



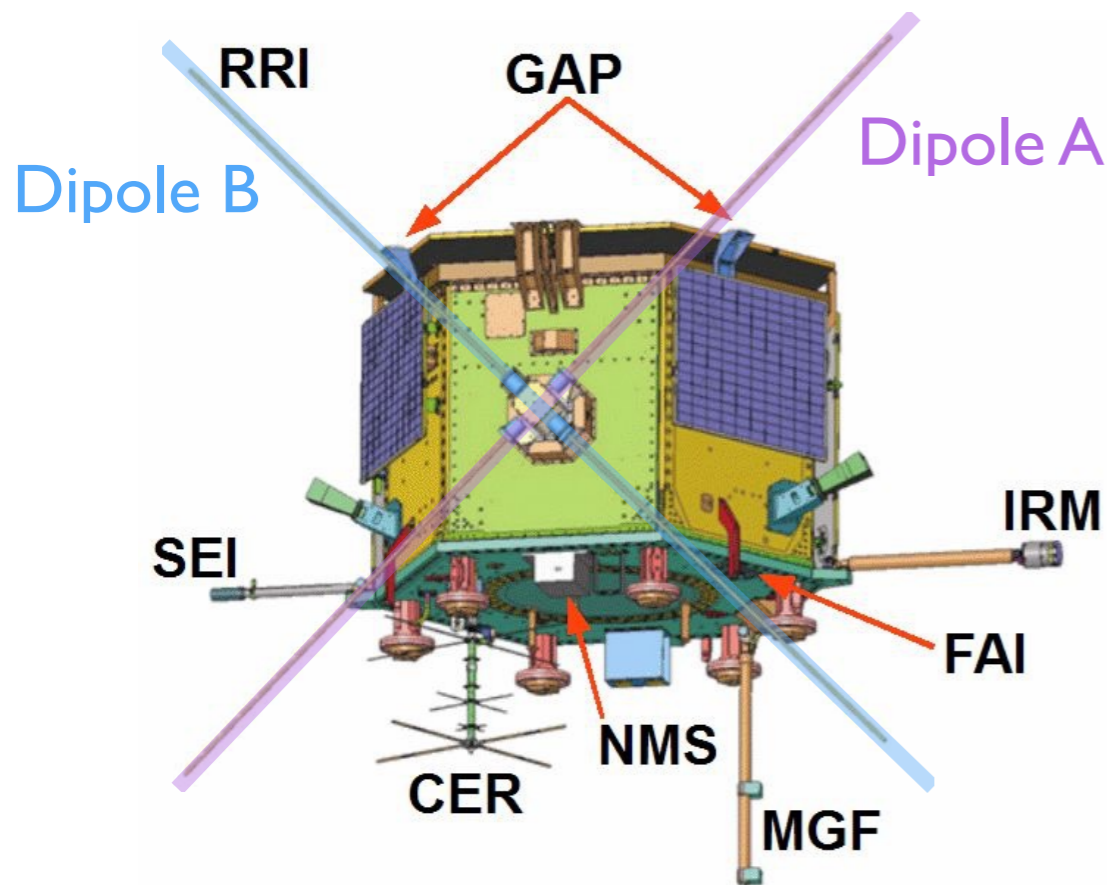
Collaborative investigations of polar ionospheric dynamics by ePOP, SuperDARN, and ISR

G. W. Perry, H. G. James, W. E. Archer, G. C. Hussey, K. A. McWilliams, and A. W. Yau.

CEDAR Workshop 2015
MIT Coupling in the Polar-Cap: Drivers and Impacts
June 24, 2015
Seattle, USA

