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Multi-stage polar cap convection response to enhanced interplanetary driving

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In two case studies we investigate the response of ionospheric
convection to enhanced magnetopause reconnection rate leading to repetitive substorm activity. Our interplanetary (IP) driver is coronal mass ejections (CMEs). The aim is to estimate the cross-polar cap potential (CPCP) at high temporal resolution (1 min). To achieve this, we use a method where we
combine direct measurements of the CPCP from satellite ion drift data, which have limited temporal coverage, with high-resolution (1 min) ground observations of equivalent convection in the central polar cap, obtained from the polar cap index in the northern hemisphere (PCN). In our CPCP estimates we distinguish between contributions from different sectors of the polar cap (center and periphery) as well as from the dayside and nightside sources. The polar cap (PC) periphery is characterized by channels of enhanced antisunward flows, which are particularly pronounced in the winter hemisphere. These flow channels are continuously monitored by ground data from the IMAGE chain of magnetometers in Svalbard - Scandinavia - Finland. They are discussed as stages in the evolution of the Dungey flux circulation cycle driven by both dayside and nightside sources. Following Siscoe et al. (2011) we distinguish between two stages of the evolution of the convection response, i.e. an initial transient phase, and a subsequent persistent phase.