Multi-instrument Analysis of Surface Geoelectric Field Drivers

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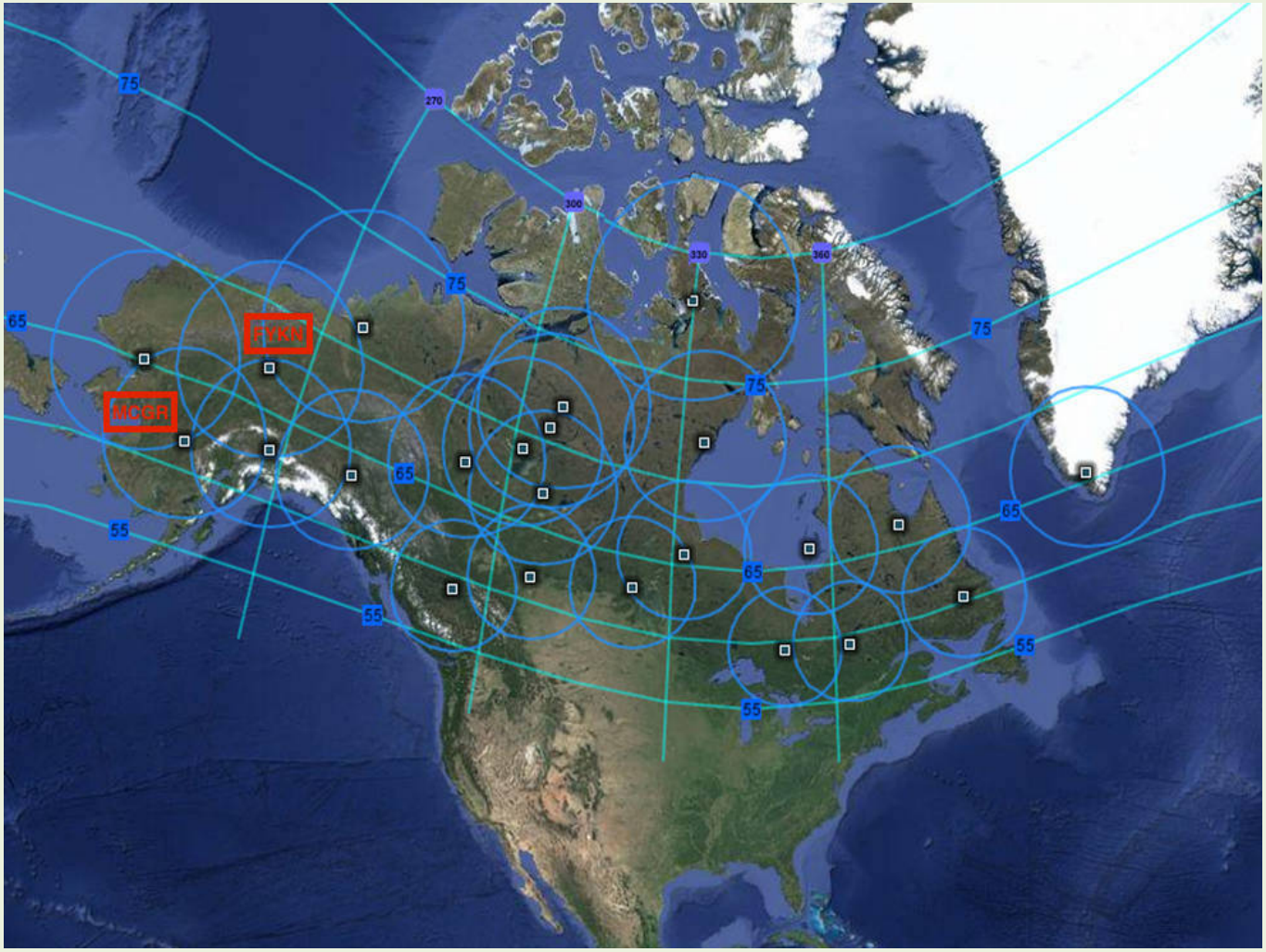
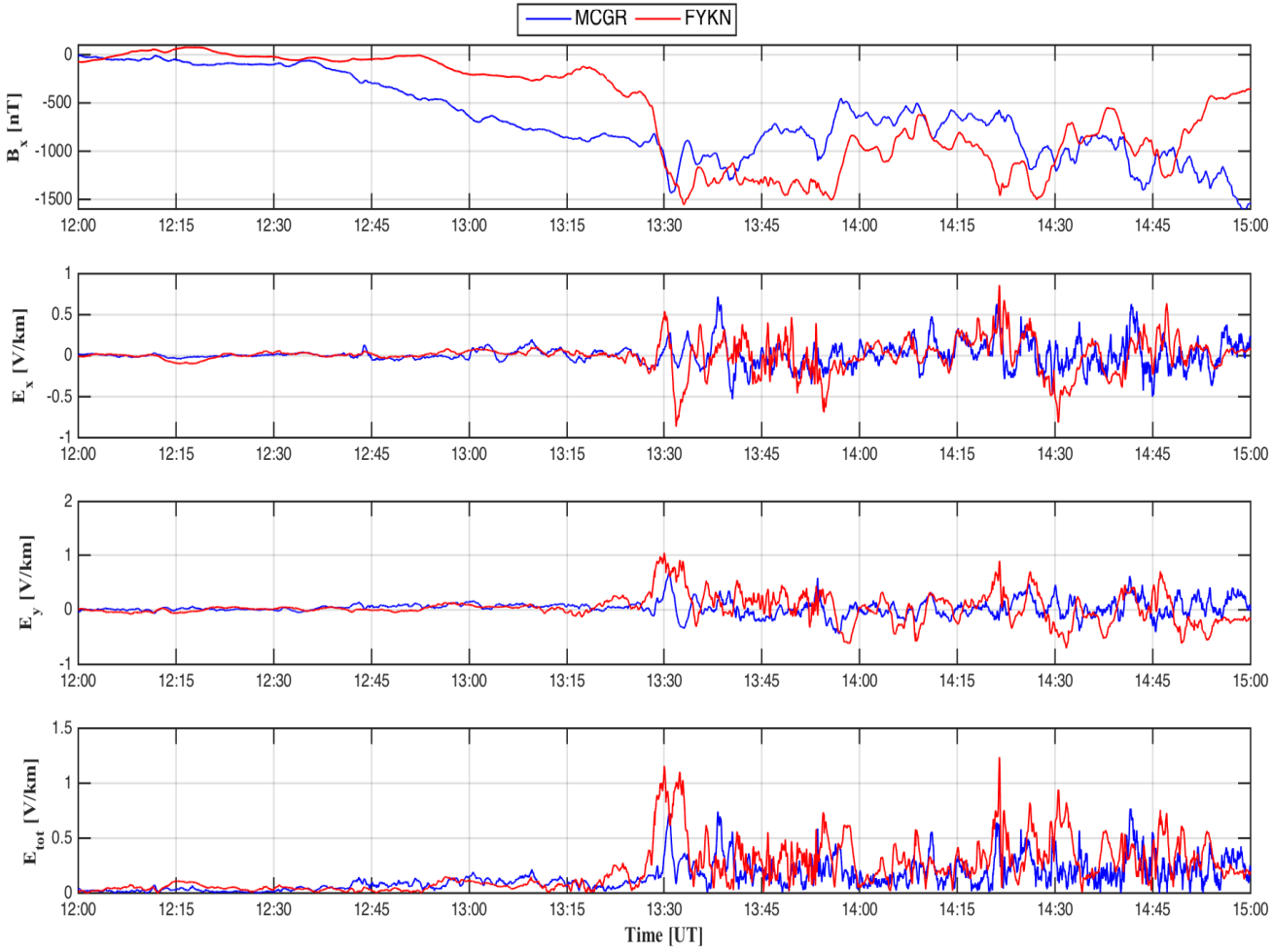
This Study

