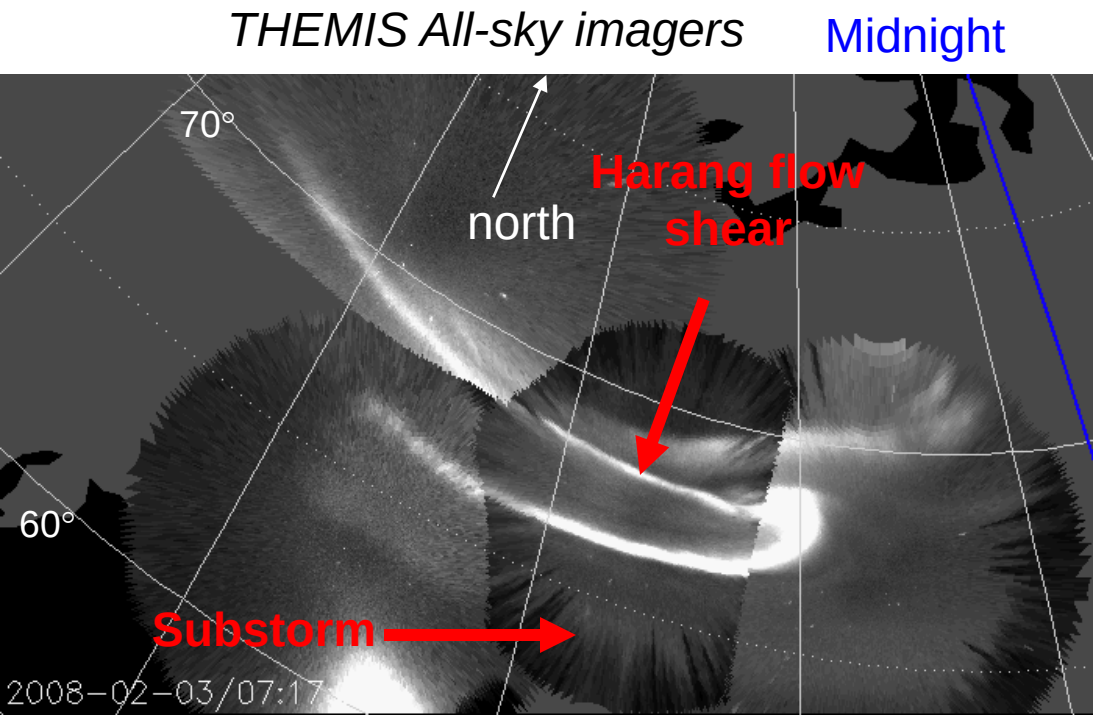
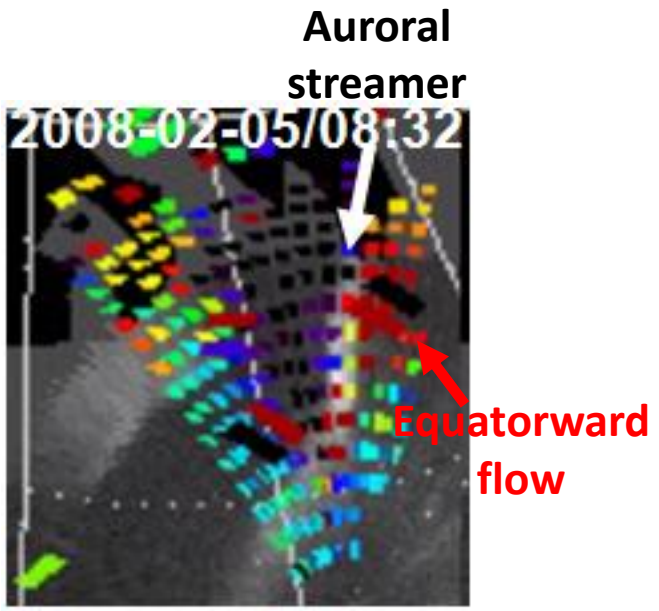
# Sequence of auroral substorms: Isolated and storm-time substorms

