

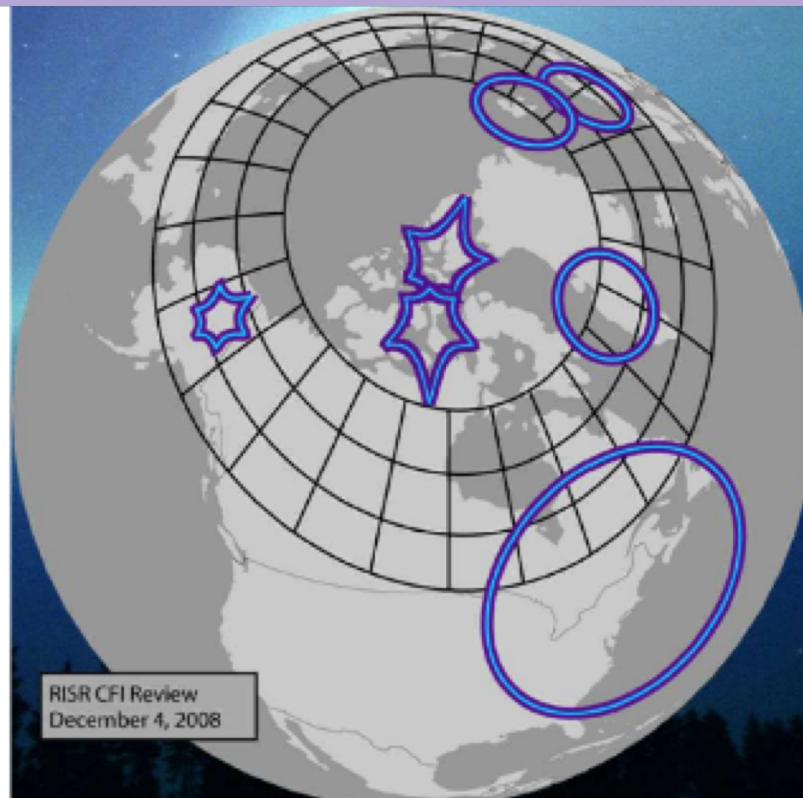
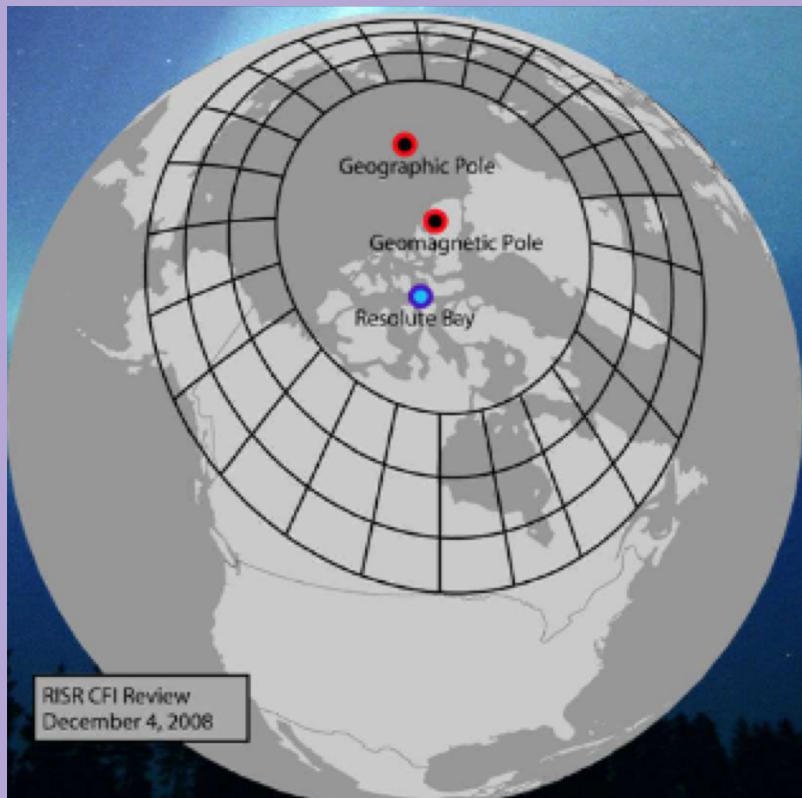
Observing the Auroral Oval

Group 2



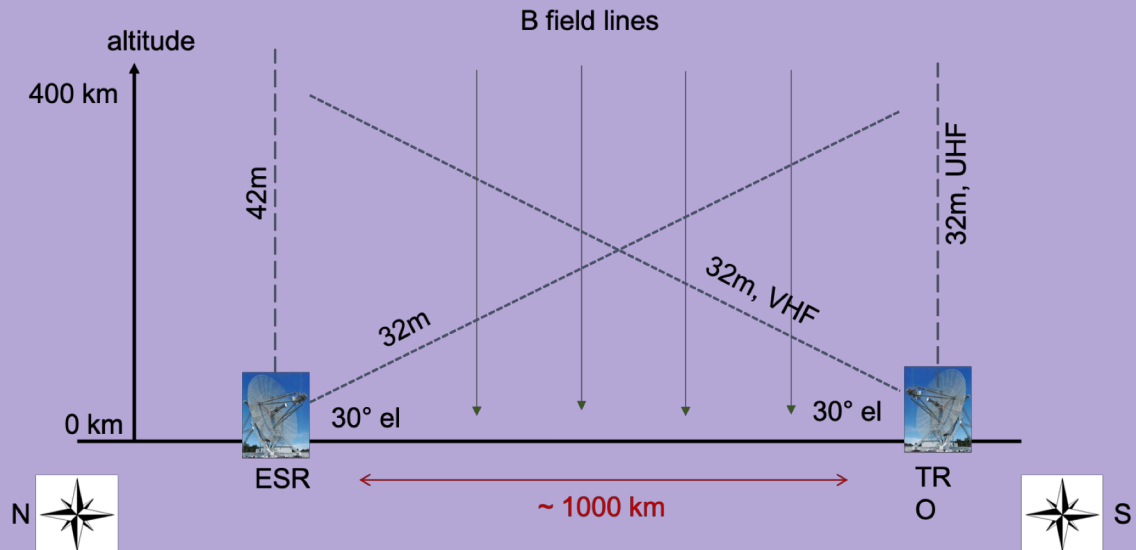
Audrey Schillings Swedish Institute of Space Physics (IRF), Kiruna, Sweden
Chizurumoke Michael Physics & Astronomy Dept., University of Leicester, UK
Caoimhe Doherty Mullard Space Science Laboratory, University College London
Nada Ellahouny Ionospheric Physics Research Unit, University of Oulu, Finland
Isaac Matthews Aerospace and Astronautics Dept., Stanford University, USA
Robert Irvin Dept. Of Electrical Engineering University of Illinois, Champaign IL

What to Investigate?