- The formation of E-fields due to temporal variation of the geomagnetic field is based on Faraday's law of induction.
- From a physical standpoint, the E-field is the basic quantity of interest for GIC since it is fundamentally controlled by currents in the magnetosphere and ionosphere, and by the conductivity structure of the earth
- A multi-instrument analysis of extreme surface E-fields during a geomagnetic storm on **17 March 2015** is presented.
- Our primary goal is to enrich our understanding of dynamic M-I currents that drive extreme E-fields during major geomagnetic storm events.

THEMIS Mission Ground Sites

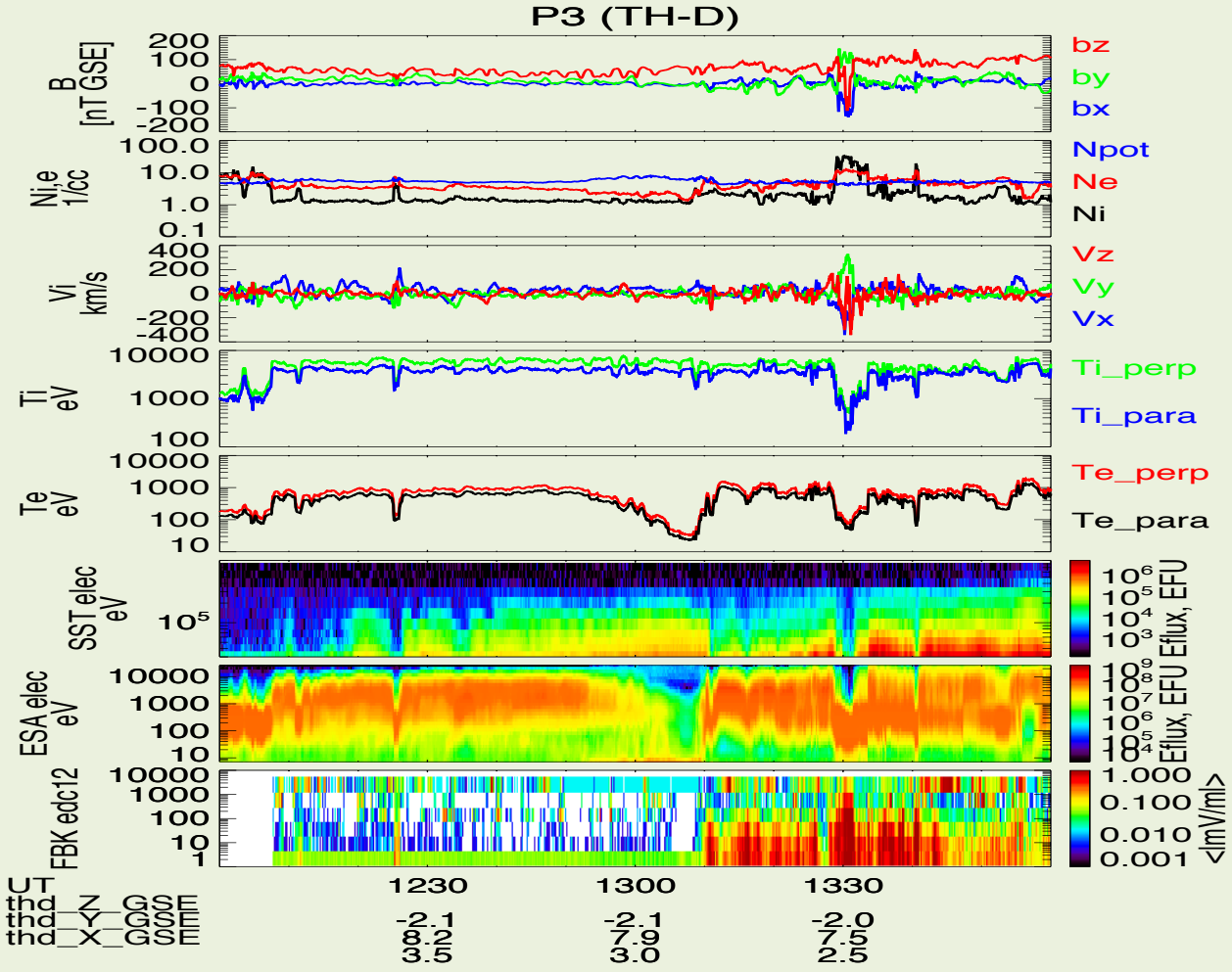


Magnetic and E-fields on March 17, 2015

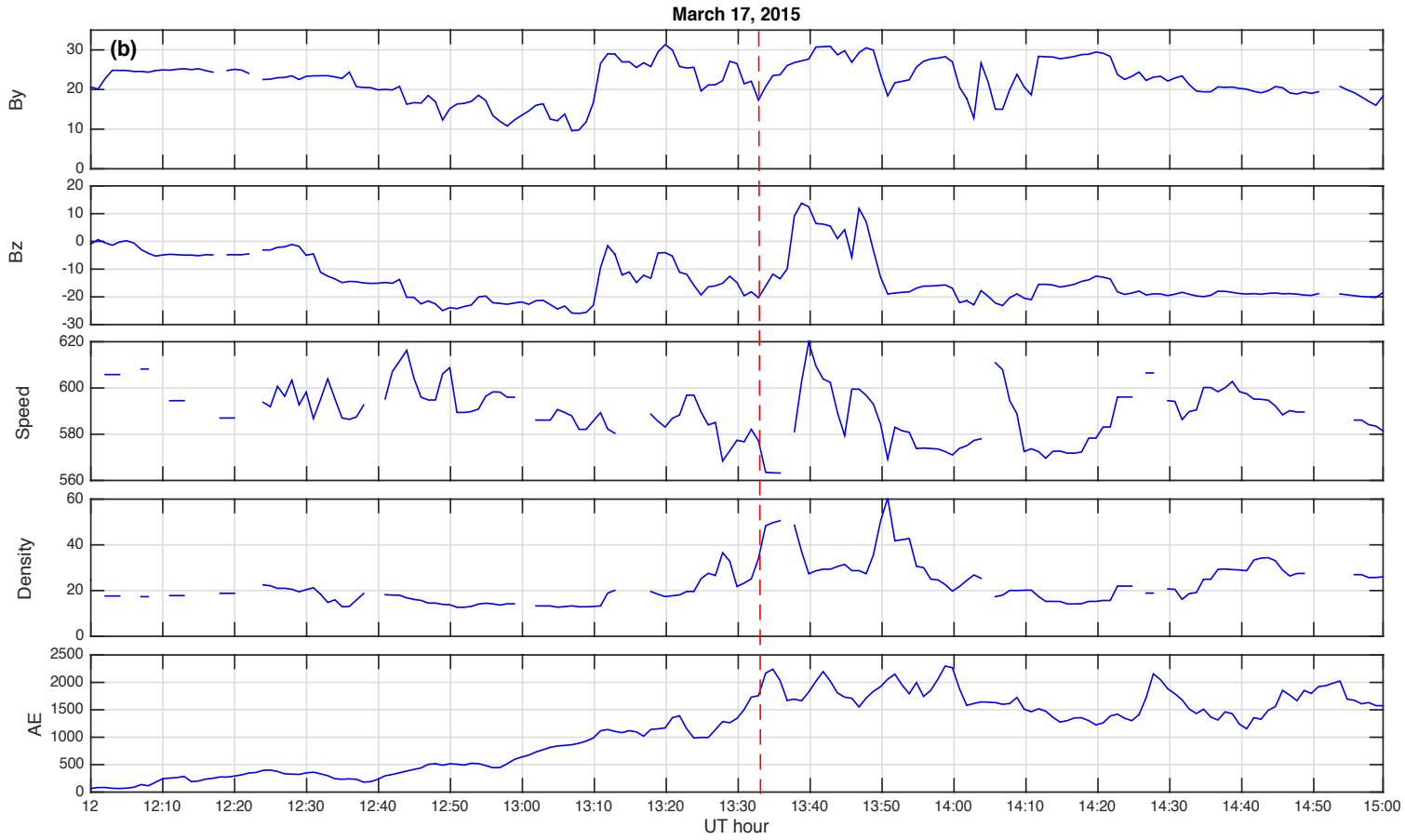


Fort Yukon and McGrath

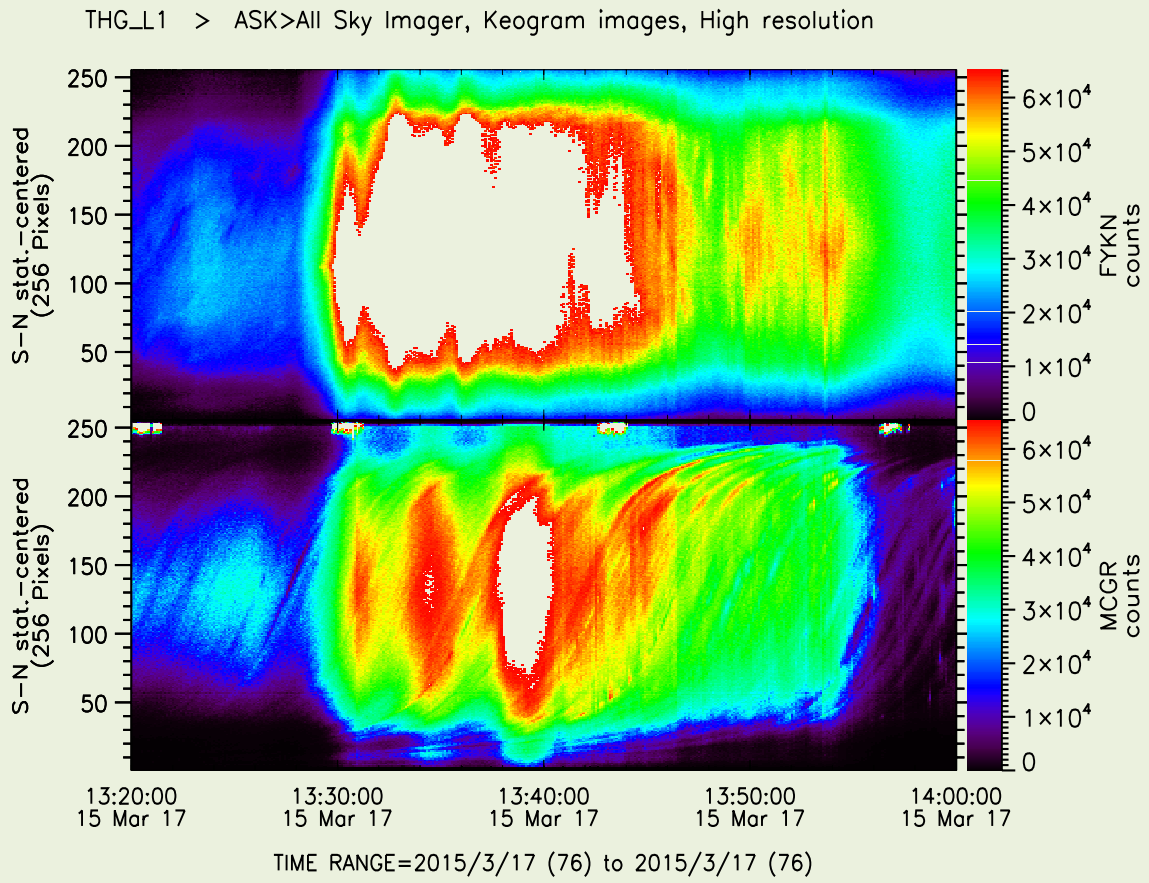
THEMIS-D Observations



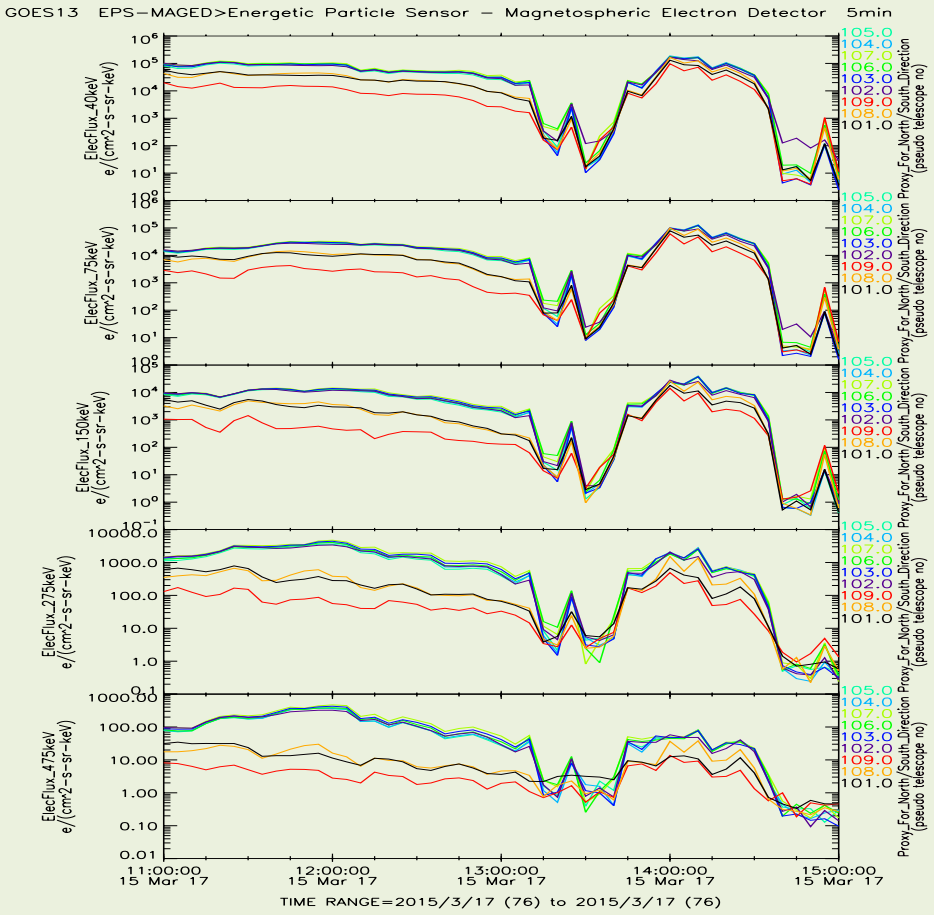
Solar Wind Measurements



All-Sky Imager Auroral Keogram Images



GOES 13 Electron Flux



Summary

- The interaction between interplanetary solar wind and the Earth's magnetosphere manifest many important space physics phenomena.
- For the first time, we combine THEMIS mission space-based and ground-based observations to examine magnetosphere-ionosphere signatures of E-field local extremes.
- To complement the THEMIS measurements, geosynchronous observations from GOES are provided to further examine the physical processes associated with the local extremes.
- We show that electron flux dropout is observed prior to E-field enhancement followed by a rapid build up of energetic electrons flux.
- This study suggests that to enrich our understanding of local E-field drivers, we must also understand the mechanisms for electron acceleration in the magnetosphere.

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