

Millstone Hill experiment choices

ISR School 2022

67 meter zenith antenna
46 meter fully steerable antenna



Geodetic Latitude: 42.61°
Geodetic Longitude: 288.51°
(WGS-84)

Experiment Type A: Rapid Regional

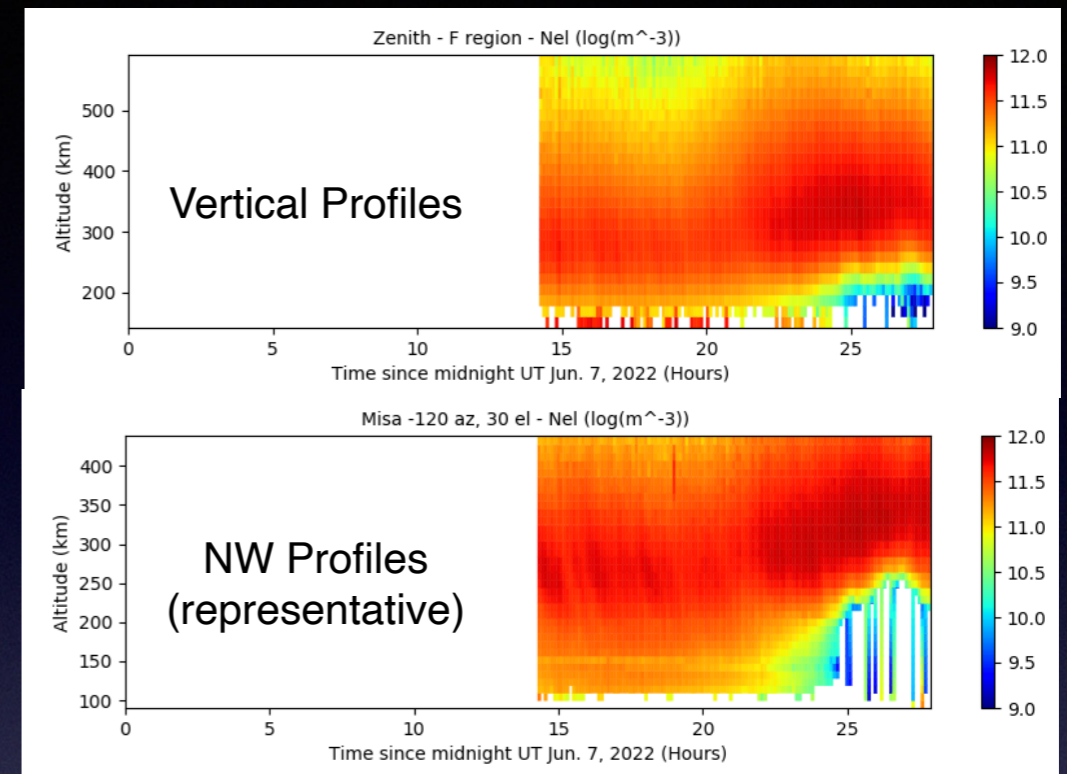
Vertical profiles [zenith; 2 minutes],
fixed pointing
to the northwest [MISA; 2 minutes]

