



Global morphology of substorm growth phases observed by the IMAGE-SI12 imager

C. Blockx (1), J.- C. Gérard (1), V. Coumans (1), B. Hubert (1) and M. Connors (2)

(1) LPAP, Université de Liège, Belgium, (2) AUGO, Athabasca University, Canada
(c.blockx@ulg.ac.be)

We present case studies and a statistical summary of global observations of proton precipitation made during substorm growth phases. Our analysis is based on observations obtained with the SI12 Spectrographic Imager on board the IMAGE satellite which images the Doppler shifted Lyman- α auroral emission at 121.8 nm every two minutes. We use SI12 images of the proton precipitation to determine the equatorward motion of the auroral oval and the size of the polar cap boundary during the growth phase on the global scale. The statistical study shows that the sector of maximum proton precipitation during the growth phase is generally located around 2200 MLT, and rapidly moves in local time by about 1.2 hour toward midnight at the time of the onset. We also show that the open magnetic flux increases by as much as 33% during the growth phase. The open magnetic flux usually drops following the onset of triggered substorms but generally continues to increase for non-triggered events. The rate of equatorward displacement is statistically correlated with the magnitude of the southward B_z component of the IMF measured by the ACE satellite, and with functions describing the efficiency of solar wind energy transfer. The equatorward motion may be global, restricted to local time sectors or a combination of both. No nightside local time sector where the motion of the equatorial boundary would be more pronounced appears to be favored.