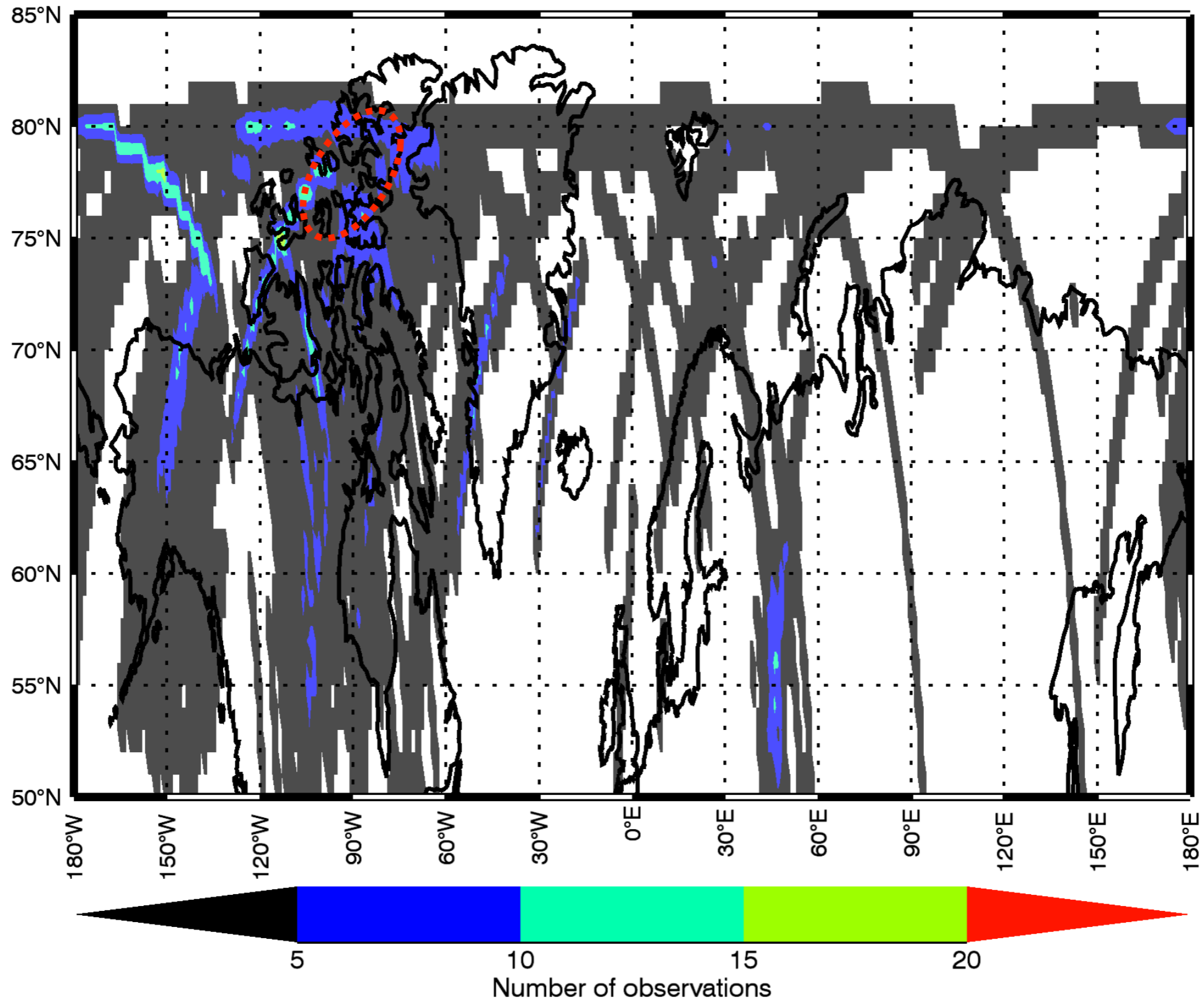


e-POP: enhanced Polar Outflow Probe



- **CASSIOPE** (CAScade, Smallsat and IOnospheric Polar Explorer)
 - Launched September 29, 2013.
 - 1500 x 325 km polar orbit.
- **e-POP** (enhanced Polar Outflow Probe)
 - 8 instruments.
 - Explore the morphology of neutral escape and microscale characteristics of plasma outflow.
- **RRI** (Radio Receiver Instrument)
 - 4, 3-m monopole antennas.
 - Study artificially and naturally generated radio emissions at 10 Hz to 18 MHz.
 - 30 kHz bandwidth.
 - 62.5 kHz sampling.
- SuperDARN/e-POP coordinated studies.
 - Study HF radio propagation in the ionosphere.
 - Investigate the source of HF coherent backscatter in the ionosphere.
 - Study F-region density structures.

