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Contribution of the "driven process" and the "loading-unloading process" during substorms: a study based on the IMAGE FUV imager

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Substorm energetics has been asserted to have two components, the "loading – unloading" component releasing previously stored energy in the tail and "directly driven" component dissipating simultaneously fed solar wind energy. Previous studies disagree about the relative importance of each process. The SI12 Spectral Imager on board the IMAGE satellite provides images of the Doppler shifted Lyman-α auroral emission at 121.8 nm every two minutes. It has been used to determine the hemispheric power during substorms, which may be compared to the solar wind characteristics and IMF components before and/or after the substorm onsets. In this study, we analyse 262 substorms between June 2000 and December 2002, which satisfy visibility criteria relative to the viewing conditions. We compare the mean hemispheric precipitated power during the expansion phase with the magnetic open flux, the ?gparameter, and coupling functions (most appropriate to describe the energy released in the proton aurora) averaged over the growth phase or the expansion phase. The mean hemispheric power during the expansion phase is well correlated with coupling functions averaged during the growth phase (r = 0.64). But we also found that the correlation between the mean hemispheric power during the expansion phase and the coupling functions averaged during the expansion phase is lower but still significant (r = 0.55). This implies that, even if both mechanisms contribute to the energy release during subtorms, the most statistically dominant process is the loading-unloading process.