

Spatial distribution of electromagnetic field variations during the 20 November 2007 sawtooth event

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Magnetospheric "sawtooth events" have been intensively studied using geosynchronous satellites. These observations have revealed that magnetic field dipolarisation, energetic particle injections, and the substorm current wedges (SCWs) extend over a wider-than-usual range of magnetic local time (MLT). On the other hand, it has also been reported that the electromagnetic fluctuations in the plasma sheet are not widely seen, but are likely to be rather localised. However, the latter result was based on the observation far tailward from geosynchronous orbit, and thus the spatial distribution of the electromagnetic fluctuations in the near-tail plasma sheet has not been established. The observations of the 20 November 2007 sawtooth event with a fortuitous configuration provide us with some informative results. The THEMIS-C satellite was located near geosynchronous orbit and more than 5 hr MLT eastward of the centre of the SCW, and observed low-frequency electromagnetic fluctuations (period of 40-160 s) before and at the onset of the first "tooth". The E-to-B ratio is roughly consistent with the local Alfvén speed during the maximum amplitude period, and the associated Poynting flux was sufficiently strong for powering aurora (140 mW/m² when mapped to the ionosphere). The results suggest that the electromagnetic field fluctuations extend over a wider-than-usual azimuthal range (possibly ~10 hr MLT), similar to the other substorm features. The contrast to the previous plasma sheet observations can be attributed to the radial extents of the field variations.