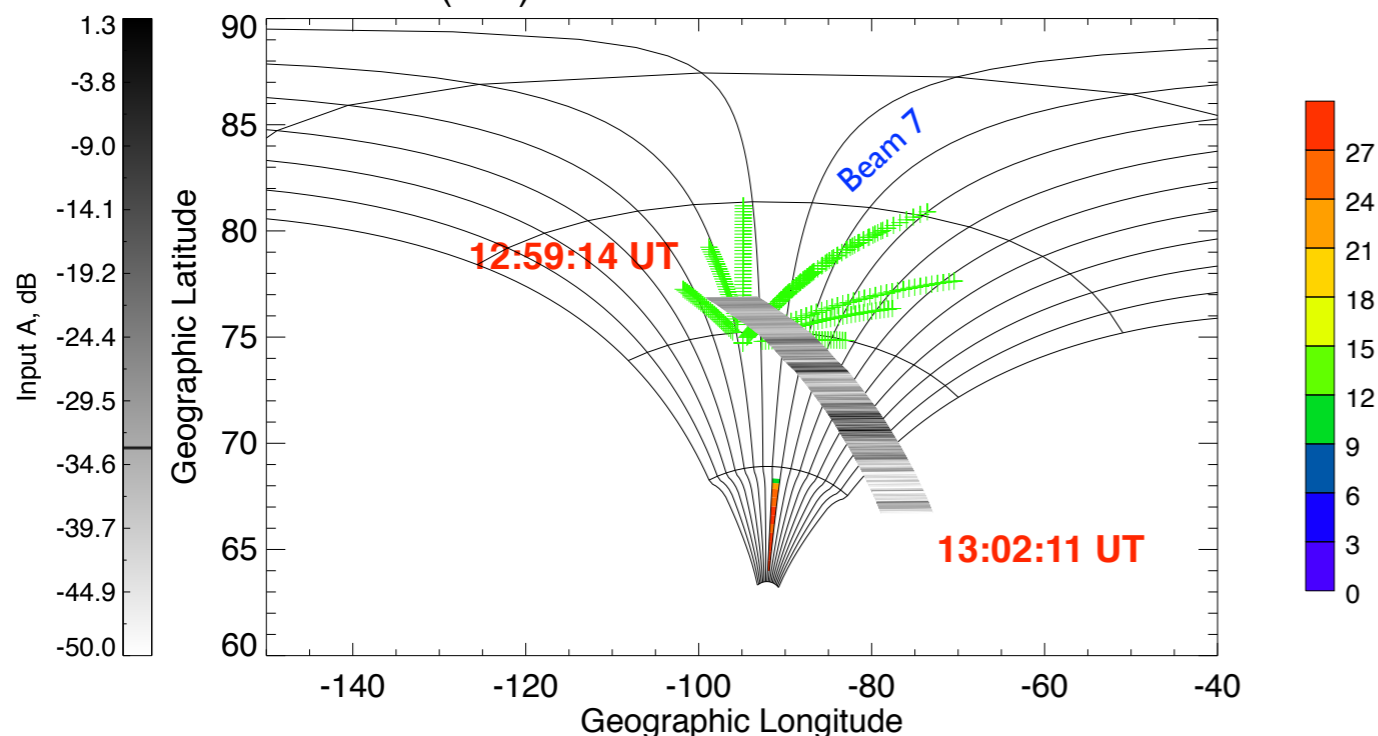
RRI data samples up to June 1, 2015



SuperDARN Rankin Inlet

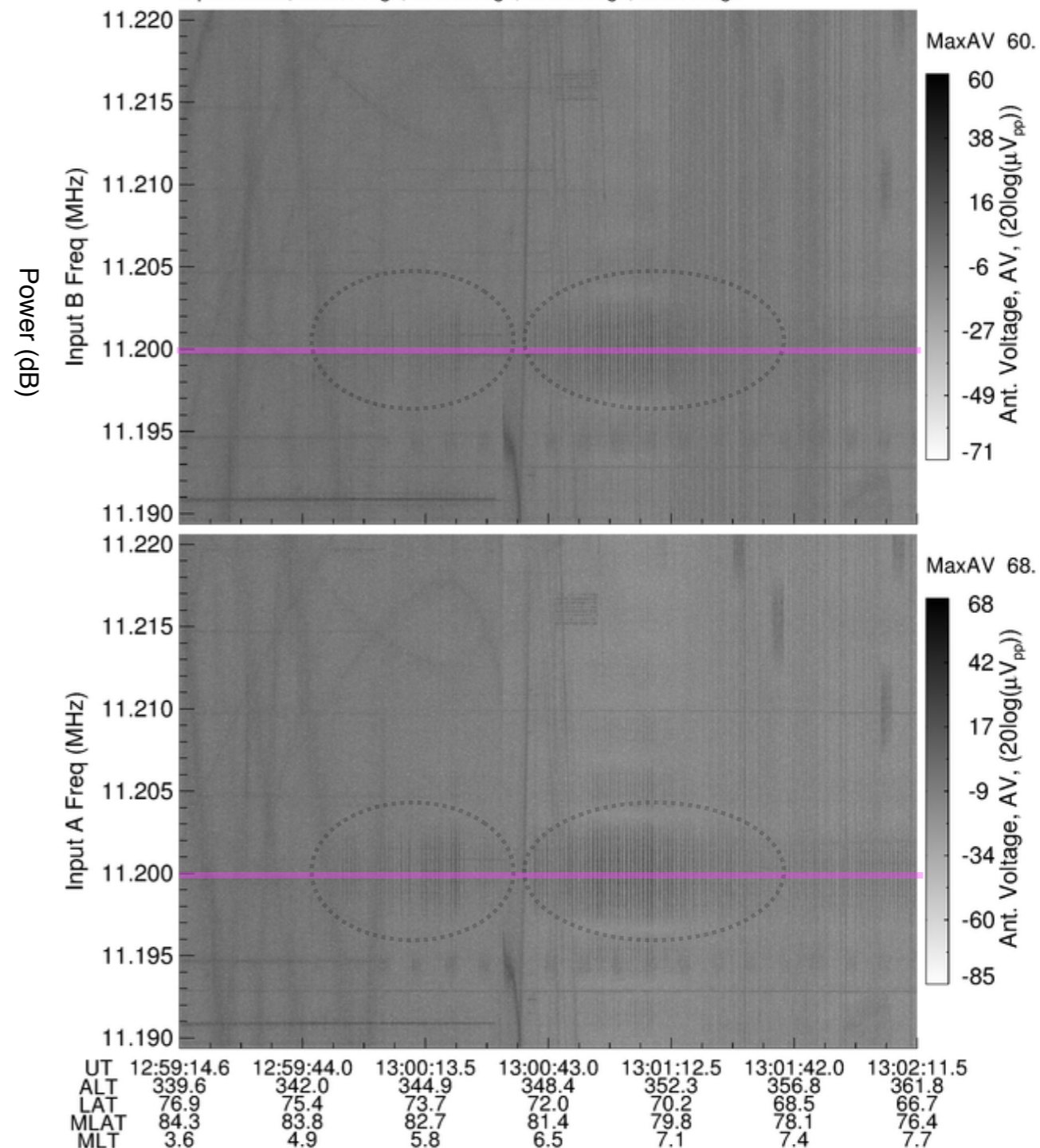
1301 00s (078)

11.200 MHz



e-POP RRI