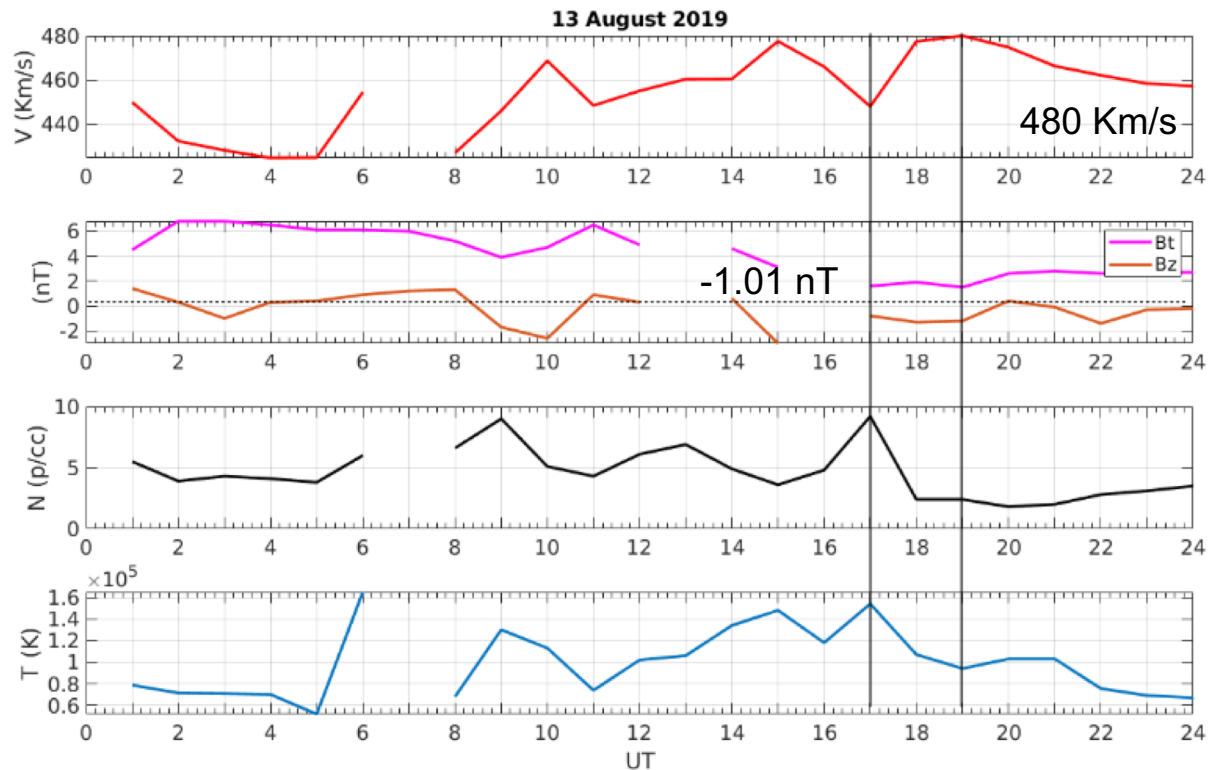
Experiment Setup

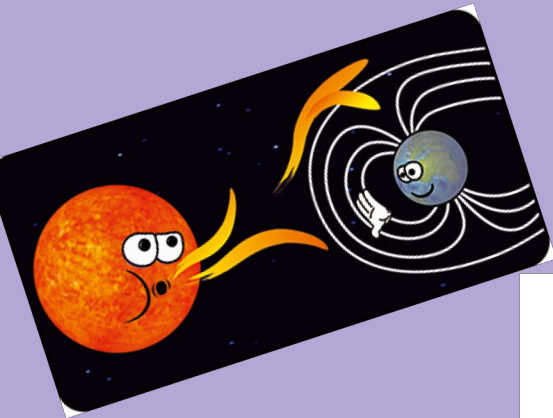
- Experiment time: 18-20 UT
- ESR (MLT=UT+2:45)
 - 42m: along B (el 81.6)
 - 32m: toward geomagnetic south, el 30
- EISCAT Tromso (MLT=UT+2:30)
 - UHF: along B
 - VHF: toward geomagnetic north, el 30



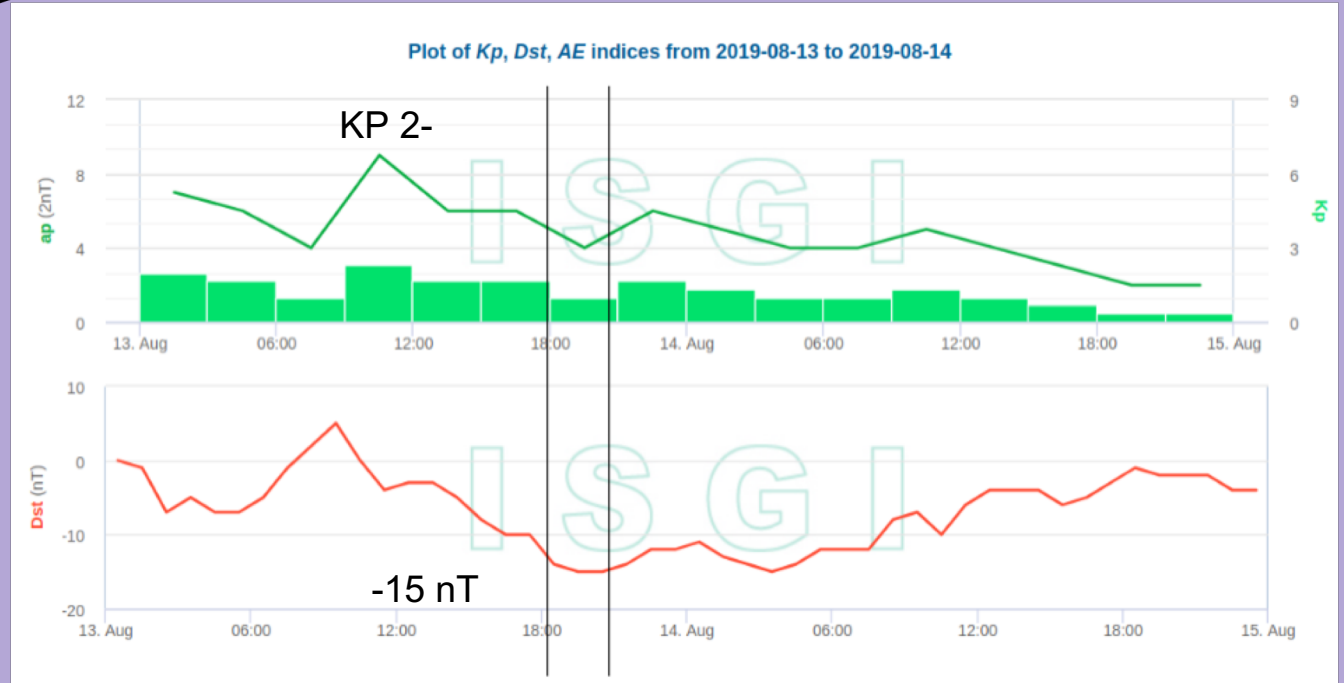


ACE data (SWPC)

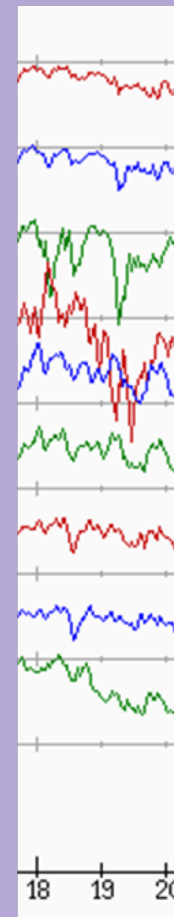
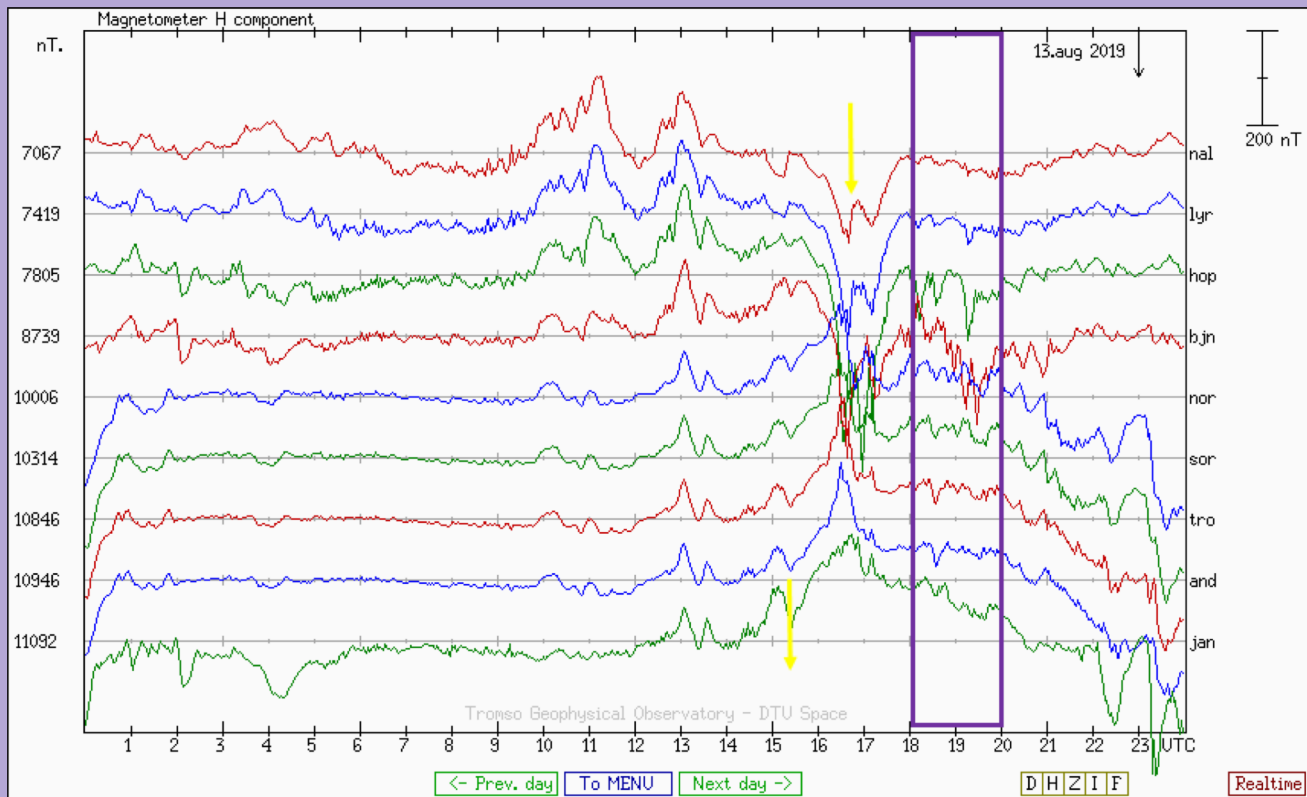




