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Near-Earth magnetic signature of a magnetospheric substorm.

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Substorms are regarded as an impulsive unloading of energy previously stored in the magnetospheric tail. It is believed that the cross-tail current is partly disrupted and rerouted towards the Earth as part of this process. There it closes in the high-latitude ionosphere on the night side. This reconfiguration of the large scale current system is expected to manifest itself in a related magnetic signature. Caan at al (1975) found with the help of a superposed epoch analysis that the field strength near the equator increases by about 10 nT subsequent to a substorm onset.

The purpose of this study is to determine the spatial distribution of the substorm-related magnetic signature in the vicinity of the Earth in more detail. Statistical properties of substorm features are deduced based on a comprehensive substorm catalogue with more than 4000 entries covering a period from the middle of 2000 to the end of 2005. In particular, CHAMP magnetic field recordings from passes within the substorm current loop are investigated. From this we deduce the latitude/local time dependence of the magnetic effect. The results are of particular interest for main field modelling since there is no correction of the employed data for substorm effects so far. As substorms occur at all Kp levels they cannot be excluded by data selection based on this activity index.