



A survey of flux transfer event velocities

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Flux transfer events (FTEs) are manifestations of transient or variable rate reconnection which are often observed by spacecraft near the Earth's magnetopause, and can be recognised by a characteristic bipolar variation in the component of the magnetic field which is normal to the magnetopause surface (B_N). The four Cluster spacecraft cross the magnetopause on each orbit between November and June each year, and consequently often observe FTEs at high northern and southern latitudes near local noon, and lower latitudes nearer the flanks. We have carried out a survey of FTEs observed by Cluster between November 2002 and June 2003, when the Cluster tetrahedron scale size (5000 km) was of the same order as the $1 R_E$ scale size of an FTE (Saunders et al., 1984). We identified 300 FTEs which occurred when the magnitude of the lagged IMF clock angle was greater than 70° - i.e. the IMF was either southward or dominated by the dawn/dusk component. 118 of these FTEs exhibited a bipolar B_N signature on all four spacecraft. The velocities of these 118 FTEs were calculated using the multi-spacecraft timing technique described by Harvey (1998), and a shortlist of 81 events were selected for a case-by-case comparison with the model of reconnected flux tube evolution developed by Cooling et al. (2001). The Cooling model explains the observed velocities reasonably well: 43 FTEs had a velocity which was within 20° of the model flux tube velocity and a speed which was between 50% and 150% of the model value, and a further 15 FTEs were within 30° of the model velocity (and fulfilled the same speed criterion).