



## **An evaluation of the contributions of the distant and near-Earth neutral lines to magnetotail reconnection rates and magnetic flux closure**

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The expanding-contracting polar cap paradigm relates the dayside and nightside rates of magnetic reconnection to changes in the size of the ionospheric polar cap, the amount of magnetic flux in the magnetotail lobes, and the excitation of ionospheric and magnetospheric plasma convection. Expansions of the polar cap are the consequence of dayside reconnection, the merging of interplanetary magnetic flux with the terrestrial dipole to increase the proportion of the dipole that is open. Contractions of the polar cap are caused by magnetic reconnection in the magnetotail at a distant neutral (or X-) line (DXL) and near-Earth neutral line (NEXL), the latter especially during substorms, to reduce the open flux in the magnetosphere. There is debate surrounding the proportion of flux closure provided by the DXL and NEXL, and hence whether substorms dominate the nightside contribution to ionospheric and magnetospheric convection. This study utilizes a 7-day interval of auroral observations from the Imager for Magnetopause-to-Aurora Global Exploration (IMAGE) satellite and convection measurements by the Super Dual Auroral Radar Network (SuperDARN) to quantify the nightside rates of reconnection during substorm and non-substorm periods and hence investigate DXL and NEXL flux closure.