Fixed: Azimuth -45 deg / Elevation 45 deg

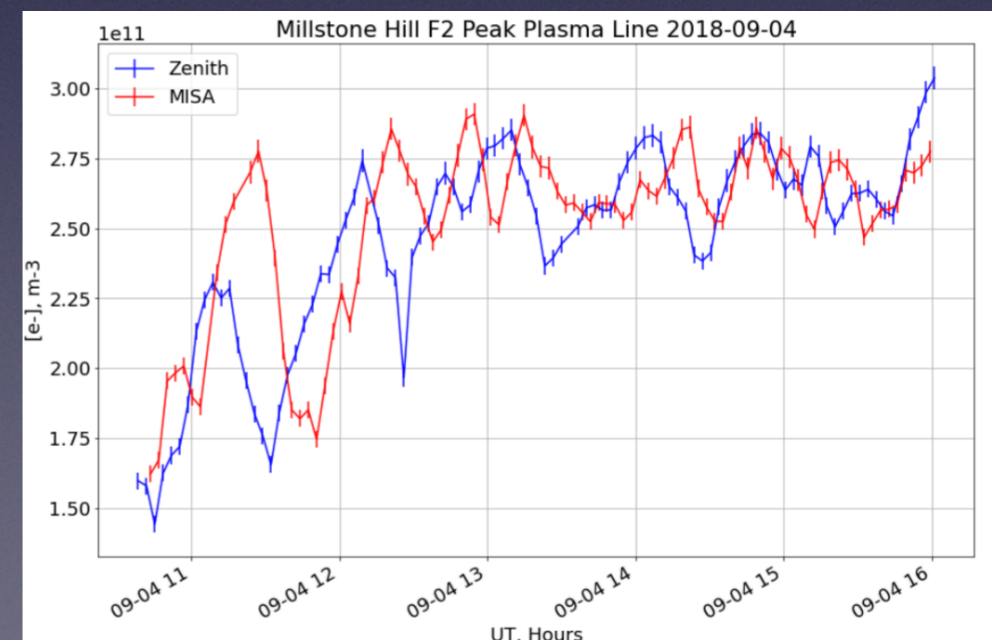
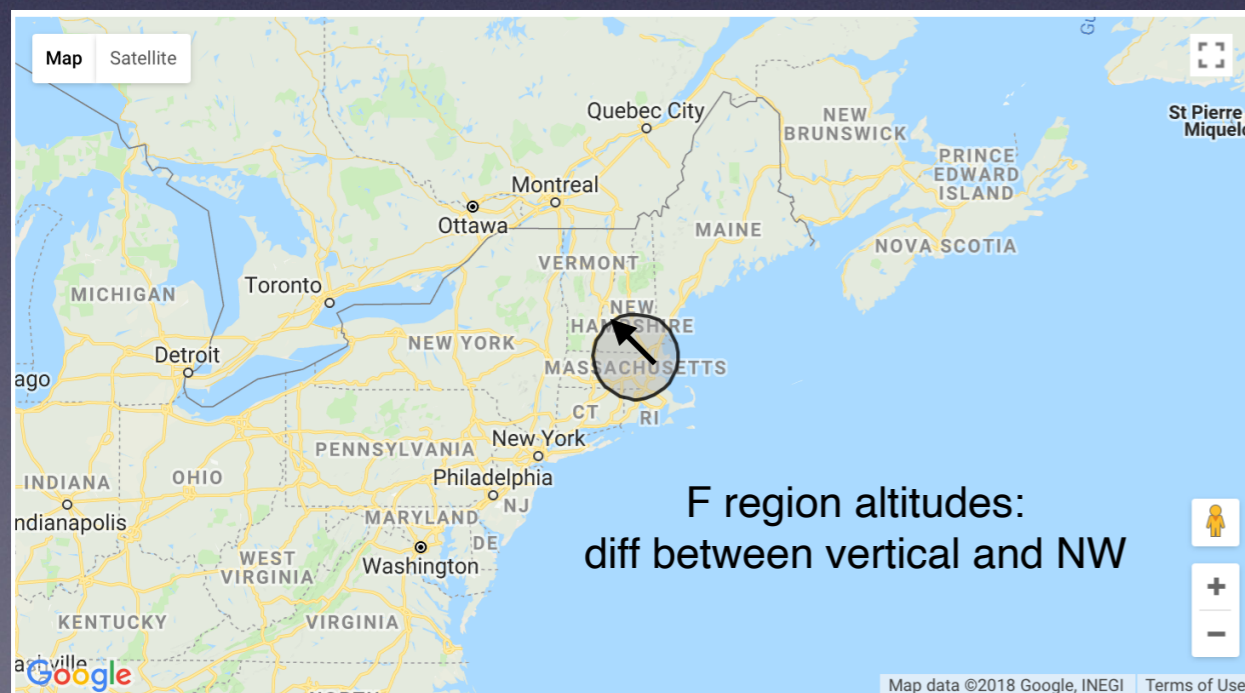
E, F region ionosphere

F2 peak high accuracy Langmuir mode
electron density available (**Daytime only**)