Toshi Nishimura (UCLA), Larry Lyons, Vassilis Angelopoulos, Takashi Kikuchi, Eric Donovan, and Stephen Mende



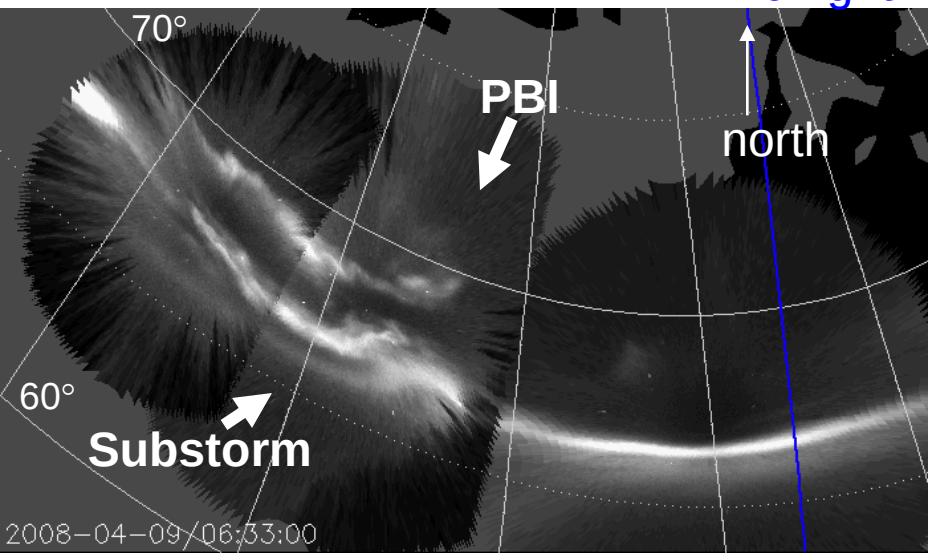



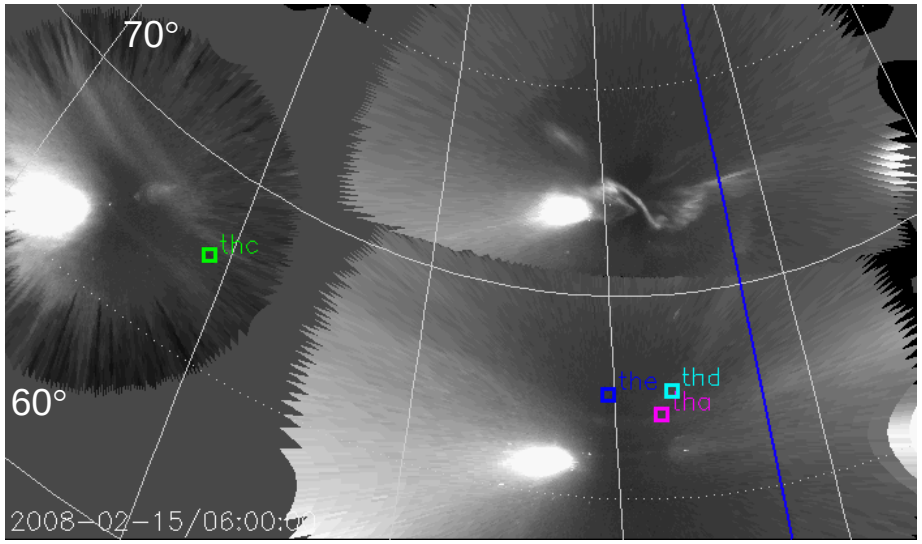

[Gallardo-Lacourt et al., GEM, 2012]