Global Magnetic indices

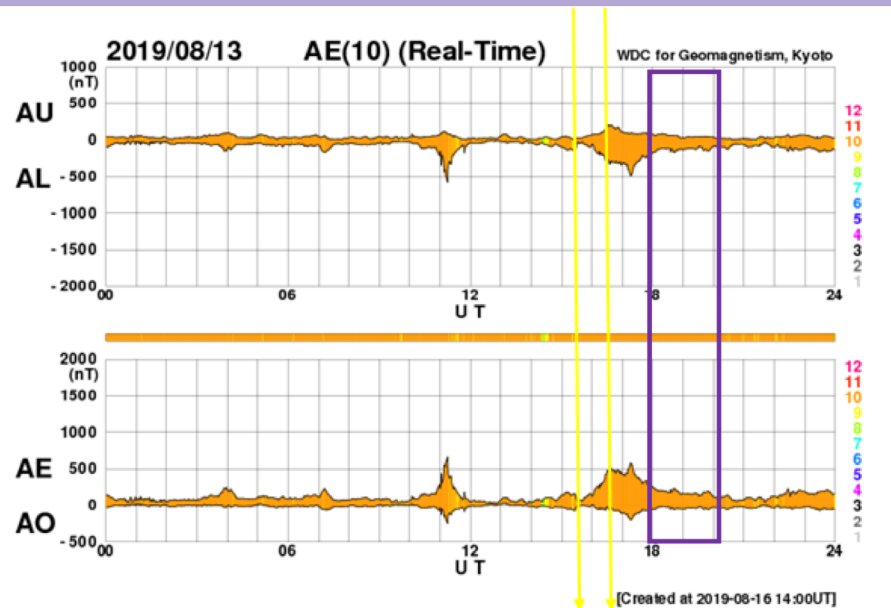
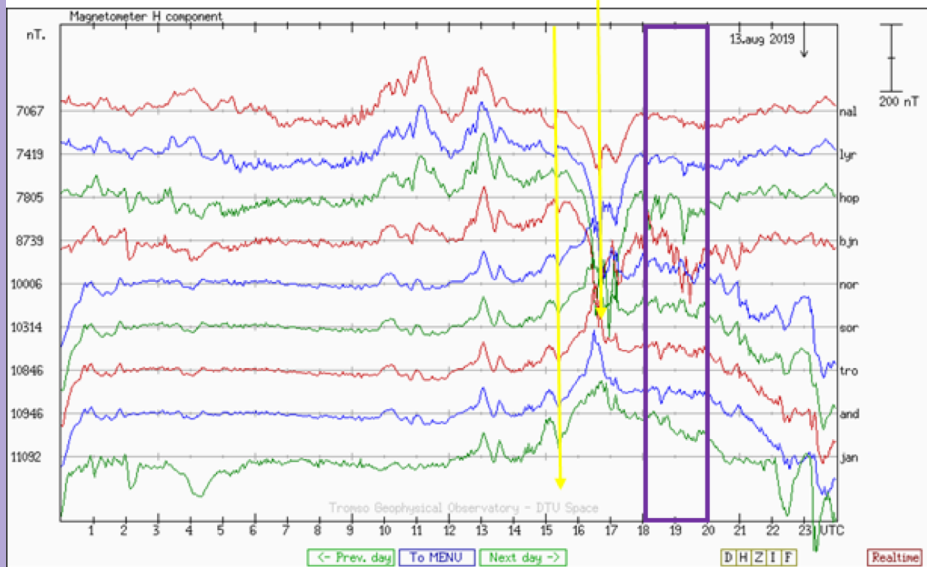


H-component magnetic field data for August 13th 2019.



- Ø Interval of radar observation (~ 18 – 20 UT).
- Ø A decrease ~15:45 and ~16:45 (high lat. Stns), a likely enhanced westward electrojet – a substorm signature.
- Ø Possible Substorm-enhanced particle population associated with the burst 1 hr before the time of radar

A comparison of H-component magnetic field and AE data for August 13th, 2019.

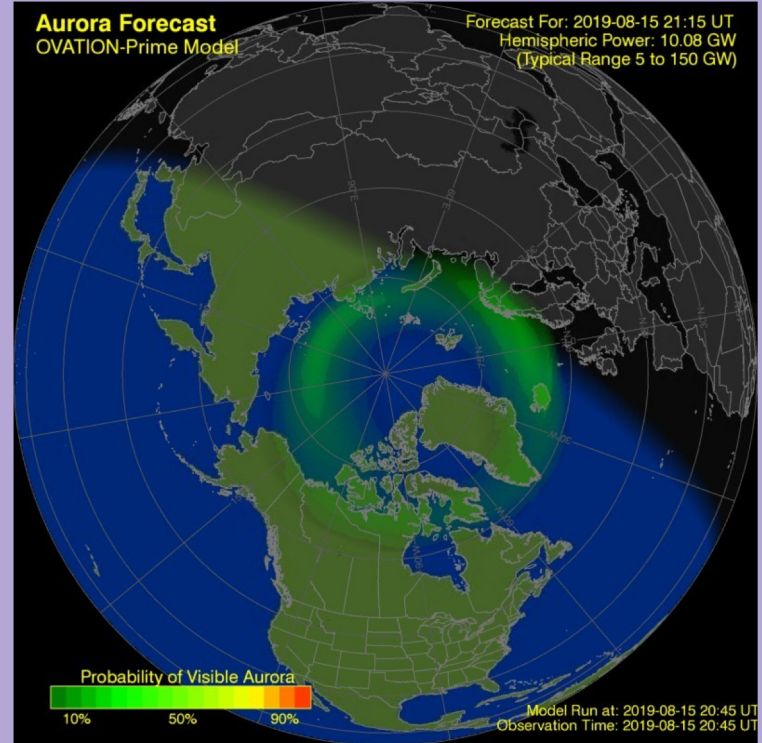


∅ Variation of AE index confirms a possible magnetic activity during the interval of radar observation (~ 18 – 20 UT)

Ovation Predictive Modeling

Ovation predicts total energy and number flux, and average energy of precipitating polar-region ions and electrons.

08/13/2019, 1800-2000 UT:
No G1, R1, S1 (Minor) or greater geomagnetic storms, transients or recurrent solar wind features expected.



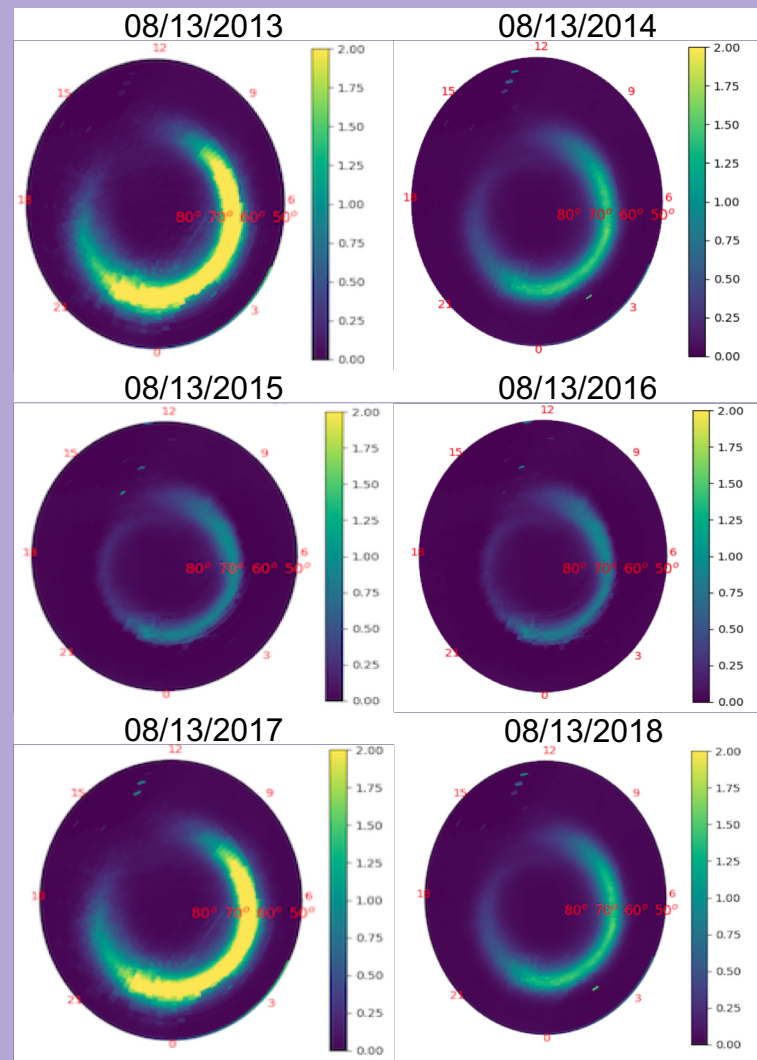
Seasonal Trends vs Acute Space Weather

The NOAA SWPC database does not store its predictive Nowcast results; NASA OMNIweb level 2 radar measurements are published with significant latency