March 19, 2015

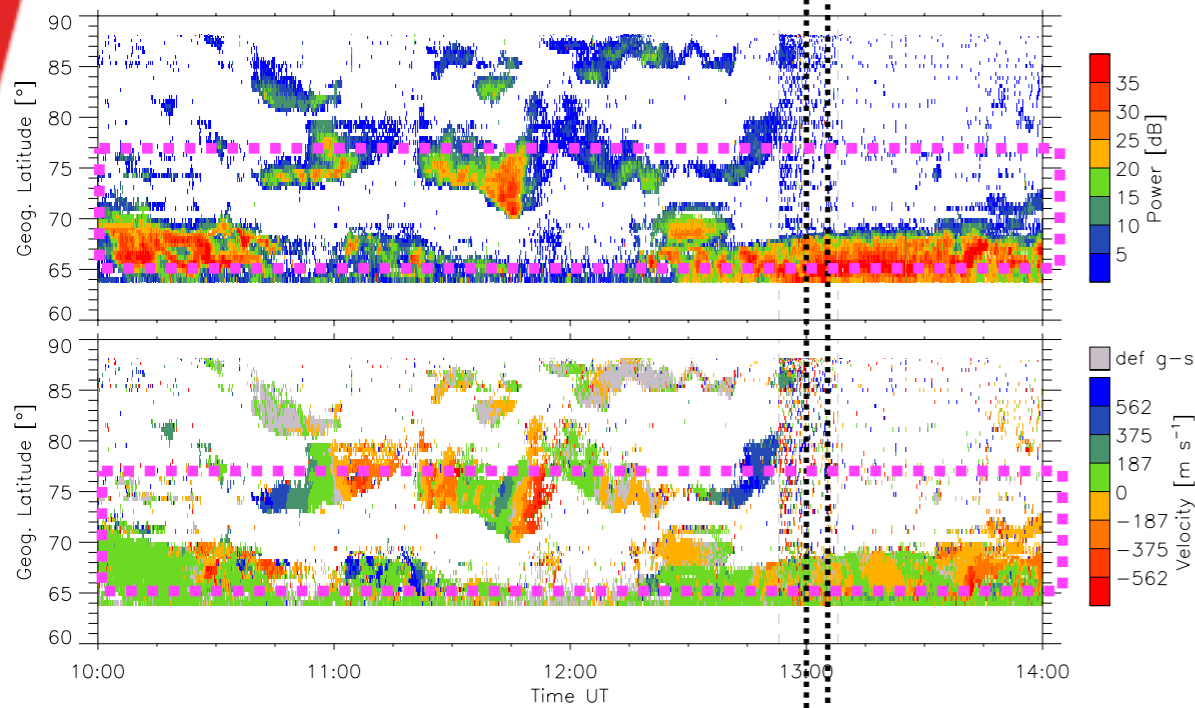
Inputs: Channel 1 - I1, Channel 2 - Q1, Channel 3 - I3, Channel 4 - Q3
Dipole Mode, GAIN1 High, GAIN2 High, GAIN3 High, GAIN4 High



