric field and the north-south magnetic field develop around onset around $X = -10$ Re and $X = -28$ Re, corresponding to the dipolarization and

the plasmoid evolution, respectively. In these regions, the fluctuation of each component of the electric and magnetic fields is enhanced around onset. In contrast, around $X = -20$ Re, the dawn-dusk electric field does not develop much in the plasma sheet even after onset. The fluctuations of the electric and magnetic fields are not also enhanced before and after onset.

Moreover, the ratio of the magnetic field fluctuation to the background magnetic field is large around $X = -28$ Re corresponding to the plasmoid, but significantly small around $X = -10$ Re corresponding to the dipolarization region.

These observational results would provide us with a significant clue to understanding of substorm onset process and mechanism.

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