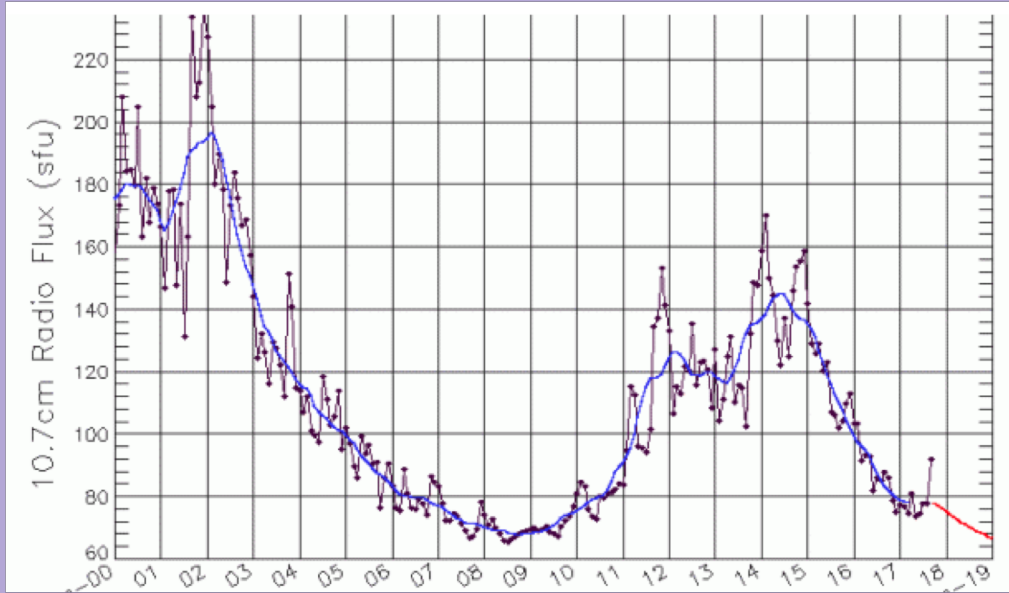
Model accuracy requires consideration of:

- Geomagnetic storm hysteresis
- IMF conditions
- F10.7

Six year (2013-2018) electron energy flux summary is shown to the right

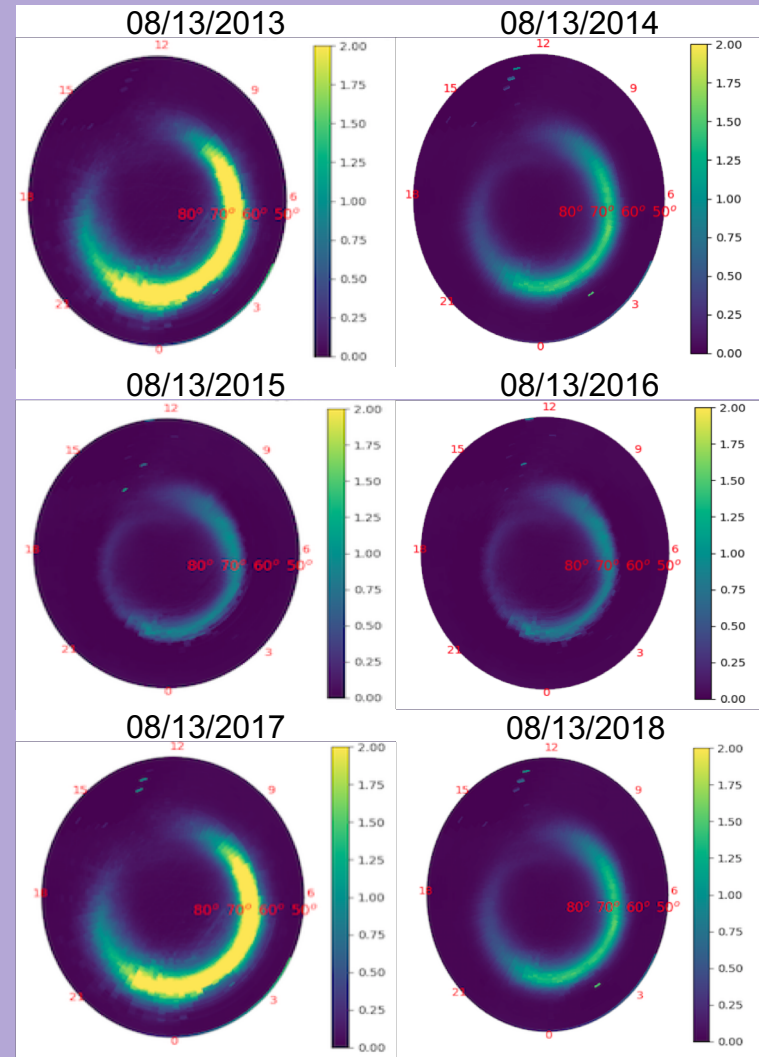


Seasonal Trends vs Acute Space Weather

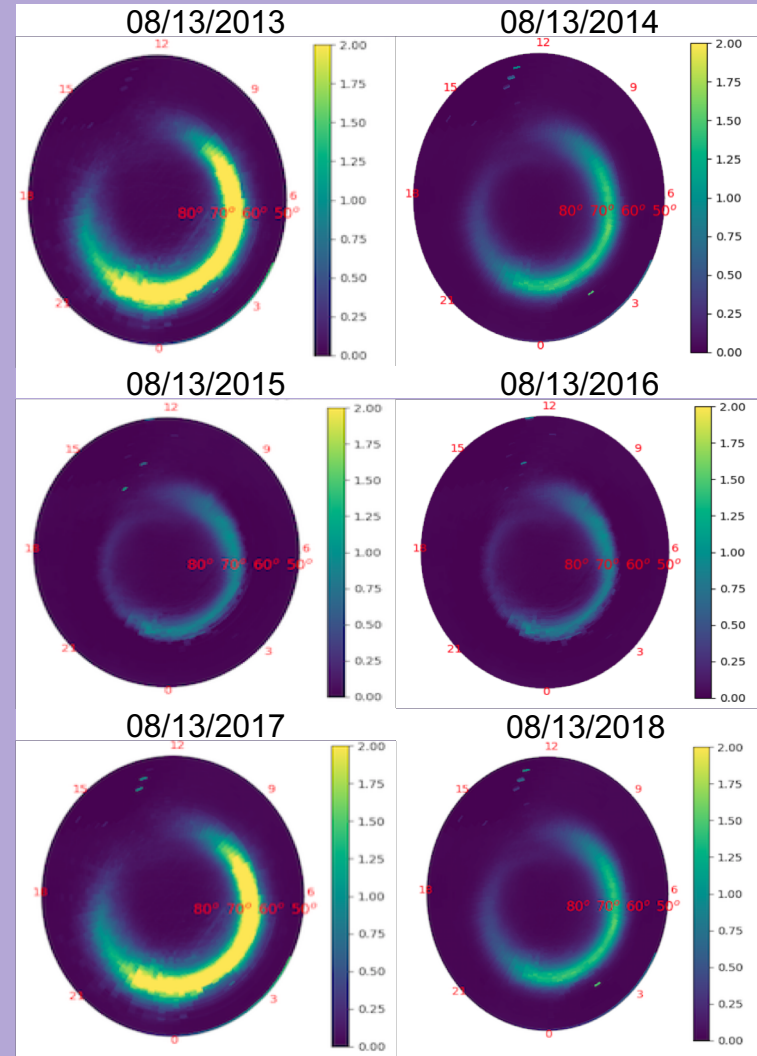
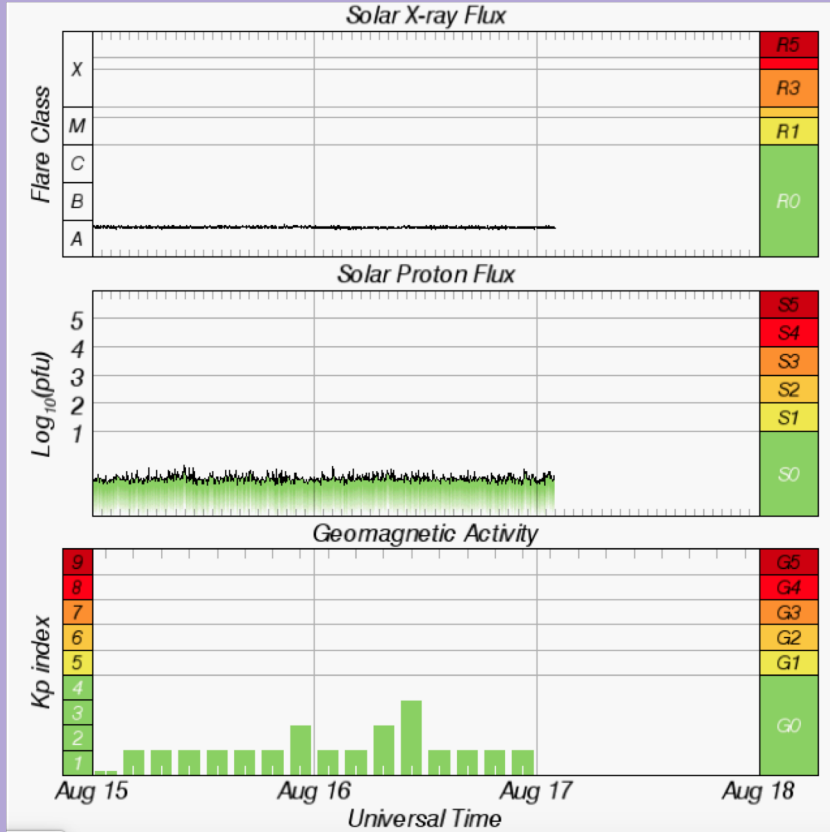


