

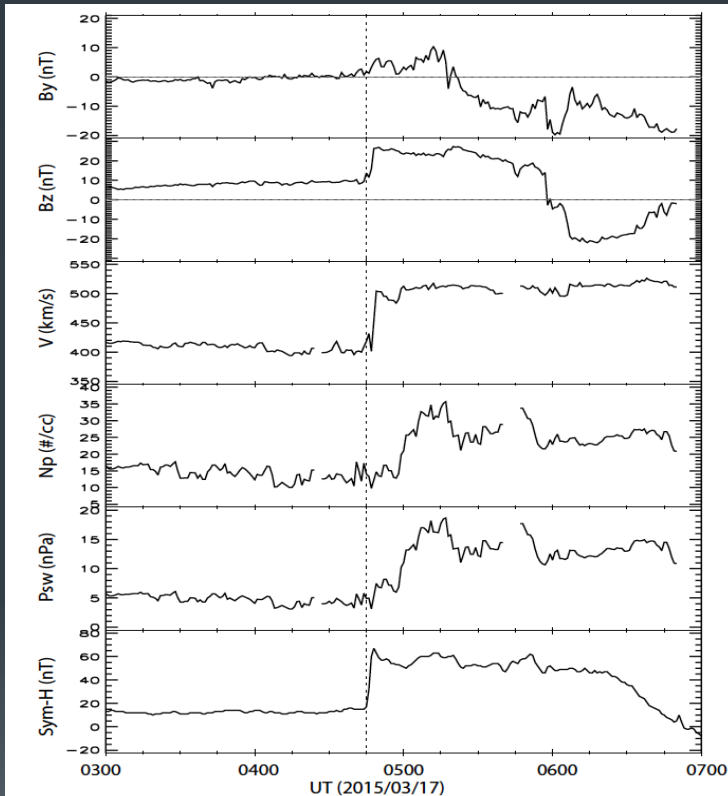
# Effects of Sudden Commencement on the Ionosphere: PFISR Observations and SWMF Simulation

