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Nightside and dayside reconnection rates computed with IMAGE-FUV and SuperDARN data.

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The Imager for Magnetopause to Aurora Global Exploration (IMAGE) spacecraft was launched in 2000 with several imaging instruments onboard. The Far UltraViolet (FUV) experiment was devoted to the imaging of the N2 LBH (Wideband Imaging Camera - WIC-), OI 135.6 nm (Spectrographic Imager -SI13-) and Doppler-shifted Lyman alpha auroral emission (SI12). The Doppler-shifted Lyman-alpha emission is solely due to proton precipitation and is not contaminated by dayglow, allowing to monitor the auroral oval at dayside as well as at nightside. Remote sensing of the polar aurora can be advantageously completed by ground based data of the Super Dual Auroral Radar Network (SuperDARN) that monitors the ionospheric convection flow pattern in the polar region. In the present study, the SI12 images are used to determine the open/closed (o/c) field line boundary, and monitor its movement. The SuperDARN data are used to compute the electric field of the polar cap at the location of the o/c boundary. The total electric field is then computed along the boundary accounting for its movement applying Faraday's law, so that the dayside and nightside reconnection voltages can be retrieved. This procedure is applied to several substorms simultaneously observed with IMAGE-FUV and SuperDARN. The dayside reconnection voltage feeds the magnetosphere with open flux, which is later closed by nightside reconnection. The computed dayside reconnection rate is consistent with the solar wind properties measured with the GEOTAIL, WIND and ACE satellites. We identify the presence of nightside reconnection due to pseudobreakups taking place during the growth phase. We establish that, at substorm time, the nightside reconnection rate is maximum at the time of the substorm onset and then slowly returns to undisturbed values.