# Auroral streamer as onset precursor

*THEMIS All-sky imagers*

Midnight



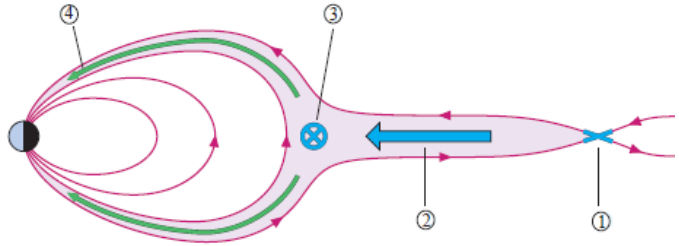



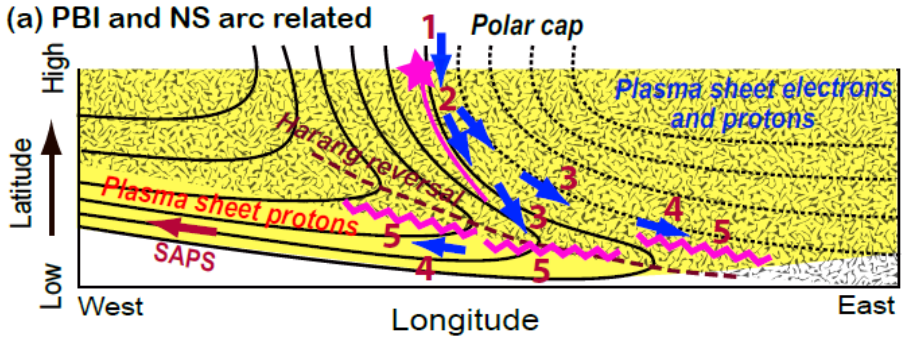

[Nishimura et al., 2010a, b]

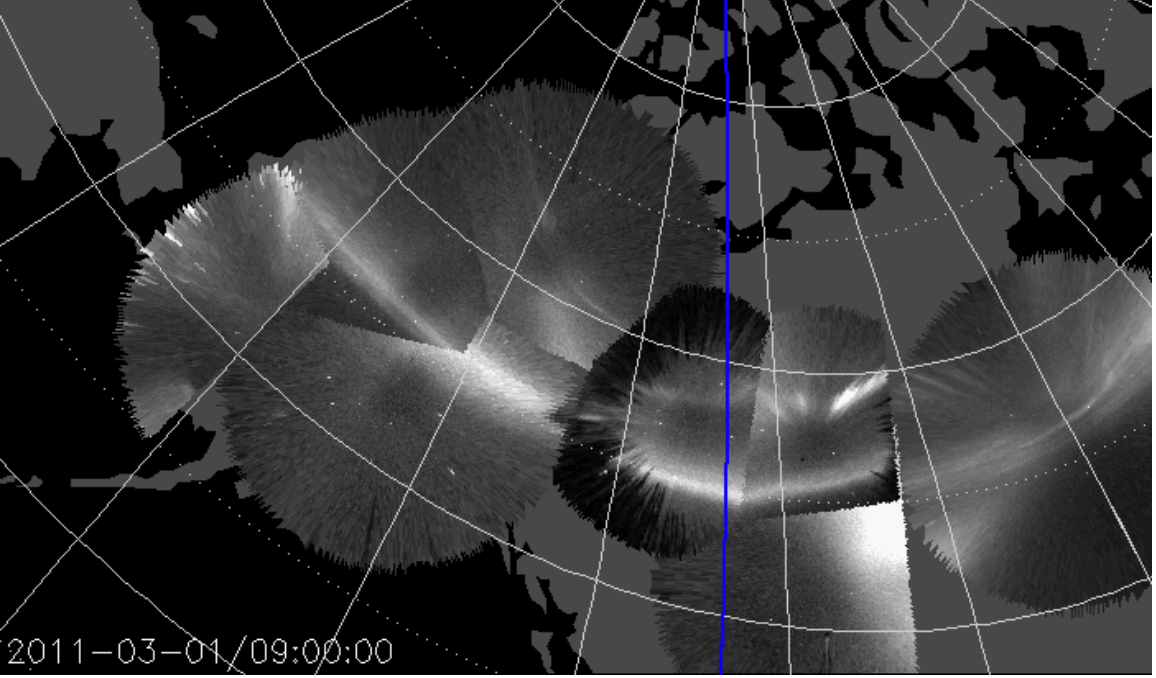
The auroral sequence indicates that the plasma flow to the near-Earth plasma sheet leads to the substorm onset.