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Aaron Ridley<sup>1</sup>

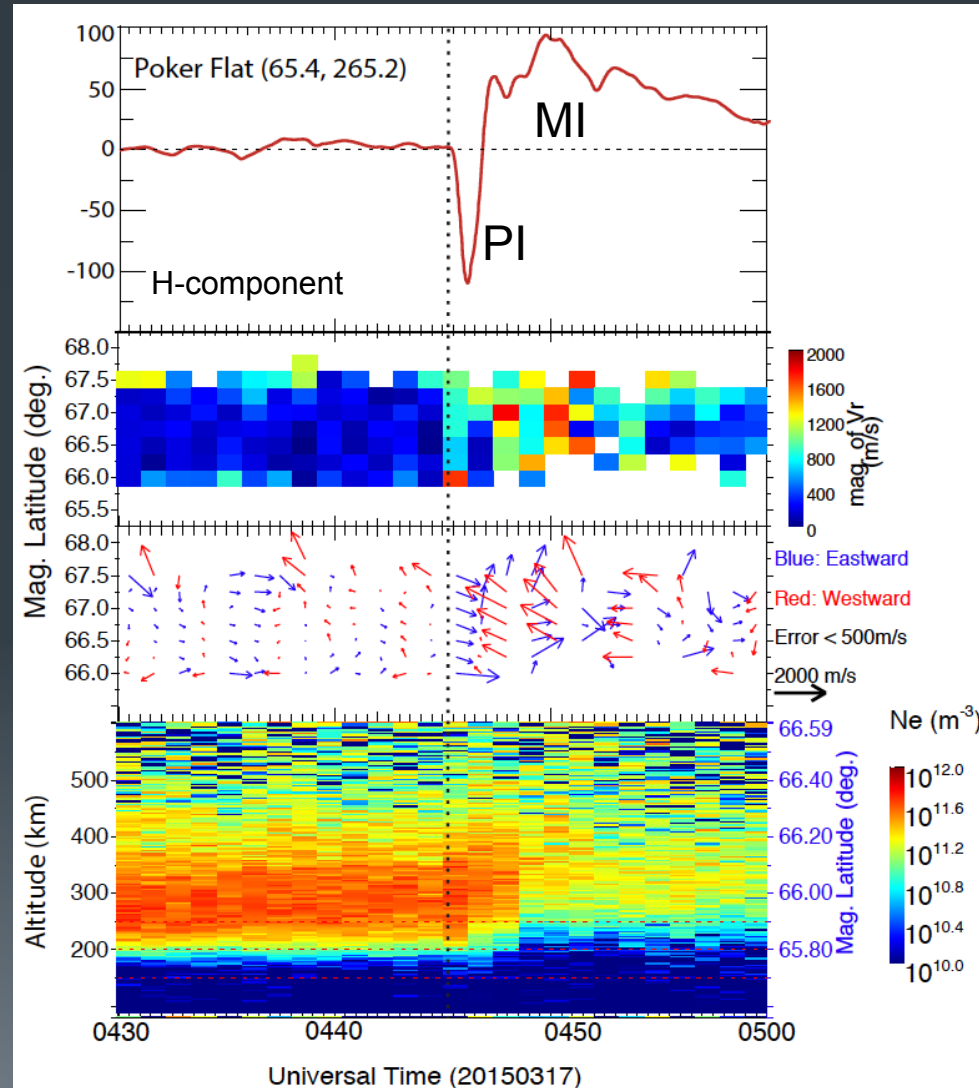
1. University of Michigan
2. SRI

# Ionospheric Response to 2015 St. Patrick Day Sudden Commencement

## OMNI solar wind and Sym-H

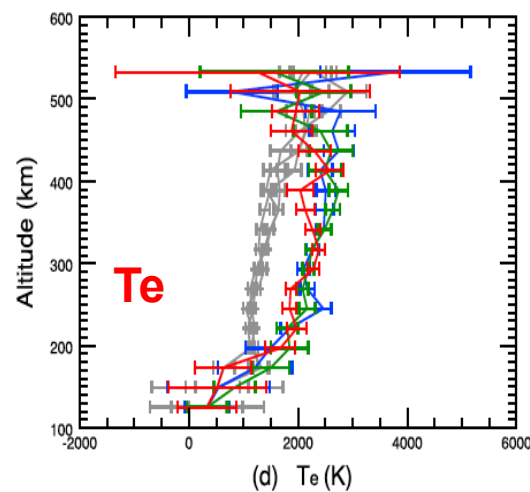
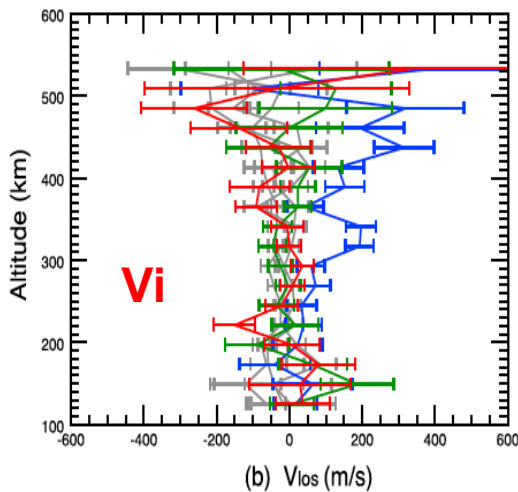
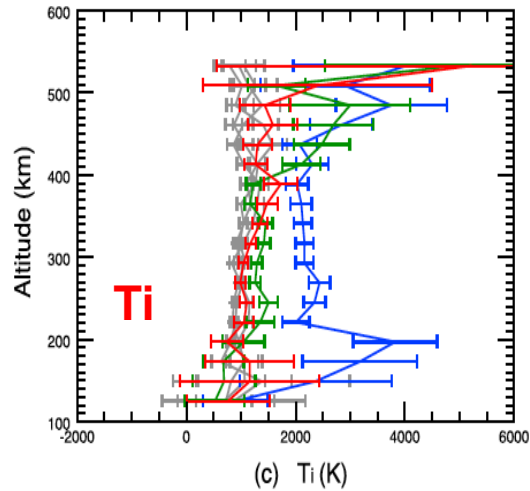
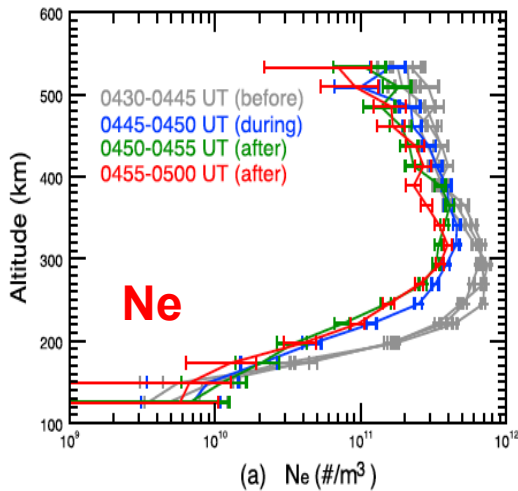


