Initial RISR-C results with REGO, SWARM, and SuperDARN : Velocity comparisons

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Making Sense of High-latitude Geospace Observations

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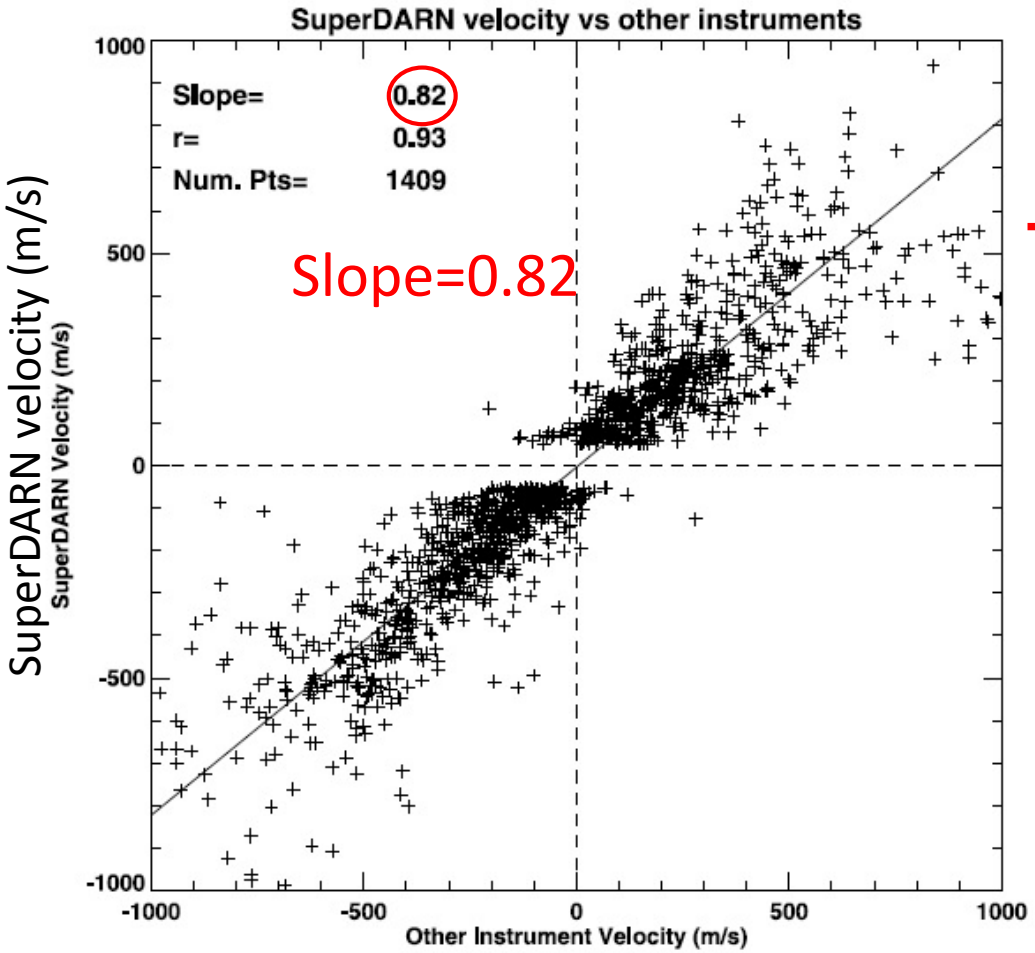
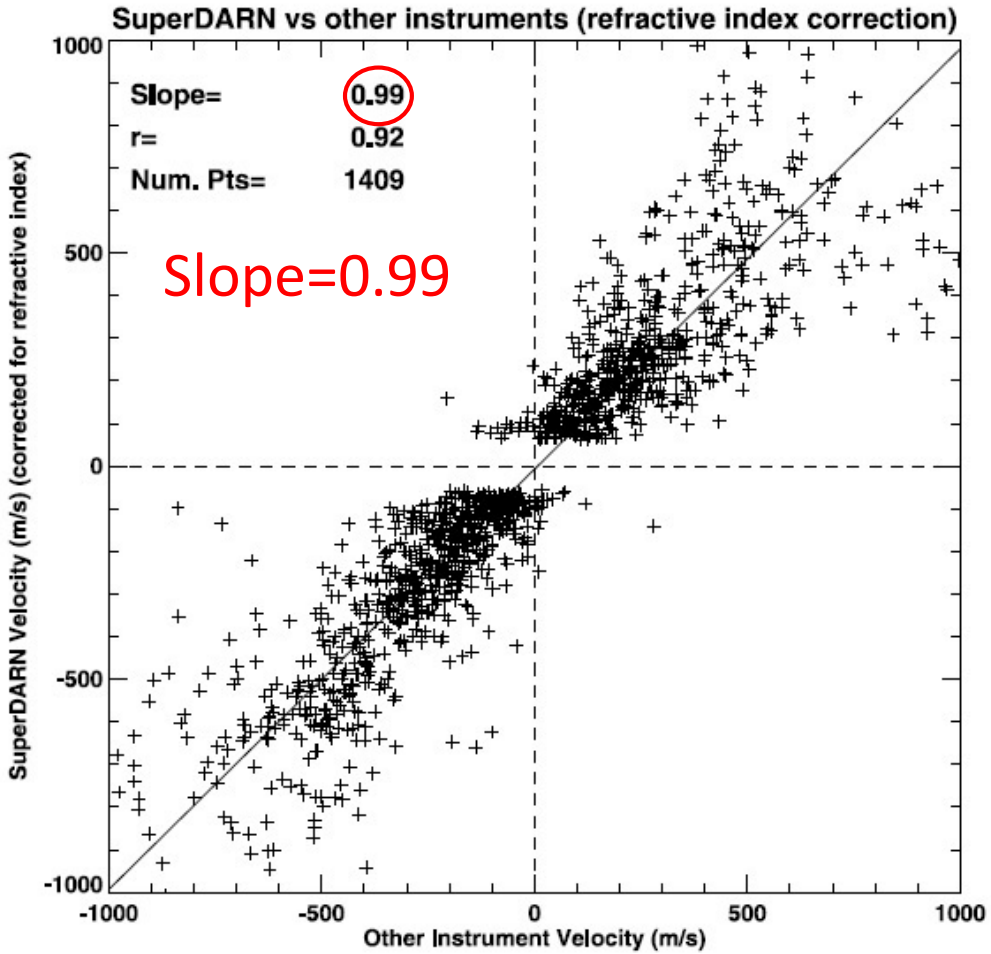
SuperDARN refractive index issue:

