



A statistical study of the open flux content of the magnetosphere at the time of substorm onset

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Making use of the Frey database of substorm onsets, we present a statistical study of the open magnetic flux content of the magnetosphere at the time of substorm onset for 150 substorms from the December and January months of 2000-2002. A semi-automated method of identifying the open/closed magnetic field line boundary from IMAGE FUV images has been developed and is used to quantify the open flux content of the magnetosphere. We compare the open flux at the time of substorm onset with that of a parent distribution of open flux at all times for over 23000 auroral images. We show that substorm onset occurs on average at higher fluxes than the flux at non-onset times, supporting the view that an open flux threshold is a necessary, but not sufficient, condition for substorm onset. By searching for LANL signatures of substorm onset we show that only ~50 % of the substorms in this study can be associated with a LANL onset signature, suggesting not all the substorms in the Frey study are true substorms. Substorms associated with a clear LANL particle injection signature are seen to occur at higher values of open flux than those showing only small enhancements or no signatures at all, giving further evidence of an open flux threshold requirement for substorm onset.