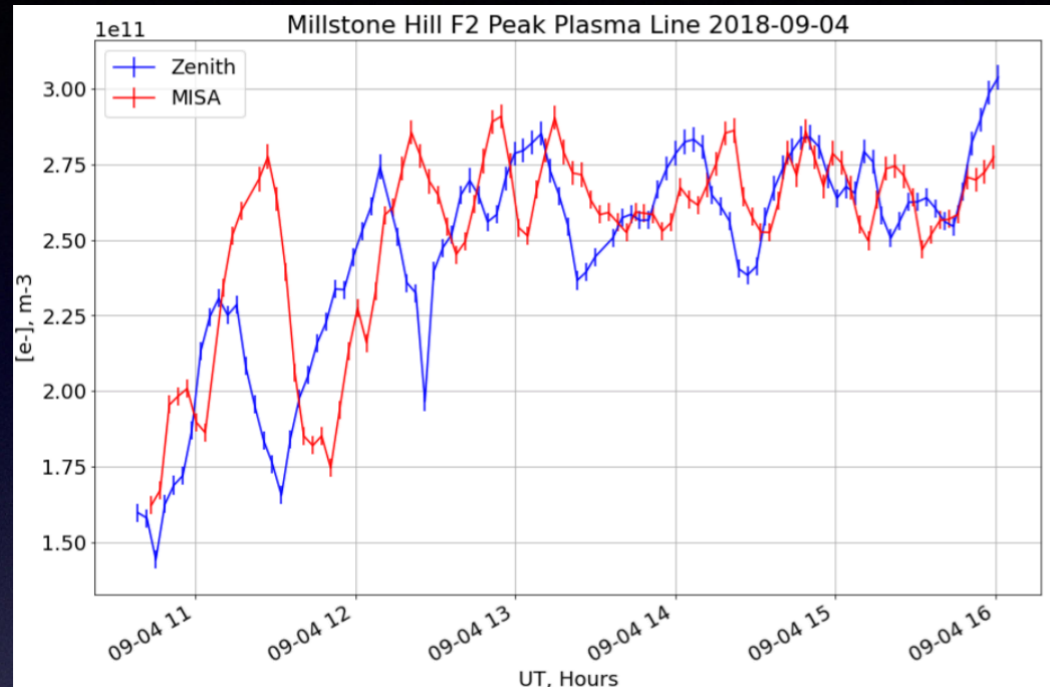
Experiment cycle time = ~4.5 minutes



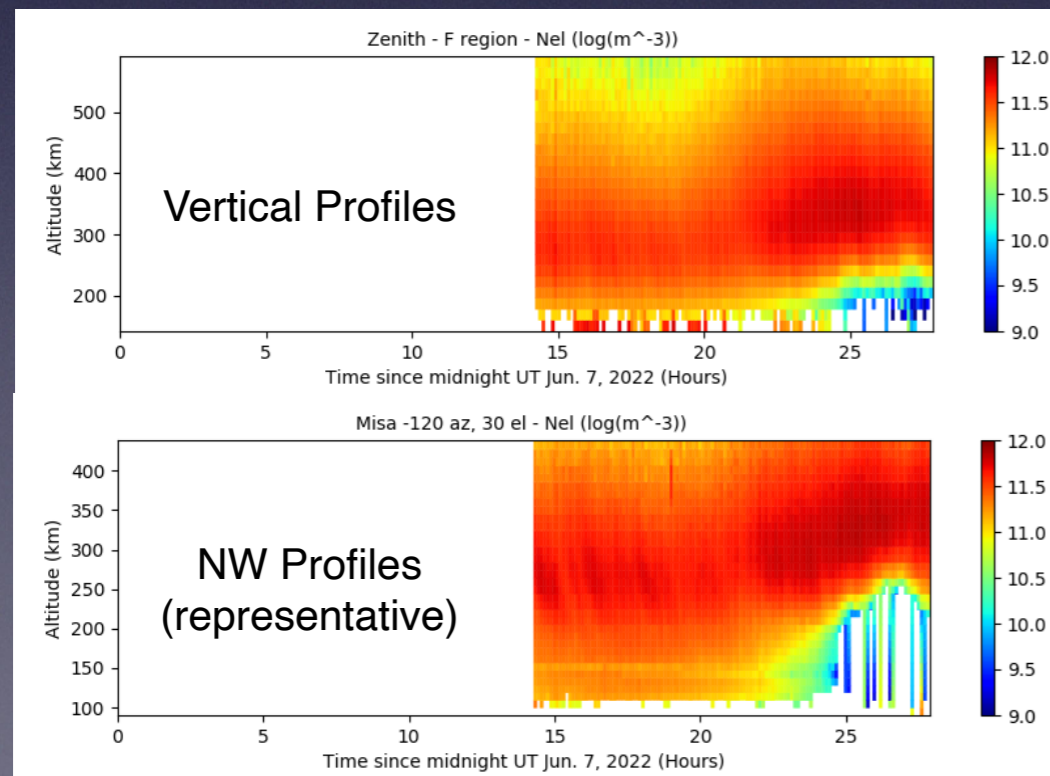
Plus



Things to see with Experiment Type A



- Mid-latitude dynamics
 - Nighttime [e-] behavior
 - Sunrise, sunset effects
- Mid latitude traveling ionospheric disturbances
 - Plasma line F2 peak variations
[NB: DAYTIME ONLY]
 - Ion line F region altitude variations
 - Altitude variations in peak height
 - Relation to ion velocity dynamics
- High time resolution mid-latitude spatial gradients in scalar parameters at two points
 - [e-], T_e , T_i
 - What scale sizes?
- E region ionospheric profiles (using zenith data) and how they differ from F region profiles



