

EVOLUTION OF HIGH LATITUDE IONOSPHERIC CONVECTION ASSOCIATED WITH SUBSTORMS: SUPERDARN AND PFISR OBSERVATIONS

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In this paper, we discuss the evolution of the nightside high latitude ionospheric convection and the relevant current systems associated with substorms, with particular emphasis on those features near the Harang reversal region. Two different types of radars, including the SuperDARN coherent-scatter radars and the new advanced PFISR radar, as well as other complementary instruments, such as the IMAGE satellite and the THEMIS ASI array, have been utilized. We found that the auroral activity at substorm onset is located in the center of the Harang reversal and the nightside convection flows exhibit repeatable distinct variations at different locations relative to the substorm-related auroral activity. Taking advantage of the simultaneous flow and ionization measurements from PFISR, a current closure relation has been found between the Region 2 and the substorm field-aligned current systems. By synthesizing observations from these observations, a 2-D picture of the evolution of ionospheric substorm electrodynamics has been established, which reveals features of an important relationship between the Region 2 and the substorm current systems. We believe these observations can shed new light on the substorm-related magnetosphere-ionosphere coupling process and contribute to the building of a holistic picture of the substorm dynamics.

Ionospheric convection, Region 2 field-aligned currents, substorm

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