Credit: NOAA Space Weather Prediction Center (SWPC)

F10.7cm data does not seem indicate relatively higher electron energy fluxes in 2017 vs 2015



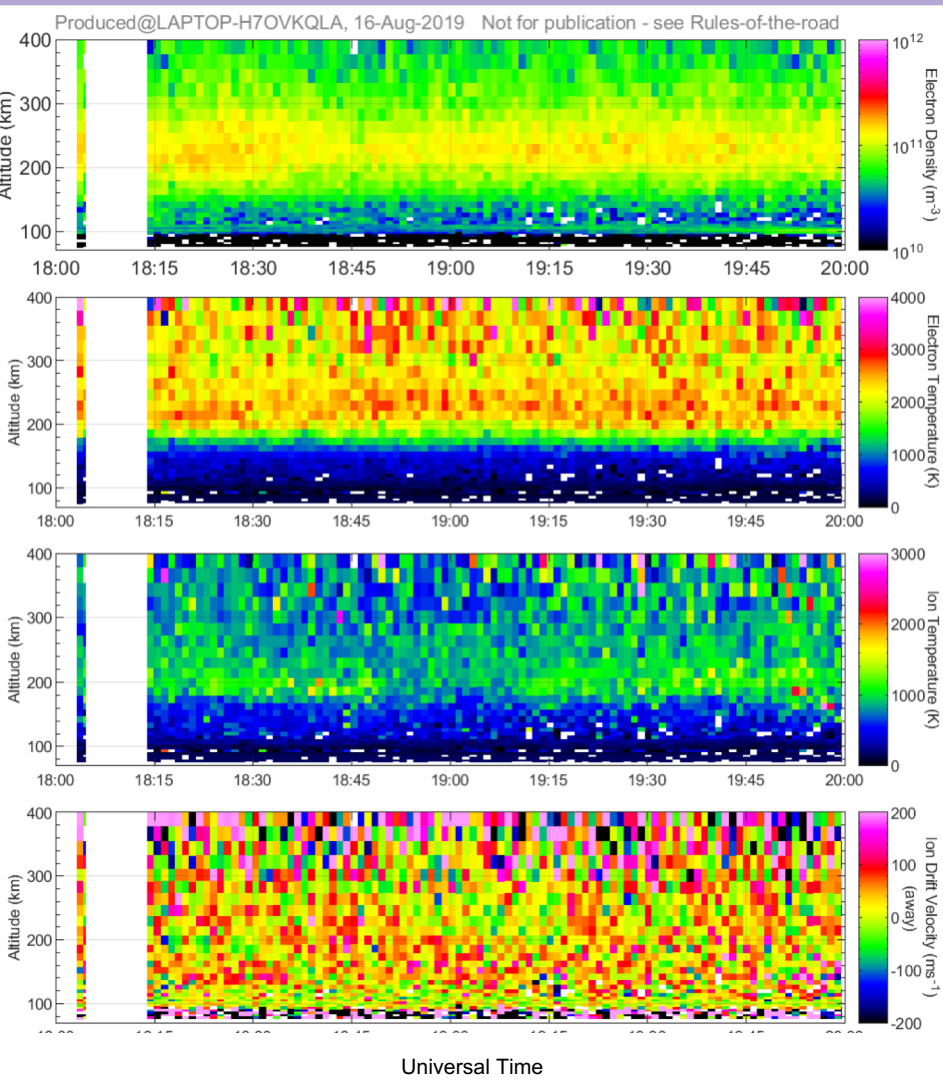
Seasonal Trends vs Acute Space Weather



Credit: NOAA Space Weather Prediction Center (SWPC)

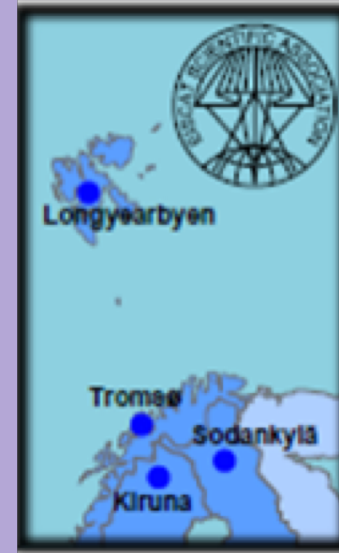
EISCAT data

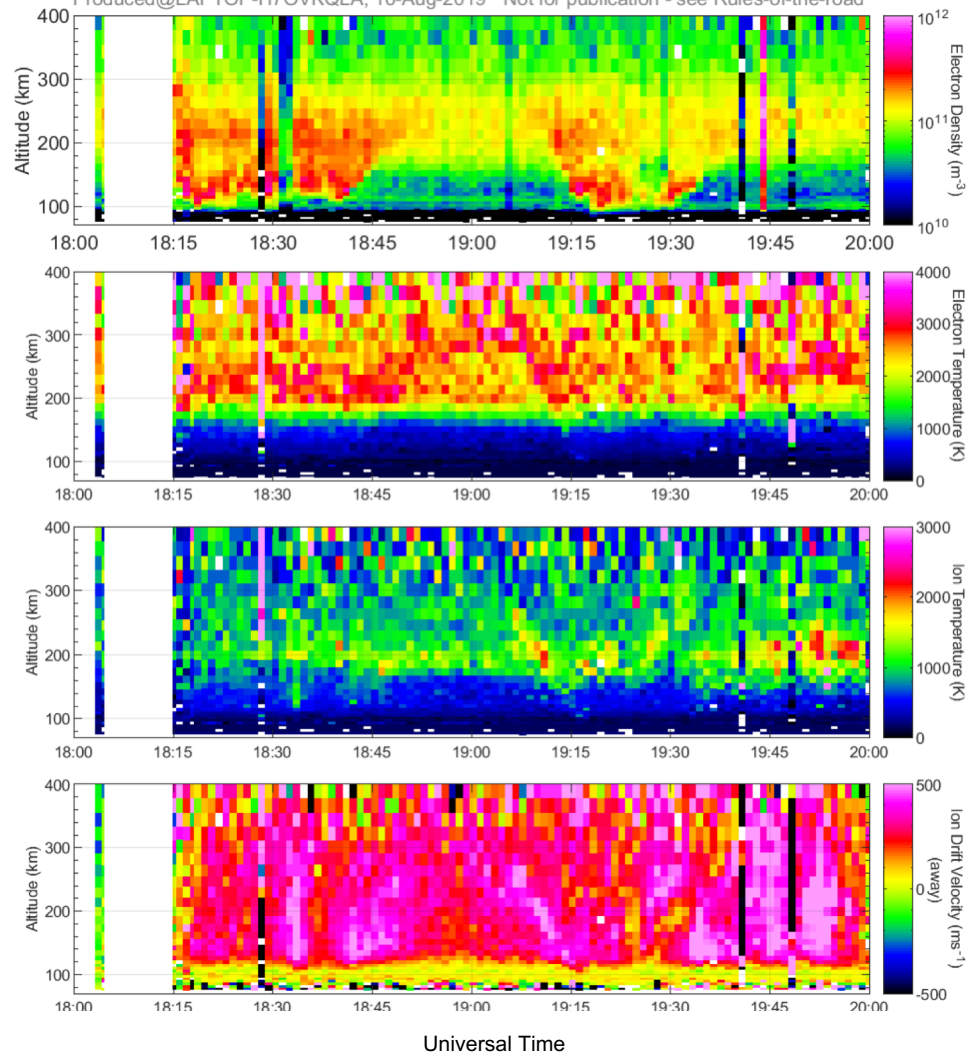




42m ESR

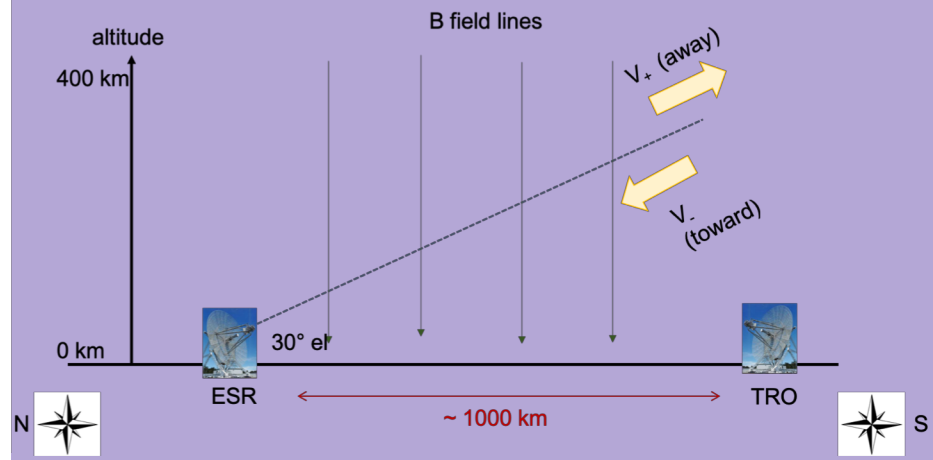
- Field aligned
- No precipitation signatures!