Experiment Type B: Regional Vector

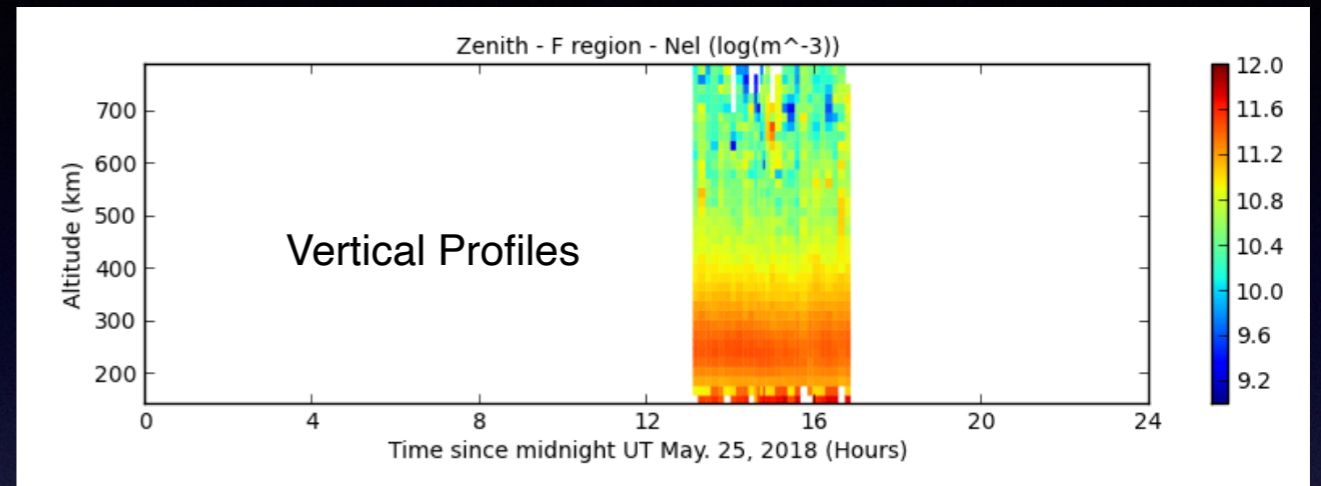
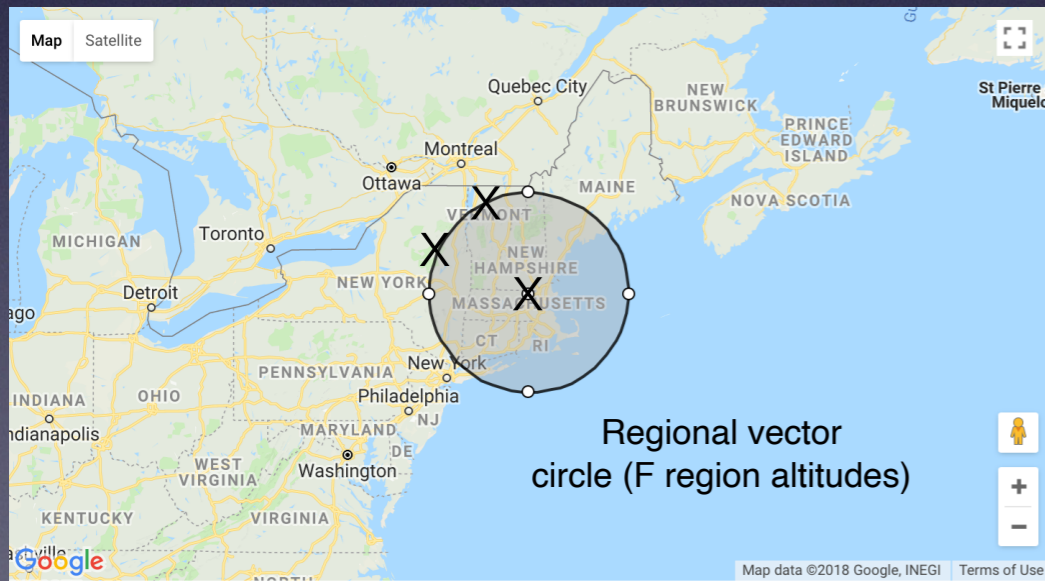
Vertical profiles [zenith],
regional measurements [45 deg elevation]

Azimuths = [-25, -70] deg

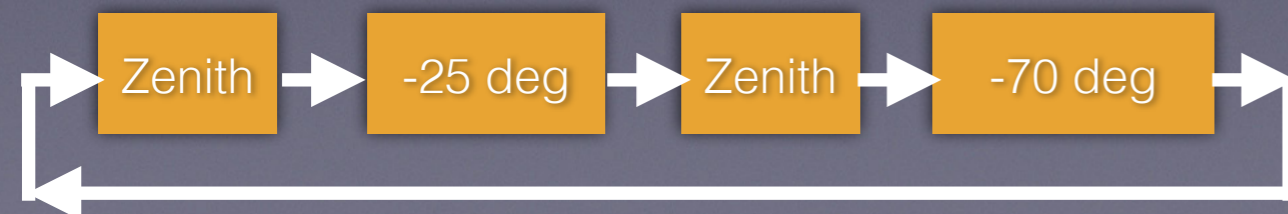
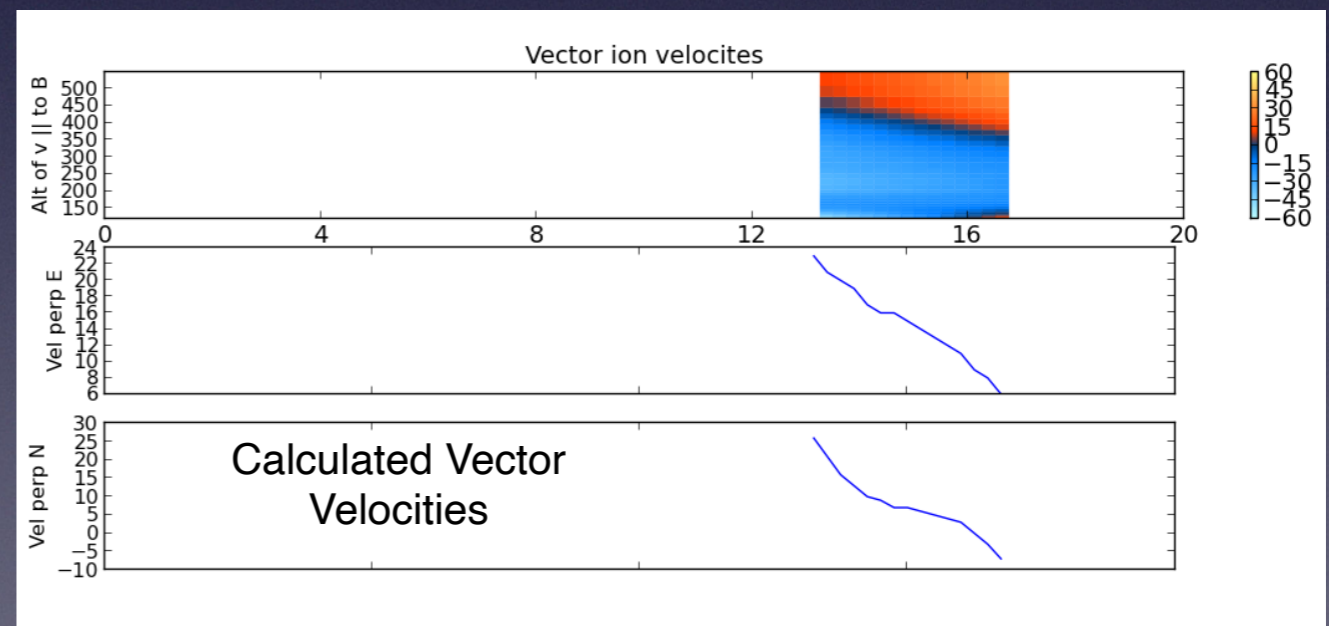
E, F region ionosphere