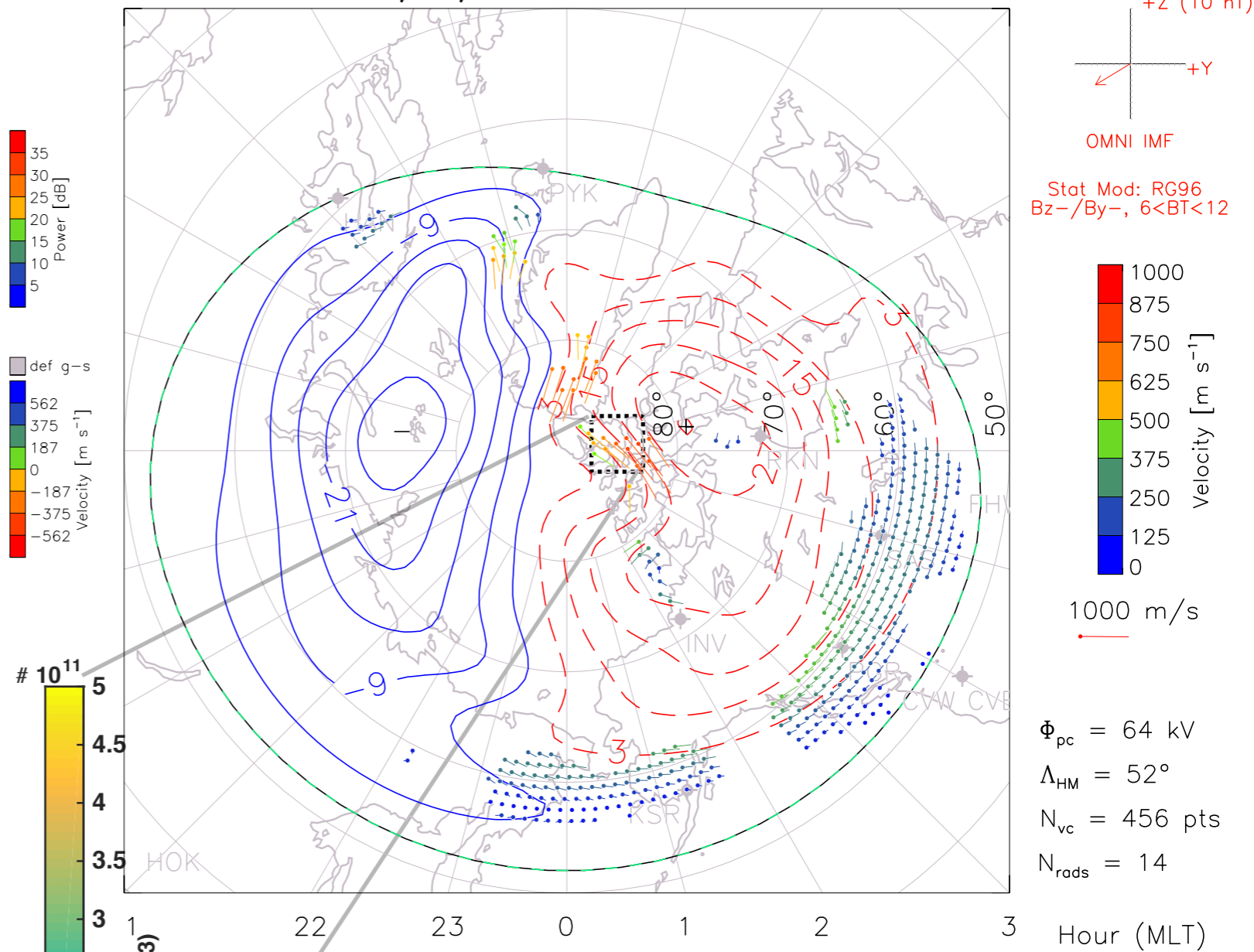
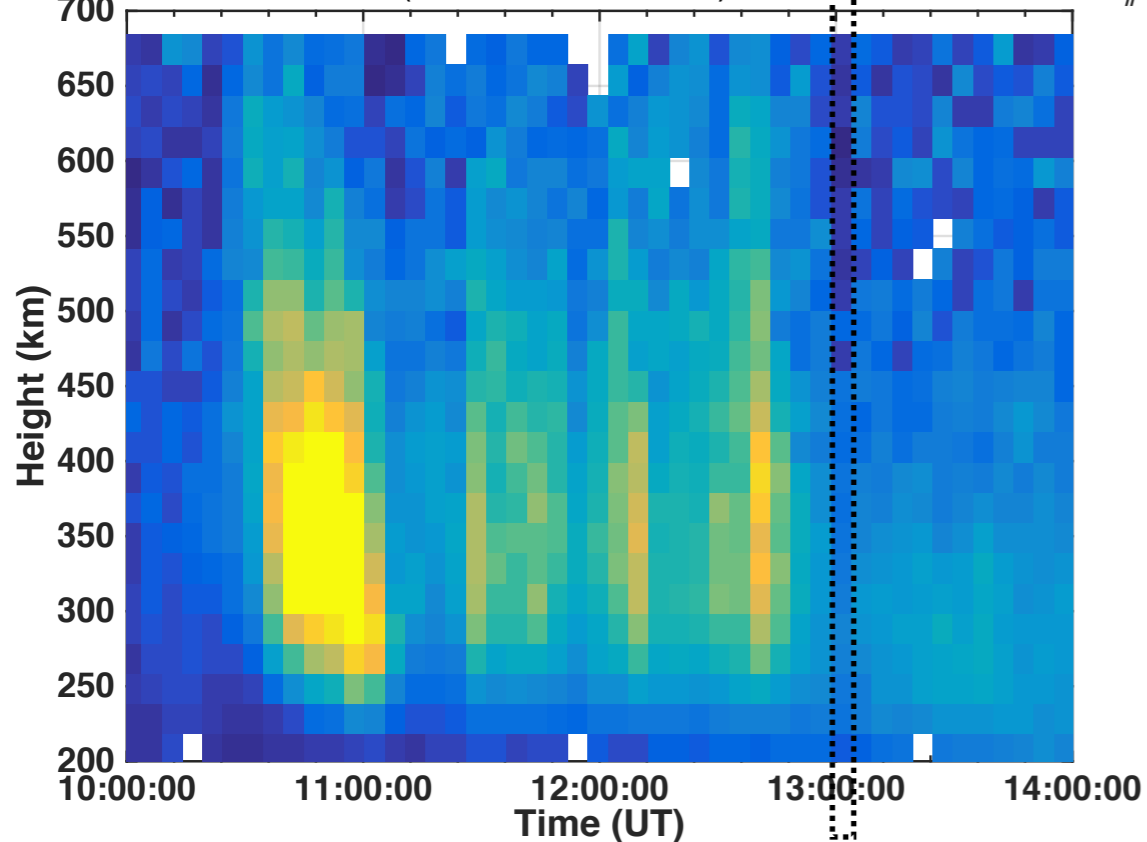
- March 19, 2015 pass through Rankin Inlet Beam 7 and RISR-N field-of-view.
 - Only Beam 7 was transmitting throughout pass.
- Original intent was to use RISR-N measurements to clarify propagation conditions of Rankin Inlet's beam.
- Significant lateral deviations detected close proximity to Rankin Inlet.

