

# **INVESTIGATING THE RELATIONSHIP BETWEEN THE OPEN MAGNETIC FLUX AT THE TIME OF SUBSTORM ONSET AND SUBSTORM PARTICLE INJECTION SIGNATURES.**

P.D BOAKES<sup>1,2</sup>, S.E. Milan<sup>1</sup>, G.A. Abel<sup>2</sup>, M.P. Freeman<sup>2</sup>, G. Chisham<sup>2</sup> and B. Hubert<sup>3</sup>

<sup>1</sup>Department of Physics and Astronomy, University of Leicester, Leicester, LE1 7RH, UK.

<sup>2</sup>British Antarctic Survey, Cambridge, UK.

<sup>3</sup>Laboratory of Planetary and Atmospheric Physics, University of Liege, Belgium.

The mechanism which leads to substorm onset is an outstanding question in magnetospheric physics. Previous studies have shown that substorm onset can be associated with external triggers in the solar wind whilst others occur independently of these changes. In this study we investigate the idea of a critical threshold in the open magnetic flux content of the magnetosphere as a necessary and/or sufficient condition for substorm onset. Using auroral images from the Wideband Imaging Camera (WIC) onboard the IMAGE spacecraft, an automated method of quantifying the open magnetic flux content of the magnetosphere has been developed. By applying this method to over 12000 auroral images from December and January 2000-2002, encompassing some 173 substorms, we determine the probability of substorm onset as a function of open flux. Splitting the substorm distribution into three categories based on their particle injection signatures at geosynchronous orbit as seen by the LANL spacecraft, we show that substorms associated with a classical substorm injection signature occur, on average, at higher values of open magnetic flux than those showing varied or no particle injection signatures. We investigate the apparent relationship between open flux at substorm onset with particle injection signatures by carrying out a superposed epoch analysis of the open magnetic flux, solar wind and magnetic activity around the time of substorm onset.

Substorm onset, particle injections, open flux

Peter Boakes, Department of Physics and Astronomy, University of Leicester, Leicester, LE1 7RH, UK, Tel: +44 116 252 3565, email: p.boakes@ion.le.ac.uk