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Simultaneous observations of flux transfer events by Cluster, THEMIS, Double Star and SuperDARN

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We present simultaneous observations of flux transfer events (FTEs) made by the THEMIS and Cluster spacecraft on the 3rd May 2007, along with supporting observations of fast ionospheric flows made by the SuperDARN radar network. The THEMIS spacecraft were in a string-of-pearls formation approximately 20,000 km long, and crossed the post-noon magnetopause at low latitudes between 12:00 UT (TH-C) and 14:30 UT (TH-E). The Cluster spacecraft were in a triangular formation tangential to the magnetopause with a maximum separation of ∼9,000 km, and were situated in the magnetosheath at high latitudes in the southern hemisphere, approaching the magnetopause which was crossed at about 16:00 UT. THEMIS observed 'standard' polarity FTEs between 11:00 and 15:00 UT, whilst Cluster observed 'reverse' polarity FTEs mainly between 11:00 and 14:00 UT. The two sets of FTEs are consistent with being generated at the same small region of a subsolar reconnection line. Fast poleward flows were observed in the 12:00 MLT sector, near the magnetic footprints of both Cluster and THEMIS, between 13:00 and 14:00 UT. However, in this interval the Double Star TC-1 satellite (situated nearer noon MLT) observed only one FTE suggesting either that the reconnection line was less active in this region or that some FTEs near to the subsolar point are not fully formed (Russell et al., 1985; Southwood et al., 1986). The large separation of the THEMIS spacecraft also allows us to track the motion of two FTEs across larger distances than the maximum separation of the Cluster spacecraft, and we find their acceleration to be negligible on this scale, adding confidence to the results of previous multi-spacecraft analyses of FTEs.