19/Mar/2015 12:44–12:46 UT

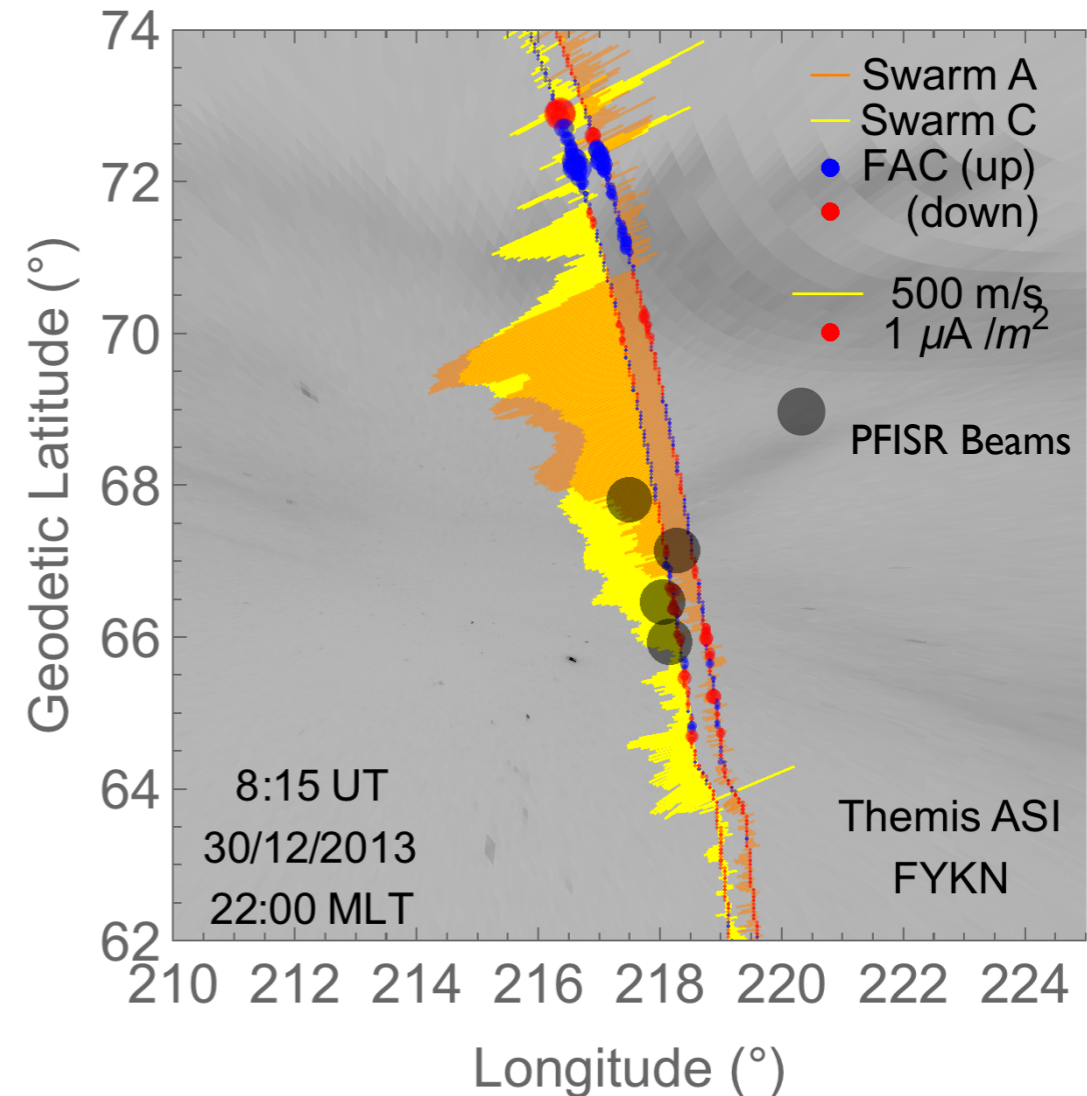