F2 peak high accuracy Langmuir mode
electron density available
(NB: daytime only)

Experiment cycle time = ~13 minutes

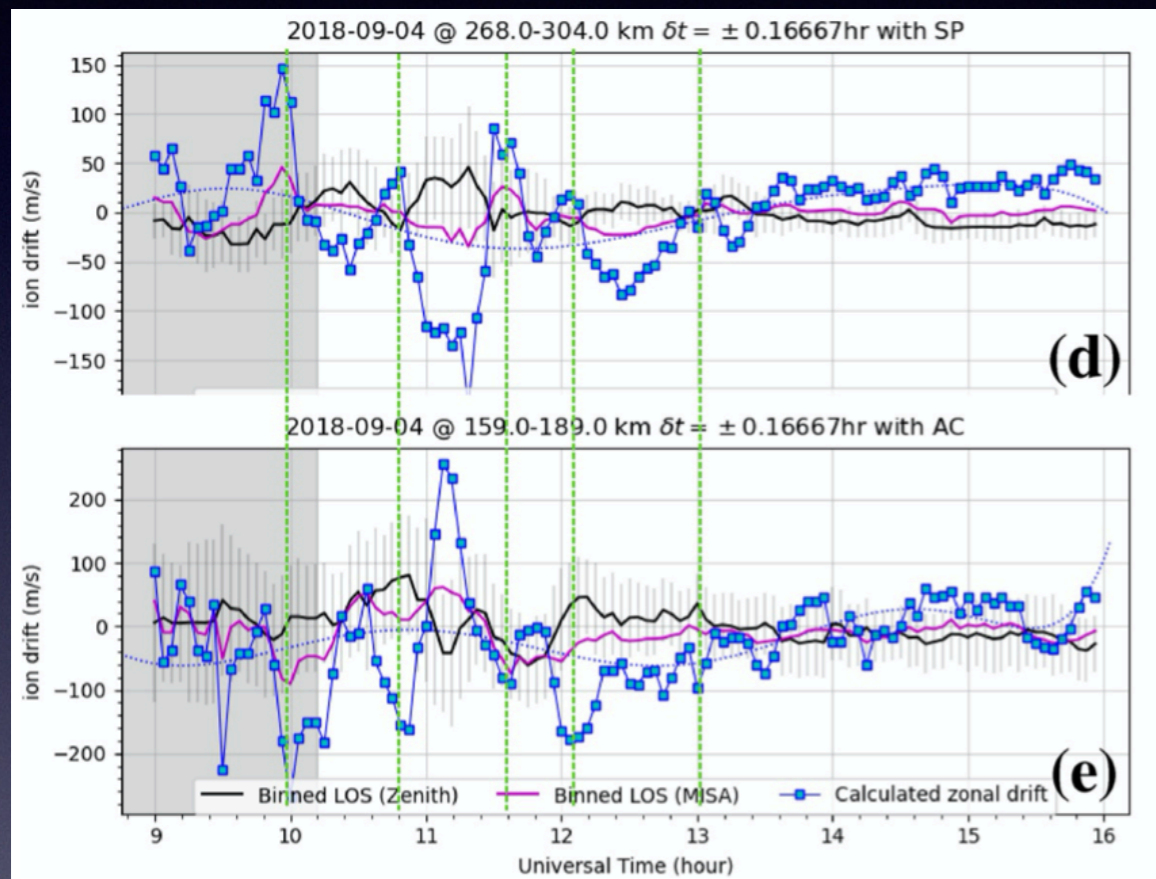


Plus



Zenith: 3 minutes
MISA fixed positions: 3 minutes
(Currently MISA motion is limited)

