



The formation of transpolar arcs

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Transpolar arcs are auroral features which form on the night side of the auroral oval, and extend into the polar cap. They occur predominantly during intervals of northward IMF (Troshichev et al., 1988, Valladares et al., 1994), and there is some evidence for IMF B_Y control of the local time at which the arc initially forms (Gussenhoven, 1982; Elphinstone et al., 1990; Makita et al., 1991; Kullen et al., 2002). Milan et al. (2005) proposed that transpolar arcs might be related to magnetotail reconnection following lengthy periods of dayside reconnection with a significant IMF B_Y component. Such intervals of dayside reconnection lead to the presence of a cross-tail component of the magnetic field in the magnetotail (Cowley, 1981), and subsequent magnetotail reconnection results in fast eastward or westward ionospheric flows which are asymmetric across midnight MLT (Grocott et al., 2003, 2004). Milan et al. argued that transpolar arcs might be formed by the build-up of closed magnetic flux near midnight MLT, where closed magnetic field lines have one foot in the pre-midnight hemisphere, and the other post-midnight, and therefore their flow back toward the dayside magnetosphere is frustrated. If the Milan et al. (2005) hypothesis is correct, then an anticorrelation should be observed between IMF B_Y and the local time at which transpolar arcs form, and fast ionospheric flows should be observed directed away from the arc and across the midnight meridian. In this presentation, we show the results of a statistical study of 209 transpolar arcs observed by the FUV cameras on the IMAGE satellite between June 2000 and September 2005. Most of the events occur when the IMF has a northward component. There is an anticorrelation between the magnetic local time at which the arcs form and the IMF B_Y component in the time leading up to the start of the arc; the anticorrelation is strongest when the IMF is averaged over the 4 hours prior to the start of the event. Examination of SuperDARN data also reveals that most of the events for which there is good ionospheric scatter are also associated with fast eastward or westward ionospheric flows. These observations are consistent with the mechanism proposed by Milan et al. (2005).