## PFISR and magnetometer



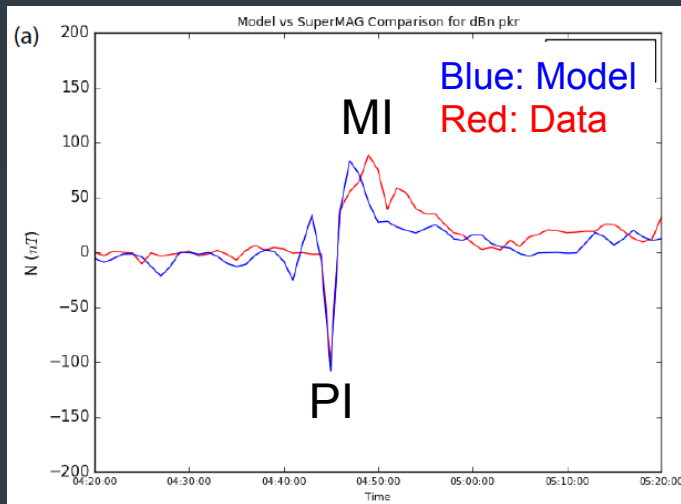
Zou, S., D. Ozturk, R. Varney, and A. Reimer (2017), Effects of Sudden Commencement on the Ionosphere: PFISR Observations and Global MHD Simulation, *Geophys. Res. Lett.*

# PFISR vertical profiles before and after the sudden commencement

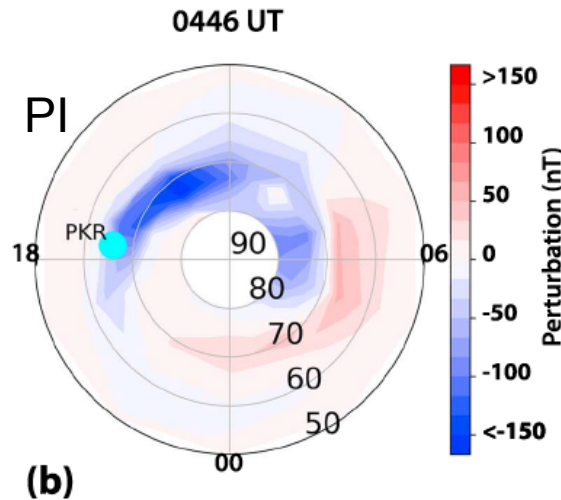


- PFISR observed lifting of the F region ionosphere;
- transient field-aligned ion upflow;
- prompt but short-lived ion temperature increase;
- subsequent F region density decrease;
- persistent electron temperature increase.