Things to see with Experiment Type B



- Mid-latitude vector ion velocities
 - How good are they with two positions separated by only 45 deg?
- E vs F region vector ion velocities
- Comparison to neutral winds
 - Millstone Hill has an on-site Fabry-Perot interferometer, measuring winds directly at night..
- Relation between ion drifts and F region density variations
 - Ion line profiles
 - Plasma line F2 peak parameters
[NB: DAYTIME ONLY]
- **Careful:** lower [e-] = noisier velocities

Experiment Type C: Limited Wide Reach NW Scan

Vertical profiles [zenith; 3 min]

+

CW, CCW azimuth scans [MISA; ~6.5 min / scan]:

6 Deg Elevation

-25 to -70 deg Azimuth

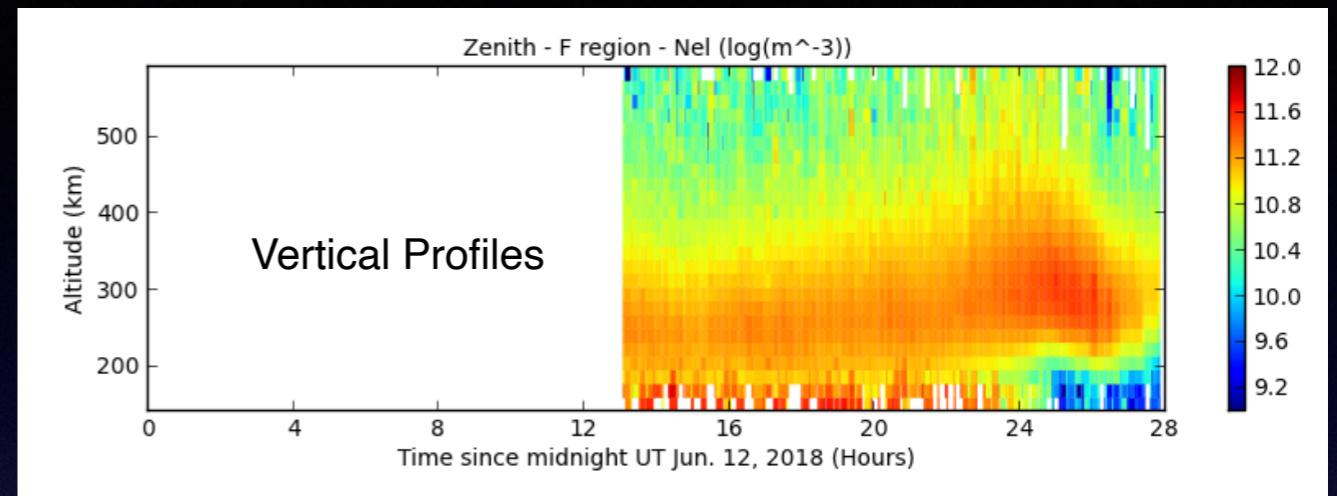
'Windshield Wiper' mode
(CW, then CCW, then CW..)