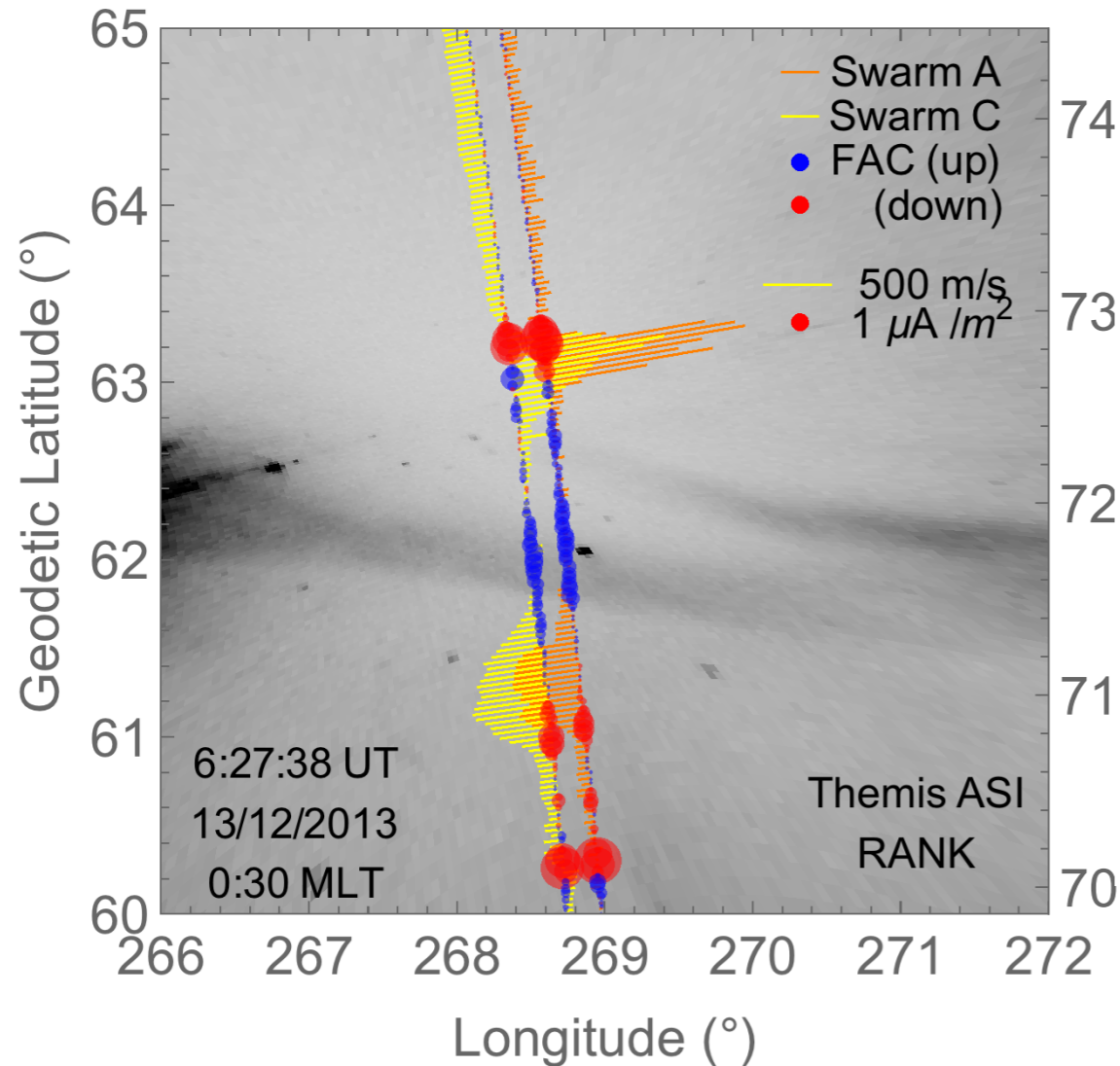
Rankin Inlet Beam 7