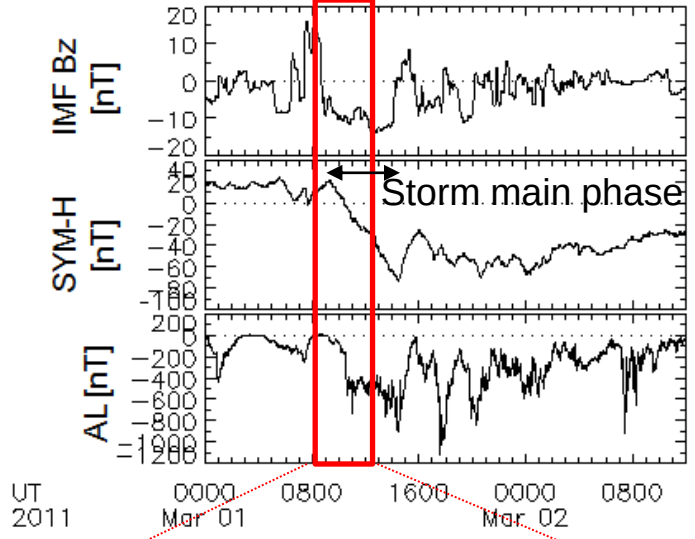
Streamer moving around the Harang flow shear toward the onset location, leading to onset.

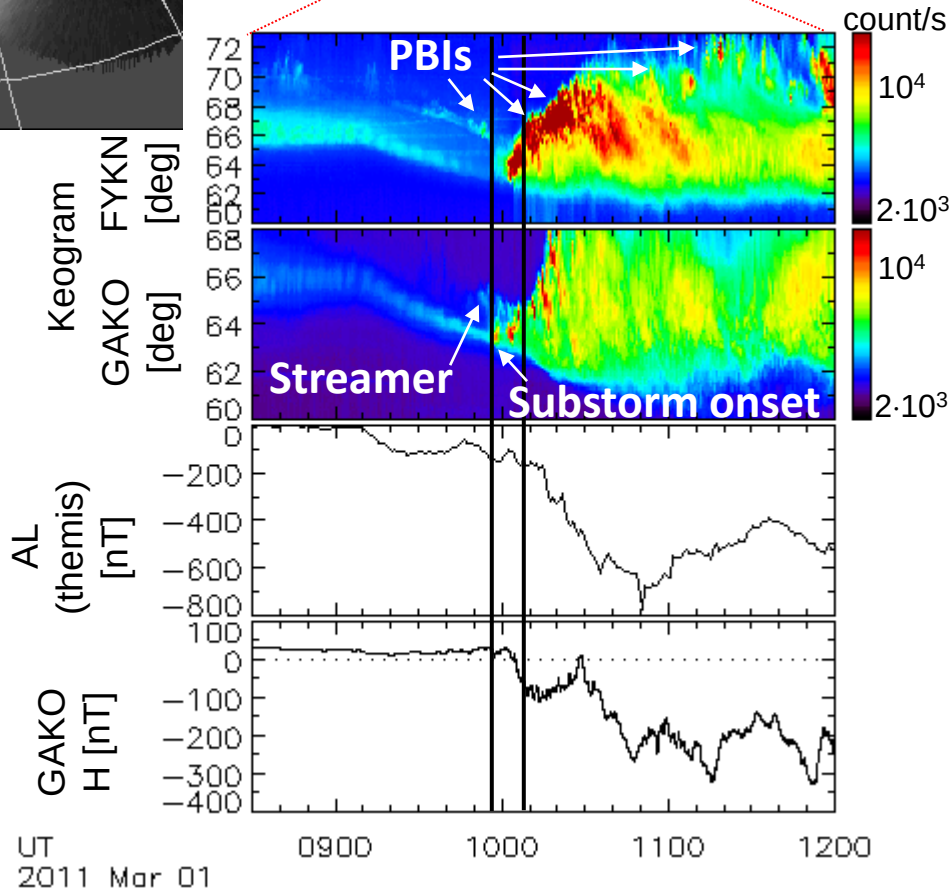
Transient localized flows play a key role in substorm onset.