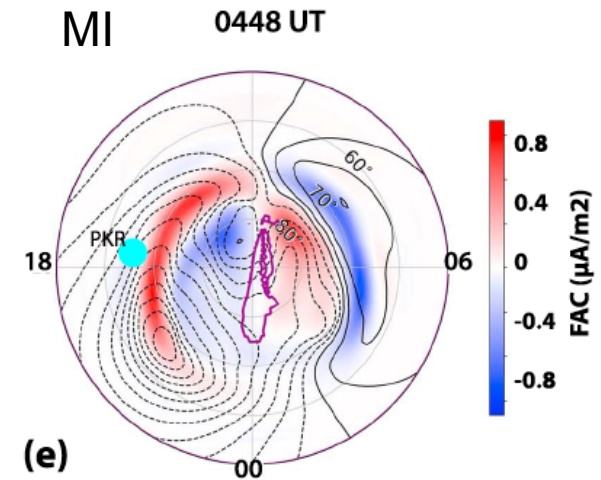
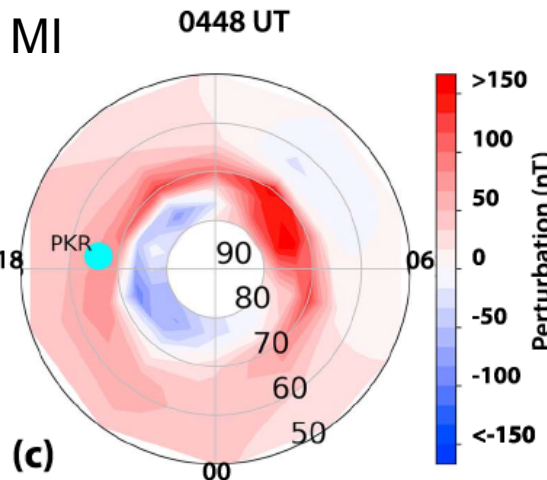
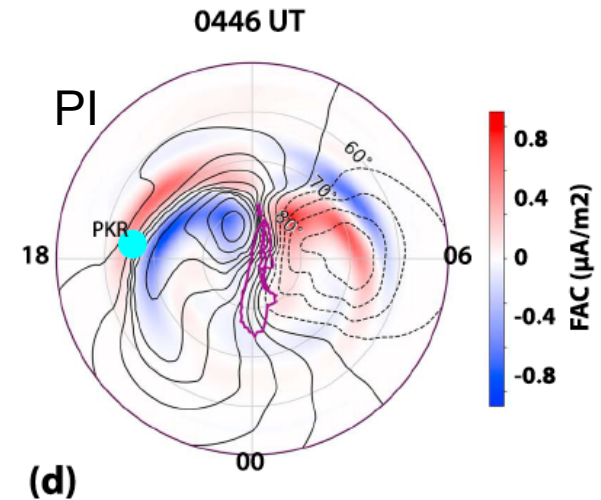
# FACs and Convection Pattern from Coupled BATSRUS MHD+CRCM Run



