Locations of the substorm current wedge during magnetic storms

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It is well known that a geosynchronous satellite which is located to the east (west) of the center of a substorm current wedge usually observes a decrease (an increase) in the eastward component of the magnetic field at the time of a magnetic dipolarization because the substorm current wedge is usually formed outside of the geosynchronous orbit. However, in a storm-time substorm which took place on May 27, 1997, the GOES 8 satellite which was located to the east of the center of the substorm current wedge, inferred from mid-latitude ground magnetic field variations, observed an increase in the eastward component of the magnetic field. This result implies that the substorm current wedge was formed inside of the geosynchronous orbit in this event and that the same could happen for other storm-time substorms. To examine this possibility, we have surveyed clear storm-time substorms which took place on a period from 1997 to 2001. Substorm events was identified by using POLAR/UVI auroral images, ground magnetometer chains (CPMN, CANOPUS and WDC), and geosynchronous satellites GOES 8, 9, 10. In storm-time substorms which took place on November 7, 1997, and June 26, 1998, the GOES 8 satellite which was located to the east of the center of the substorm current wedge observed an increase in the eastward component of the magnetic field, which suggests that the substorm current wedge was formed inside of the geosynchronous orbit as in the May 27, 1997 event. This same features for the three events implies that this is a generally common feature, and a statistical study is ongoing for further support. This feature is explained by an enhanced magnetospheric convection during magnetic storms.