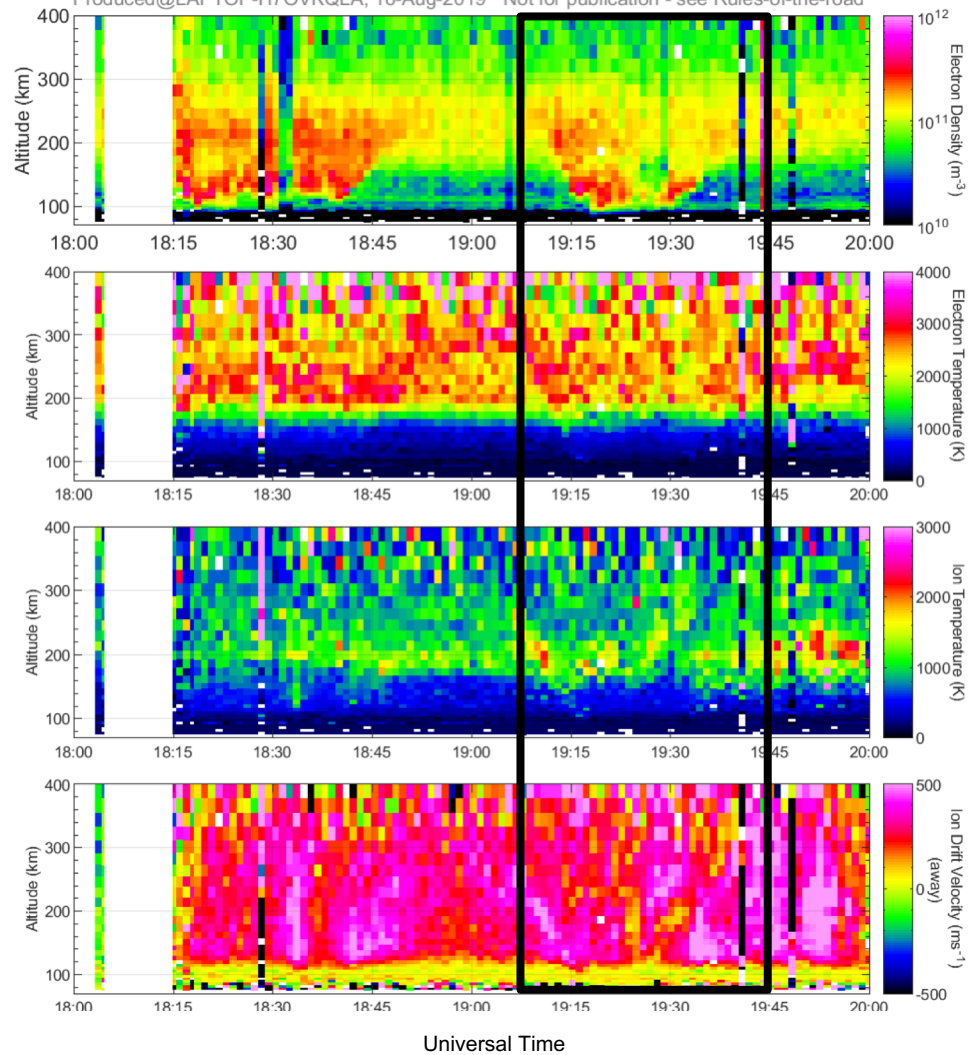




32m ESR

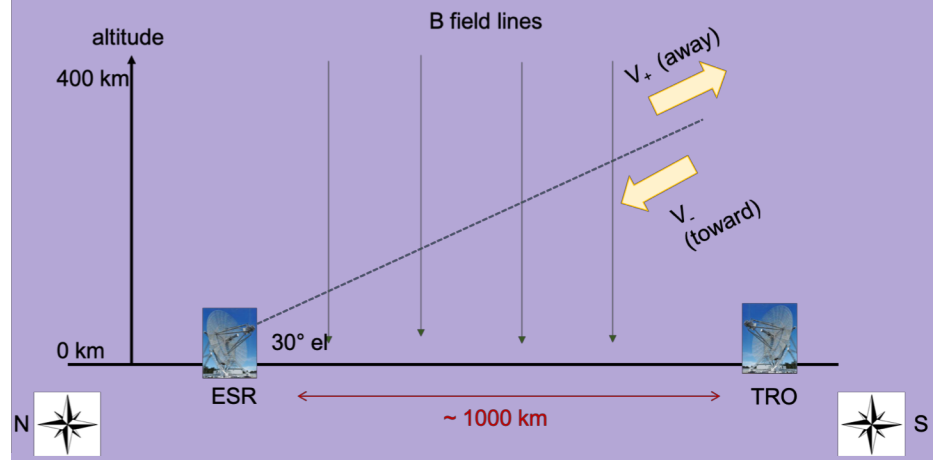
- Low elevation south

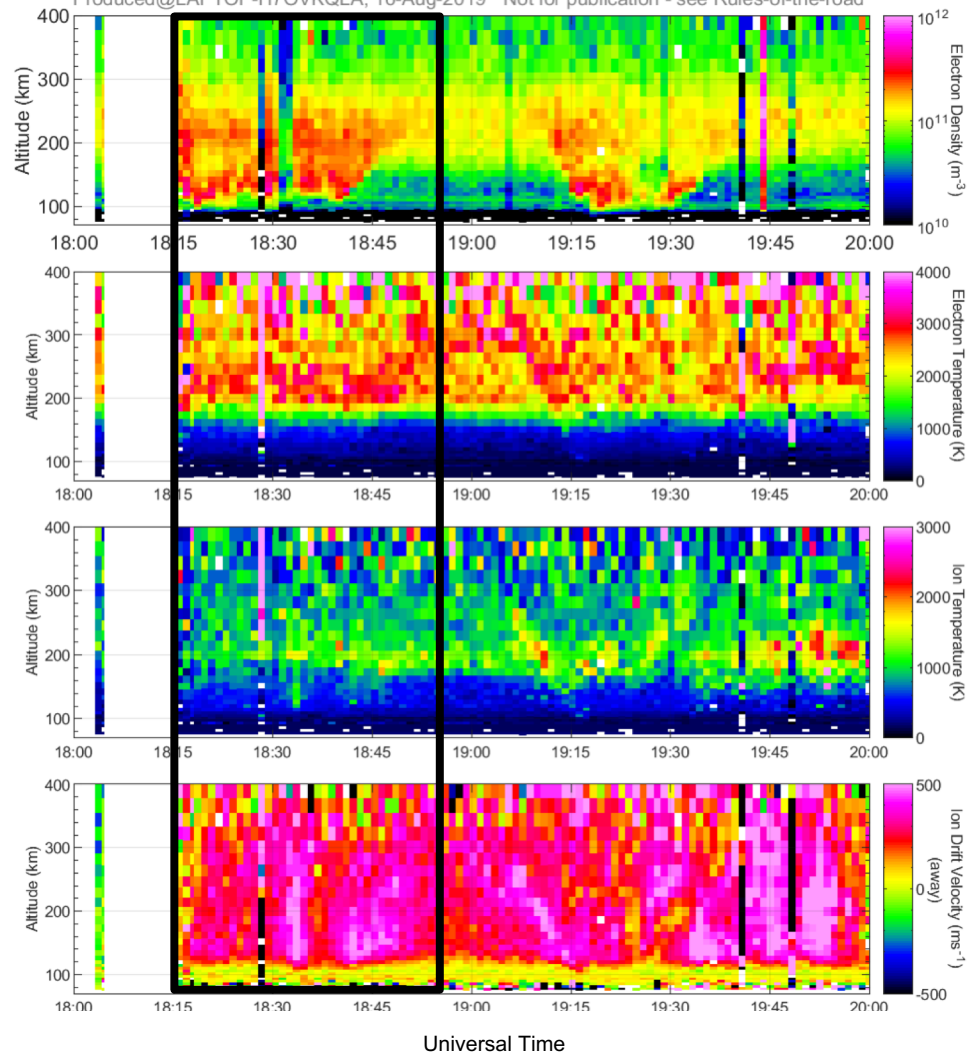




32m ESR

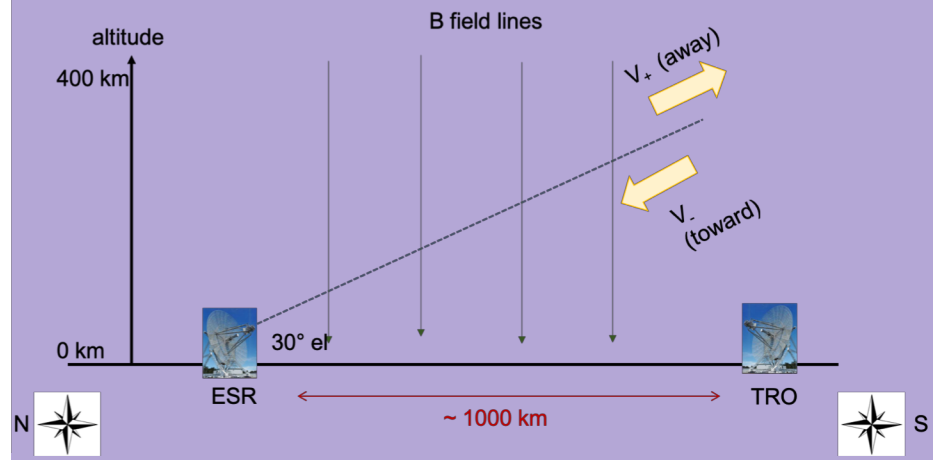
- Precipitation reaches low altitudes
- Still moving southward