Zenith profiles taken at end of each scan

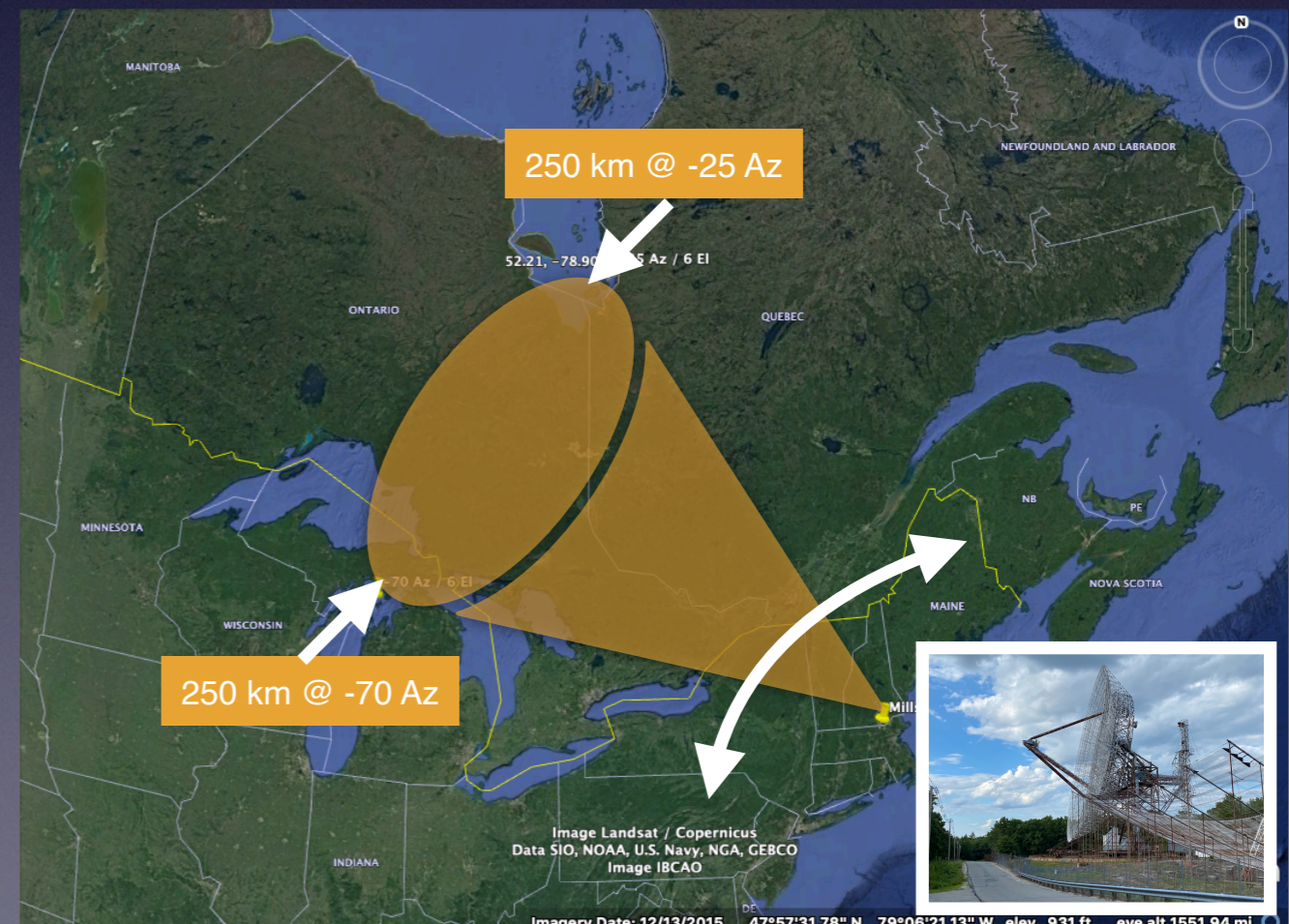
E, F region ionosphere local to Millstone
and wide reach F region structure

Local F2 peak high accuracy Langmuir mode
electron density available (**Daytime only**)

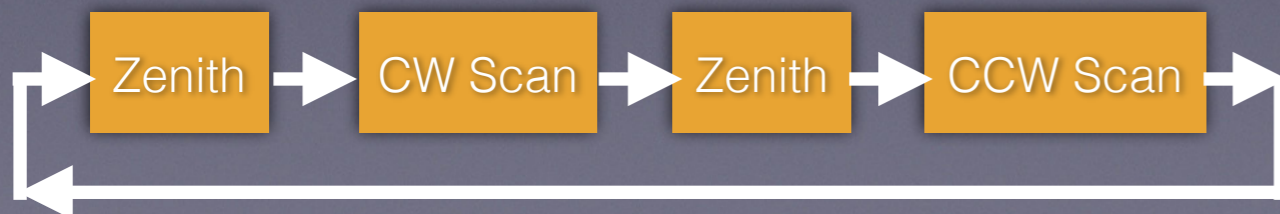
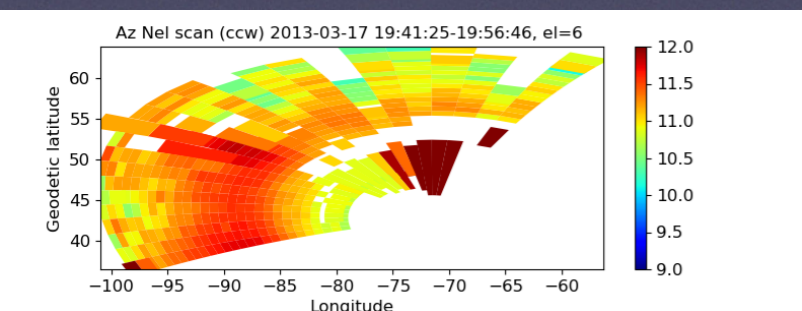
Experiment cycle time = ~20 minutes