RISR-N Beam 6 (61.2° az., 49.4° el.)



- Plasma density structures detected by RISR-N in the hours before and leading up to the ePOP pass.
- Active E-region may be responsible for deviated beam signature (in this instance).
- Significant deviations have been seen in the majority of ePOP/ SuperDARN conjunctions. More passes planned.



- ~ 100 PFISR/Swarm conjunctions early in the Swarm mission (during “string of pearls” configuration).
- Intense electric fields and FACs near the OCB.
 - Strong, westward flows south of the arc; strong, eastward flows north of the arc.
- Altitude of Swarm satellites was 500 km.
- Features in Swarm’s Electric Field Instrument (EFI) have been used for a selection criteria.
- Passes occurring during very quiet conditions.

- Initial results from RRI onboard ePOP have detected significant deviations of SuperDARN Rankin Inlet's Beam 7.
 - Significant implications for HF propagation in the polar-cap.
- Very few ePOR/RISR-N conjunctions have occurred.
 - Planning underway for a winter campaign of conjunctions.
- ~100 Swarm/PFISR conjunctions have occurred.
 - Swarm was in “string of pearls” configuration.
 - Lots of observations to explore.

[e-POP data available at cssdp.ca](http://cssdp.ca)

[“Initial results from HF radio wave propagation studies with e-POP”
ITIT-07, Wednesday.](#)