32m ESR

- Auroral precipitation near the radar site
- Moving southward



VHF, 32m, pointing North, 30° el

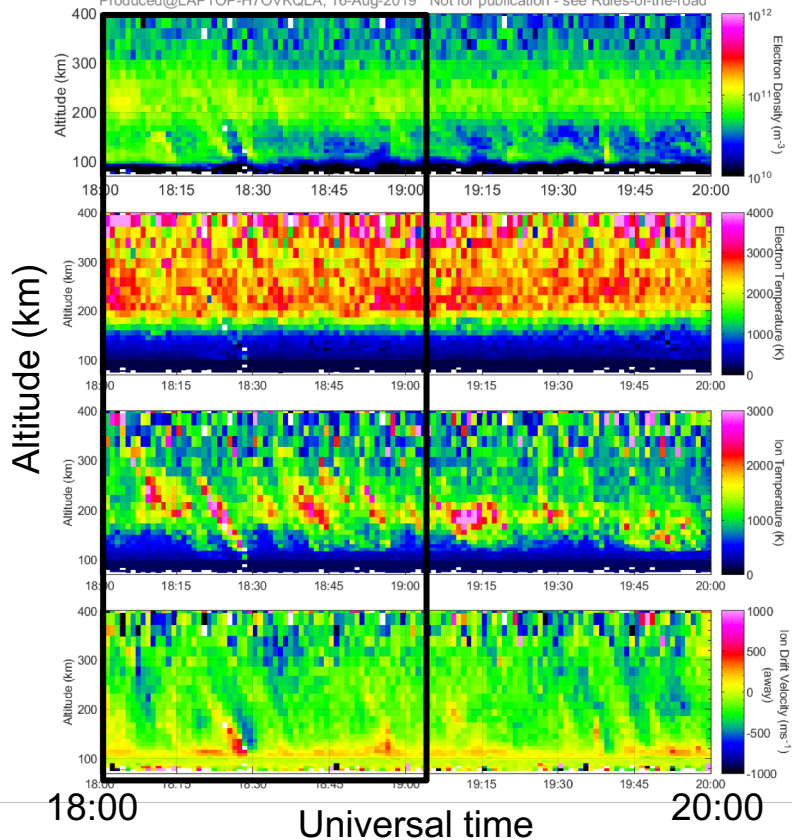


EISCAT Scientific Association

EISCAT VHF RADAR

CP, vhf, bella, 13 August 2019

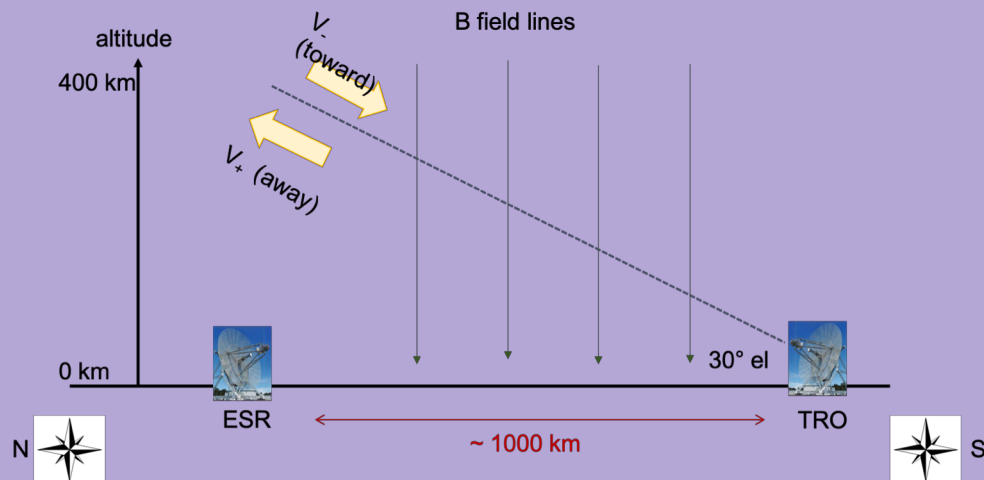
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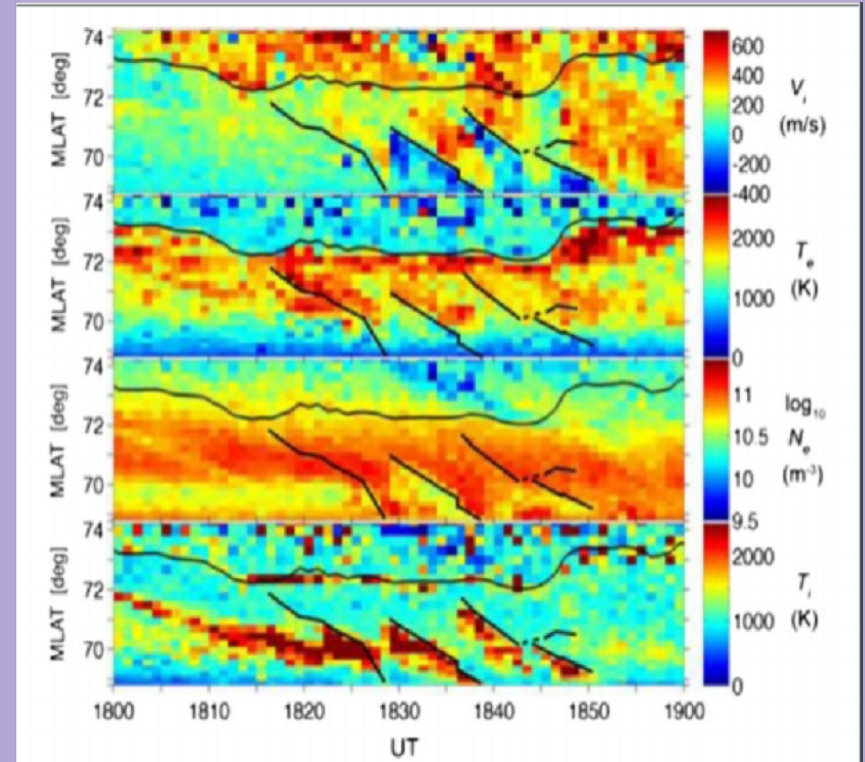
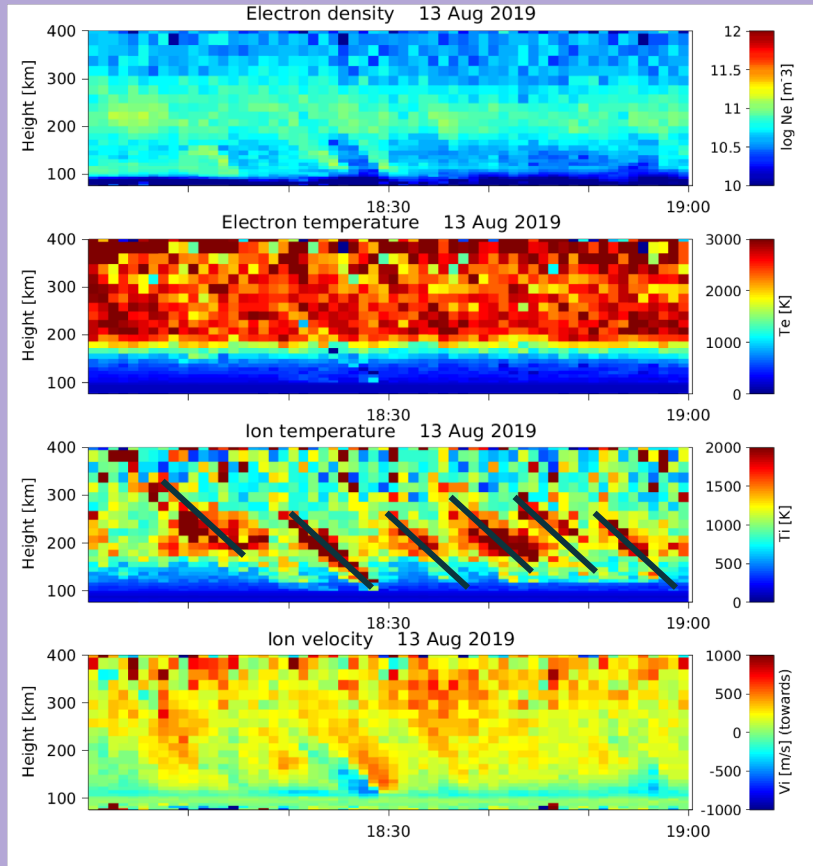
32m VHF TRO

- Periodic features in ion temperature (Ti)
- ~ 5 - 10 min periodicity
- Enhancement of ~ 2000 K

TIDs or ULF, or aurora streamers ?

