

Substorm timing in the polar magnetosphere: POLAR satellite observation

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We present a case study of substorm effects in the high-altitude, high-latitude magnetosphere using data from the POLAR satellite together with ground-based CANOPUS observations and WIND solar-wind observations.

The substorm of this paper had a clear growth phase and one clear major expansion onset, enabling an unmistakable comparison of the substorm timings and those of the magnetic field perturbation observed by POLAR.

During the growth phase, the magnetic field strength increased at POLAR, due to the pileup of magnetic field lines over the polar magnetopause. On the other hand, the magnetic field at POLAR did not start its recovery to its presubstorm values until ~28 min after the expansion onset.

This delay could be ascribed to dipolarization/compression of the inner magnetosphere after the expansion onset, balancing/cancelling the rarefaction effect of the near-Earth neutral line over the lobe field. This compression effect is likely to have been active while the expansion-phase activity increased.