

**SPACE-BORNE AND GROUND-BASED OBSERVATIONS OF TRANSIENT PROCESSES
OCCURRING AROUND SUBSTORM ONSET**

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The combined THEMIS five spacecraft in-situ and ground magnetic and visible camera arrays have advanced considerably our understanding of the causal relationship between midtail plasma flows, transient ionospheric features, and ground magnetic signatures. In particular, recent work has shown a connection between equatorward moving visible ionospheric transients and substorm onset, in both white-light (Nishimura et al., [2010]) and 6300 nm (Kepko et al., [2010]) emissions. These observations, together with THEMIS in-situ measurements of bulk flows, provides strict constraints on the sequence of events leading to substorm auroral onset. We first provide a brief summary of these observations, highlighting in particular areas where the two observations differ, and suggest reasons for the differences. Next, by combining the observed correlation of flow and Pi2 waveform with a unified model of global Pi2 generation and substorm current wedge initiation, we present a self-consistent description of the dynamical processes and communicative pathways that occur just prior to and during substorm expansion onset.