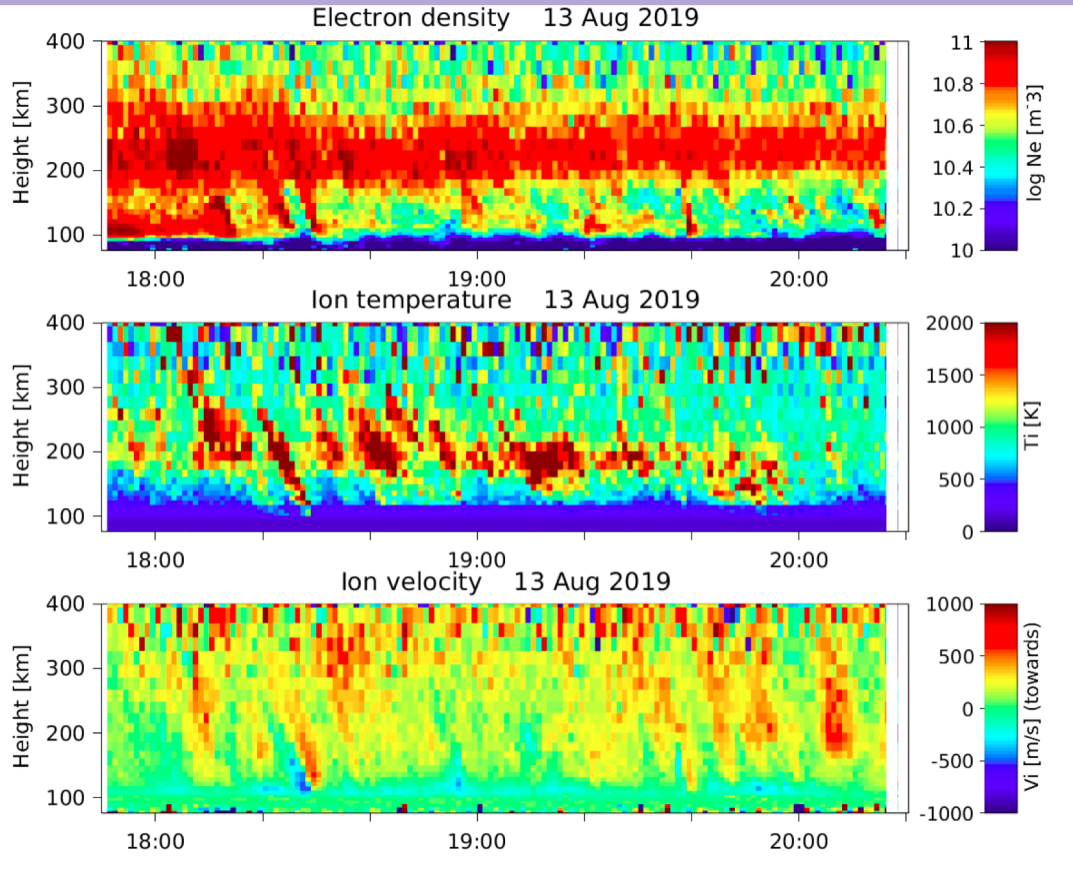


32m VHF TRO - aurora streamers?

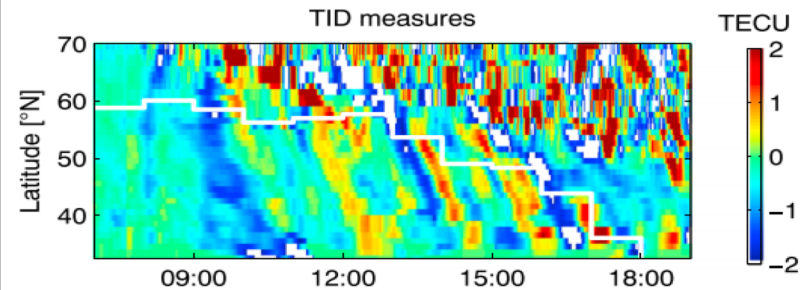


Ian's presentation - large structures

32m VHF TRO - TIDs?



Borries et al., 2017



20 November 2003

UHF, 32m, pointing along B

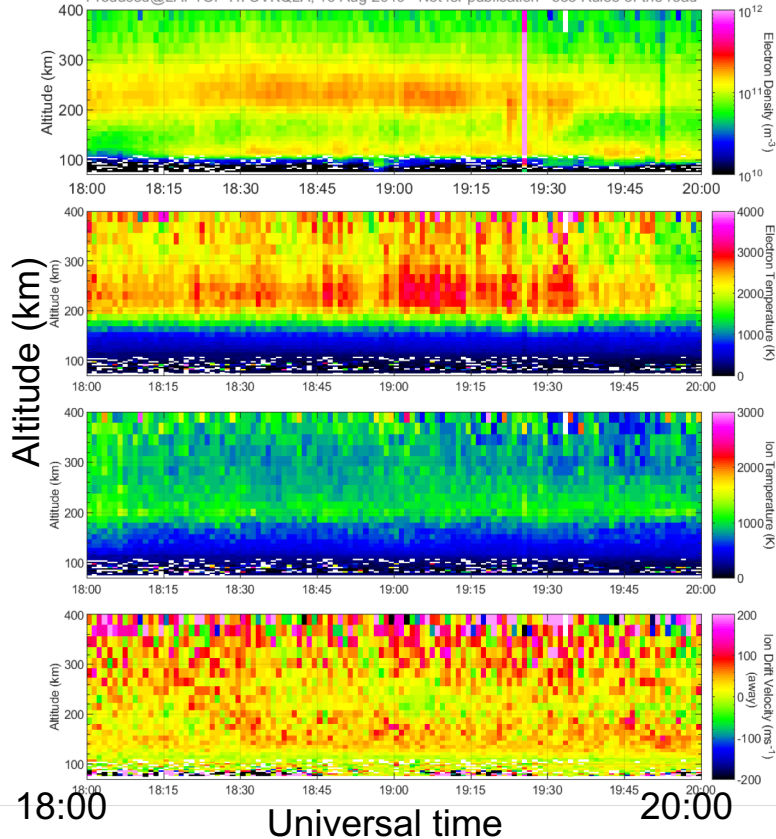


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CP, uhfa, beata, 13 August 2019

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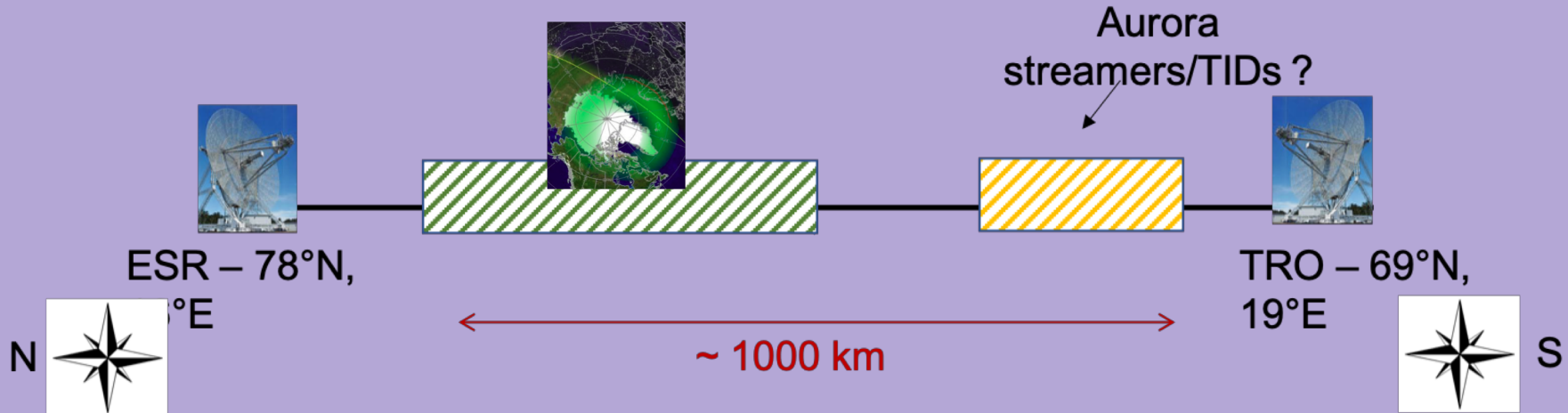


32m UHF TRO

- Nothing particular
- F-region/ E-region in Ne

Conclusion

- Relatively quiet solar conditions - small increase in sw velocity and a substorm at our observations time
- Detection of the auroral oval in ESR 32m pointing southward
- Observations of ionospheric features in Tromsø 32m VHF (TIDs, ULF waves or aurora streamers ?)



Acknowledgements

Sources of Data/ Information

- EISCAT, Finland
- CCMC NOAA/NASA GSFC
- Ovation, SRI International
- SWPC JHU/APL
- Tromsø Observatory, Norway
- WDC for Geomagnetism, Kyoto Japan

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- ...