H-component perturbation contour



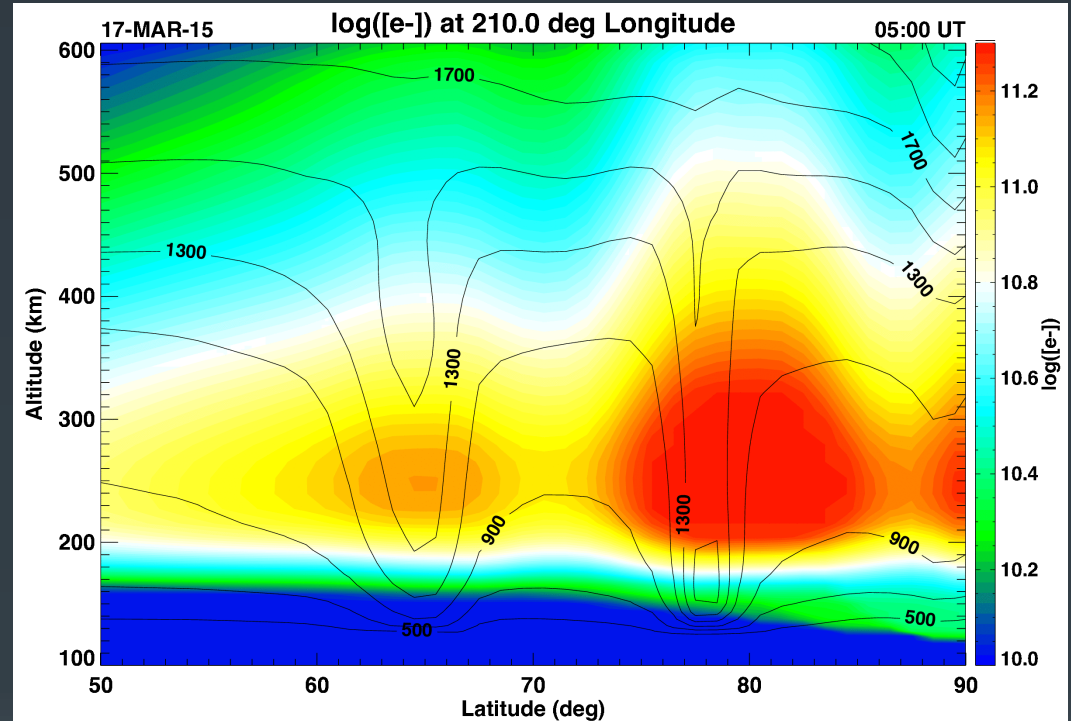
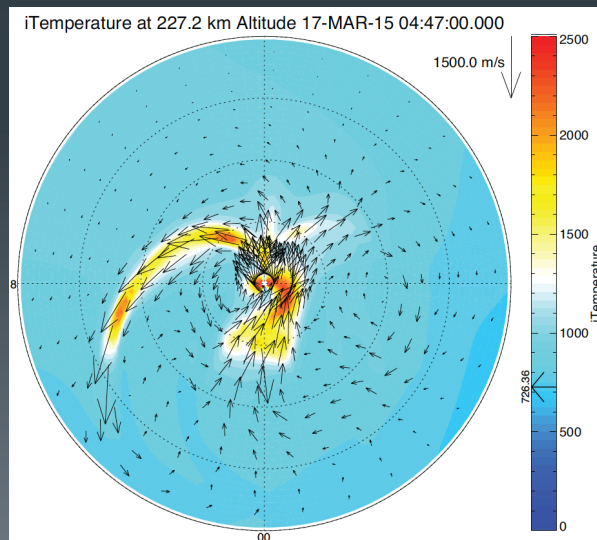
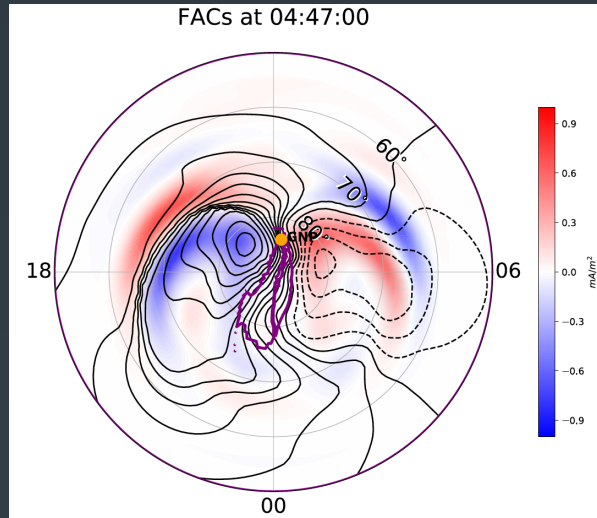
Field-aligned currents



## SWMF:

- used to characterize the SC-induced current, convection, and magnetic perturbations;
- provides a global context for linking localized PFISR observations to large-scale dynamic processes in the MI system.

# Preliminary Results from BATSRUS +CRCM Driven GITM Run



- GITM was driven by BATSRUS+CRCM output in order to study the global ionosphere response to SC.
- Preliminary results show rapid heating of ionosphere plasma and F-region density depletion.
- We will continue quantify the various processes that would create such rapid density loss.

# Summary and Conclusions



- During the SC of the 17 March 2015 storm, PFISR observed lifting of the F region ionosphere, large and transient field aligned ion upflow (type-1), prompt but short-lived ion temperature increase, F region density decrease and persistent electron temperature increase.
- The global BATSRUS MHD simulation revealed the distribution of large-scale FACs and their evolution and propagation through the polar cap.
- The MHD results are used to drive GITM to study the global effects of SC-related electrodynamics. Preliminary results show good agreement with radar observations.