Recurrent Formation of a Dawnside Electric Current System During Geomagnetic Storms

This study identifies a previously undocumented pattern of the formation and development of an electric current system during geomagnetic storms, which causes large magnetic disturbances in the dusk sector, where the risk of GICs is very often overlooked.

- During geomagnetic storms a wedge current system forms recurrently in the dawn sector as the westward auroral electrojet (WEJ) intensifies.
- Whereas the associated upward FAC stays at postmidnight, the intensified WEJ extends eastward presumably along with the downward FAC.
- The dawnside wedge current system is accompanied by a major auroral intensification and the reduction of the cross-tail current.

An intense auroral current system forms recurrently on the dawn side during major geomagnetic storms causing large magnetic disturbances at midlatitudes.

Figure. Polar distributions of (a-d) SuperMAG equivalent currents, (e-h) AMPERE magnetic disturbances in different colors for different satellites, (i-l) AMPERE fitted magnetic disturbances (green arrows) and FAC density in blue for downward FACs and red for upward FACs at selected times during the 17-18 March 2015 event.