Substorm impacts on inner magnetosphere convection

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Nighttime plasma convection in the subauroral and mid-latitude ionospheres as observed with the Wallops Island and Blackstone radars is typically westward directed until well past midnight at speeds of ~50 m/s under stable quiescent conditions. However, in the aftermath of substorm injections into the inner magnetosphere, these convection velocities can increase substantially for periods ranging from a few minutes to tens of minutes. The magnitude and duration of the convection enhancement is dependent on the strength and duration of the substorm. Velocities can increase from 10s to 100s of meters/second. Both the Wallops and Blackstone radars show these increases concurrently indicating that the flow enhancements are a large scale feature of the nighttime plasmapause boundary region. The flow enhancements are often accompanied by Pi1 and Pi2 pulsations and a companion paper by J. B. Baker will describe one example of a Pi2 pulsation that was observed in association with a THEMIS substorm. In this paper, we present several examples of flow enhancements associated with substorm onset and discuss their timing and duration relative to the substorm expansion and recovery phases.