

## Overshielding at subauroral-equatorial latitudes at the onset of substorm

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The dawn-to-dusk convection electric field propagates instantaneously from the polar ionosphere to the equator, and causes the DP2 current system consisting of two-cell current vortices at high latitude and eastward current amplified by the Cowling effect at the dayside geomagnetic equator. Reversed currents have often been observed at subauroral-equatorial latitudes, when the convection electric field reduces its intensity because of northward turning of the IMF. The reverse current has been explained by means of an overshielding electric field due to the Region-2 field-aligned current (R2 FAC) that overwhelmed the convection electric field when the R1 FAC decreased its intensity. In this paper, we show a new type of overshielding that occurs at a substorm expansion onset. In addition to the conventional features, the overshielding has new features that the convection electric field increased concurrently and its onset was a few minutes earlier than the onset of the positive bay in the midnight. Considering that the R2 FAC is connected with the partial ring current, we suggest that a current circuit is created between the inner magnetosphere and the subauroral-equatorial ionosphere a few minutes prior to formation of the substorm current wedge.