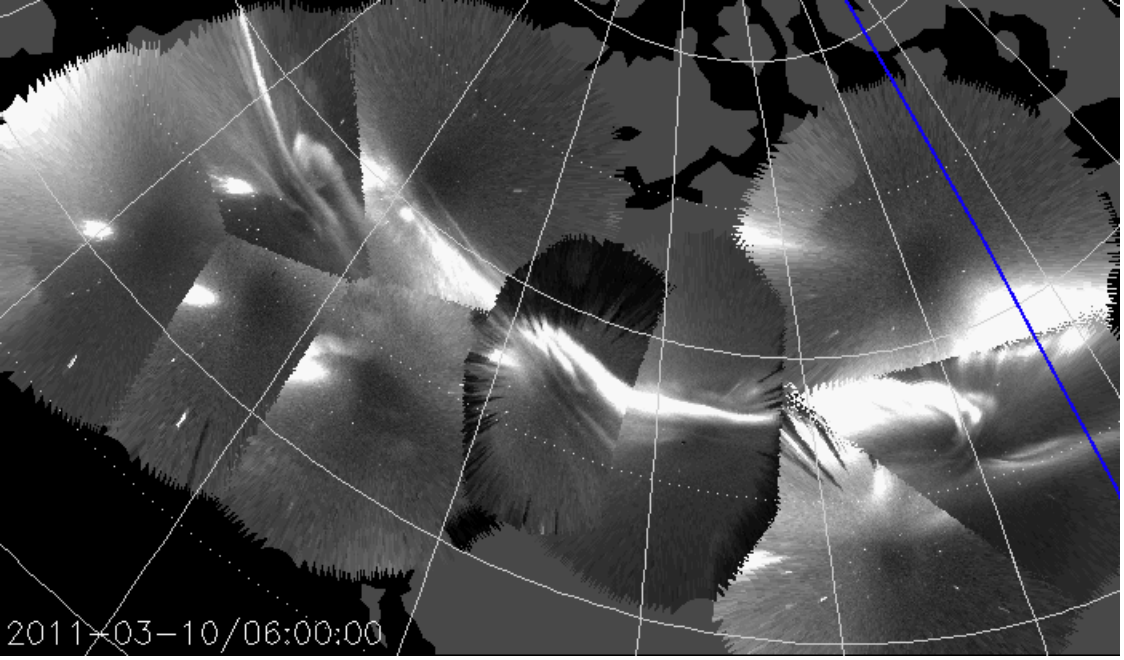



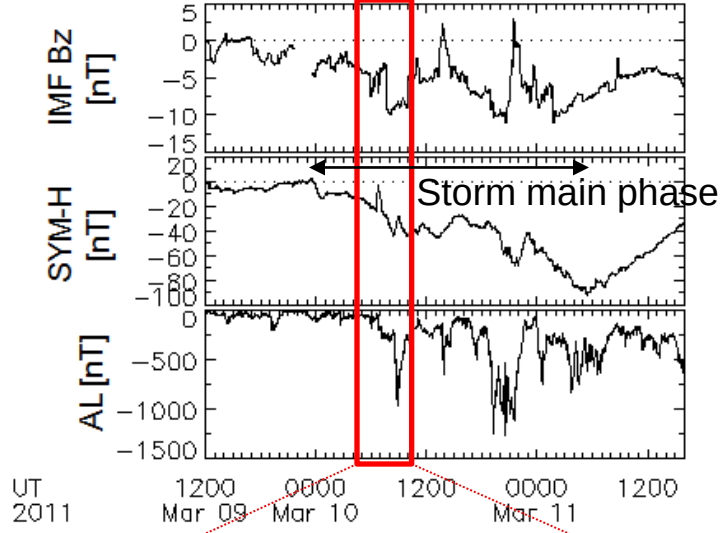



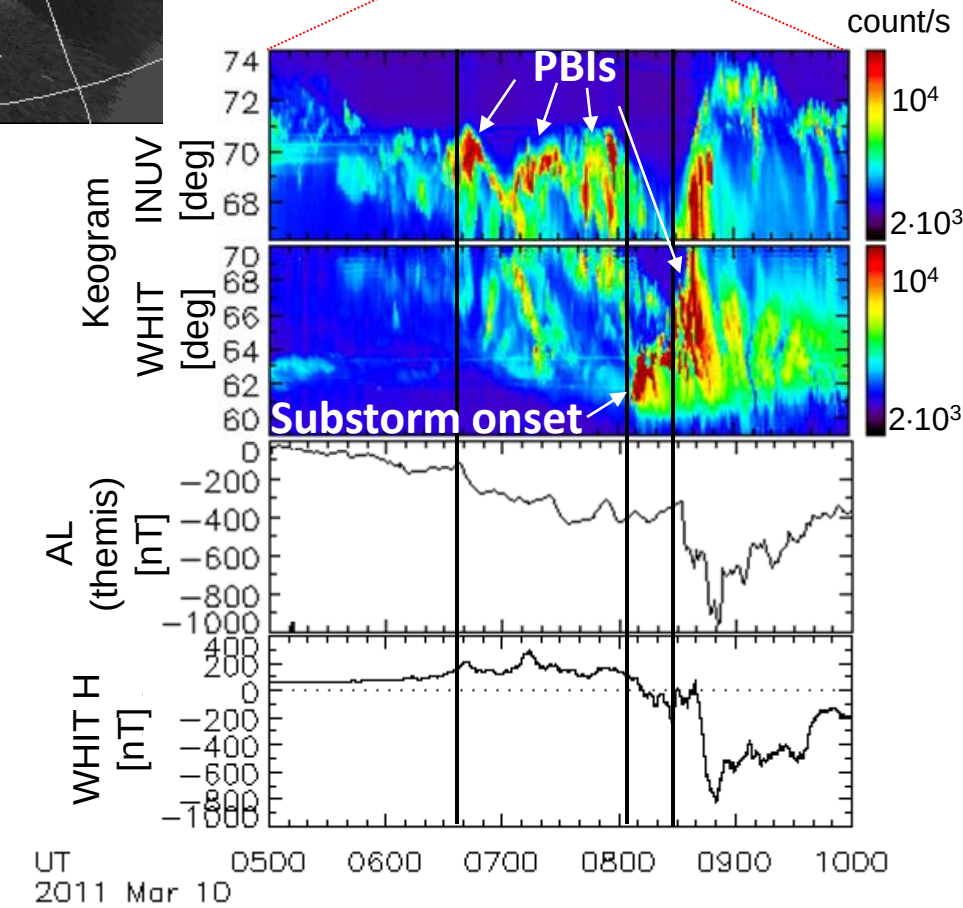

The precursor PBI and streamer can also be seen in the storm-time substorm.

The major AL decreases were not associated with substorm onset but with expansion-phase PBIs and streamers.

It suggests that multiple, transient flow bursts play an important role in the substorm expansion phase activity.

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Note also that auroral activity extends over a wide latitude and longitude ranges but includes meso-scale dynamical forms. Imaging with global coverage with high resolution is essential.