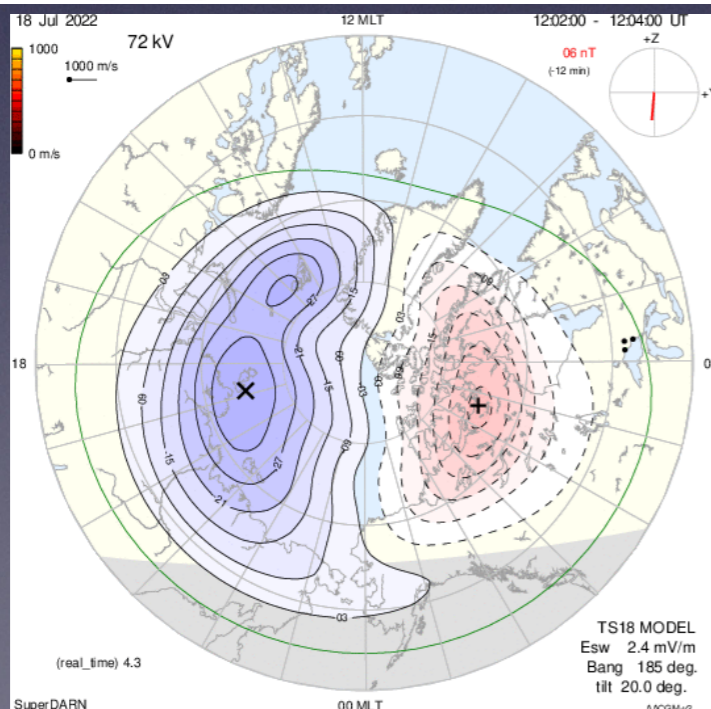
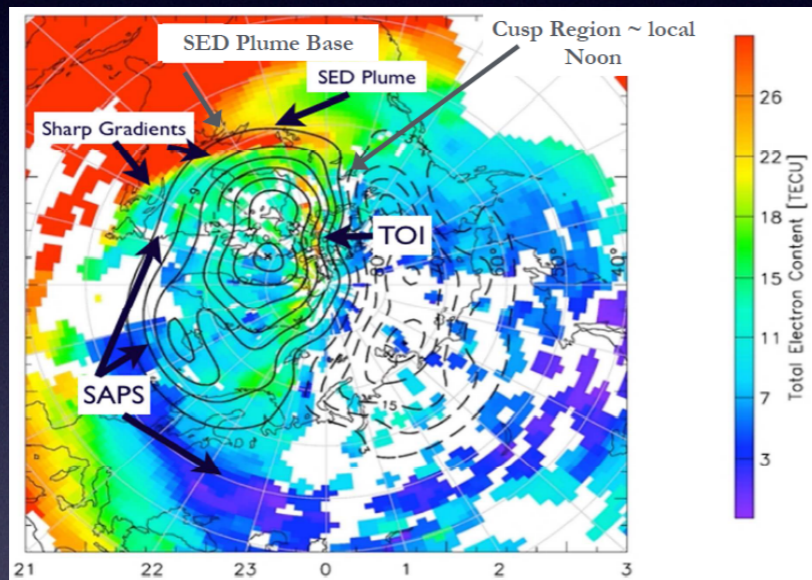
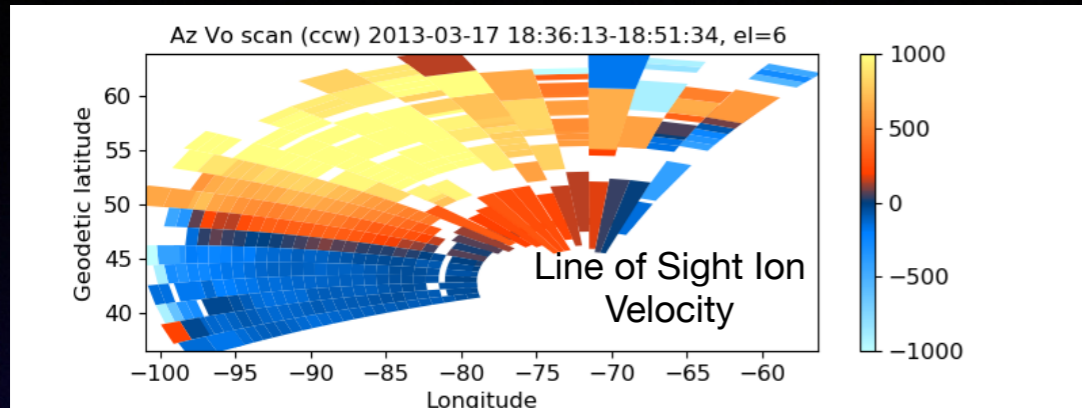
Plus



(From data examples;
Your scan will be
more limited angle)



Things to see with Experiment Type C



- Local vs. wide field conditions to the NW
 - Millstone vertical is farther away from high latitude boundaries
 - Quiet vs. disturbed time behavior
- Sub-auroral polarization stream (SAPS)
 - Disturbance time
 - High velocity
 - At equatorward boundary of high latitude convection pattern
- Storm-enhanced density (SED)
 - Disturbance time
 - Enhanced [e-]
 - At equatorward boundary of high latitude convection pattern
- Spatial gradients in [e-], etc.
 - Scale size range?
 - Amplitude?
 - How does it relate to geophysical boundaries?

Experiment Time Windows Available

Millstone Hill will be running continuously

Start: 10 LT 2022-07-18

Stop: >08 LT 2022-07-19

Procedure:

- Each student group selects one 2-hour block
- First come first serve for a particular block
- When a student group is not running an experiment, radar defaults to a 'background mode' (Type A) and continues operations

Available Blocks: (UT = LT + 4 hours)

- 16 - 18 LT
- 18 - 20 LT
- 20 - 22 LT
- 22 - 24 LT
- 00 - 02 LT
- 02 - 04 LT
- 04 - 06 LT
- 06 - 08 LT

