# A case study of intense substorms during a weak geomagnetic storm

# Yukinaga Miyashita[1]; Yohsuke Kamide[1]; Yoshizumi Miyoshi[2]; Kan Liou[3]; Akimasa Ieda[4]; Shinobu Machida[5]; Toshifumi Mukai[6]; Yoshifumi Saito[7]; Ching Meng[3]; George K. Parks[8]

[1] STEL, Nagoya Univ; [2] STEL, Nagoya Univ.; [3] JHU/APL; [4] STEL; [5] Dept. of Geophys., Kyoto Univ.; [6] ISAS/JAXA; [7] ISAS; [8] Space Sci. Lab., UCB

A main issue in magnetic storm research is whether or not substorms are fundamentally important in the development of magnetic storms. In the present paper, we have studied intense substorm events during which a magnetic storm did not develop very much. On February 8, 1997, a series of very intense substorms occurred during 12-14 UT, where the westward auroral electrojet reached more than 1800 nT. Polar UVI auroral images show that a very large auroral bulge extended from 60 to 80 degrees in magnetic latitude and from 18 MLT to the morning sector. The Dst index, however, was small, only -14 nT, during this period, and grew only to -39 nT after that, indicating that this event was a weak storm. The solar wind dynamic pressure was high, but the southward component of the interplanetary magnetic field had values of -10 to -15 nT, persisting only for 1-2 hours. In the magnetotail, Geotail at X˜-28 Re observed a very large total pressure and its large decrease, indicating that a large amount of energy was stored in the magnetotail and subsequently released. Large dipolarizations and particle injections were observed at geosynchronous orbit. The low-altitude, polar-orbiting NOAA-12 satellite observed an enhancement of the proton flux with ˜40-80 keV in the duskside during 12-15 UT, probably associated with substorm injections, but the enhancement was not seen closer to the Earth. The magnitude of the flux does not seem to be very large throughout the period. These results suggest that the ring current did not develop considerably in this event. A rough estimate of energy dissipation from geomagnetic indices shows that the energy dissipated by auroral precipitation and the ring current was not very different, while that dissipated by Joule heating was twice as large. The role of substorms in the growth of magnetic storms as well as energy budget will be discussed.