HF radars underestimate LOS velocities by a factor equal to refractive index *n* (*v_meas = n*v_real)*



n correction

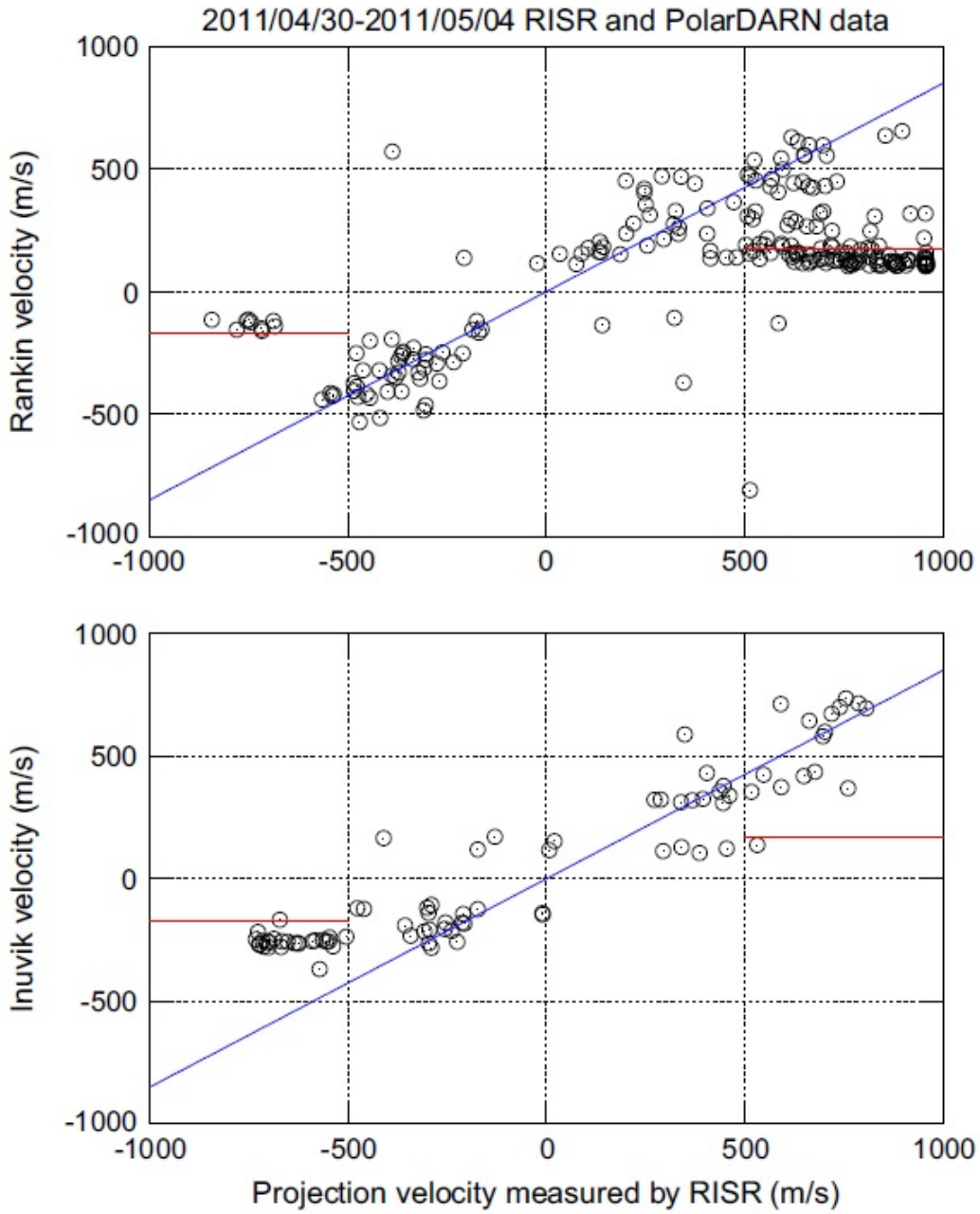


DMSP and EISCAT velocities (m/s)

*Figure 5 from *Gillies et al.* 2012

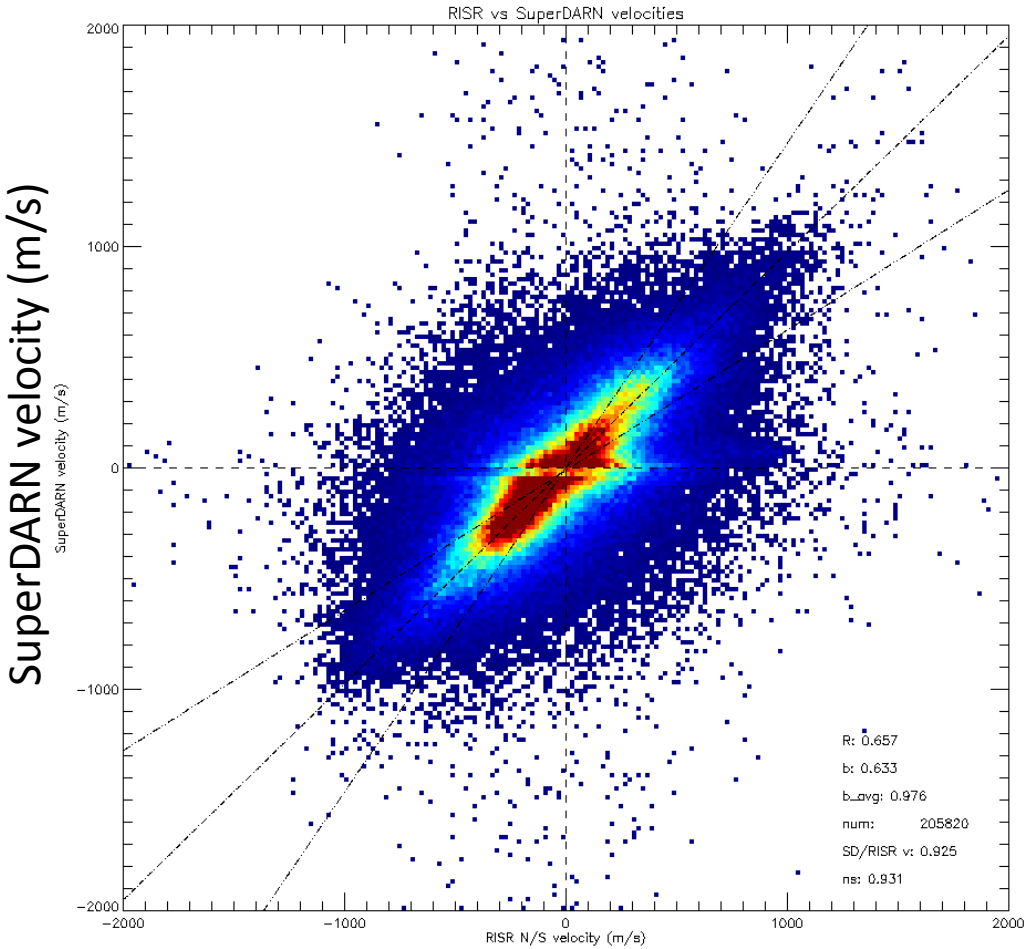
RISR-N vs PolarDARN study

- Study by *Bahcivan et al.* [2013] compared PolarDARN and RISR-N velocities
- Found that PolarDARN measurements had E-region contamination even at far ranges
- Otherwise agreement between radars good considering refractive index effect (slope=0.85)

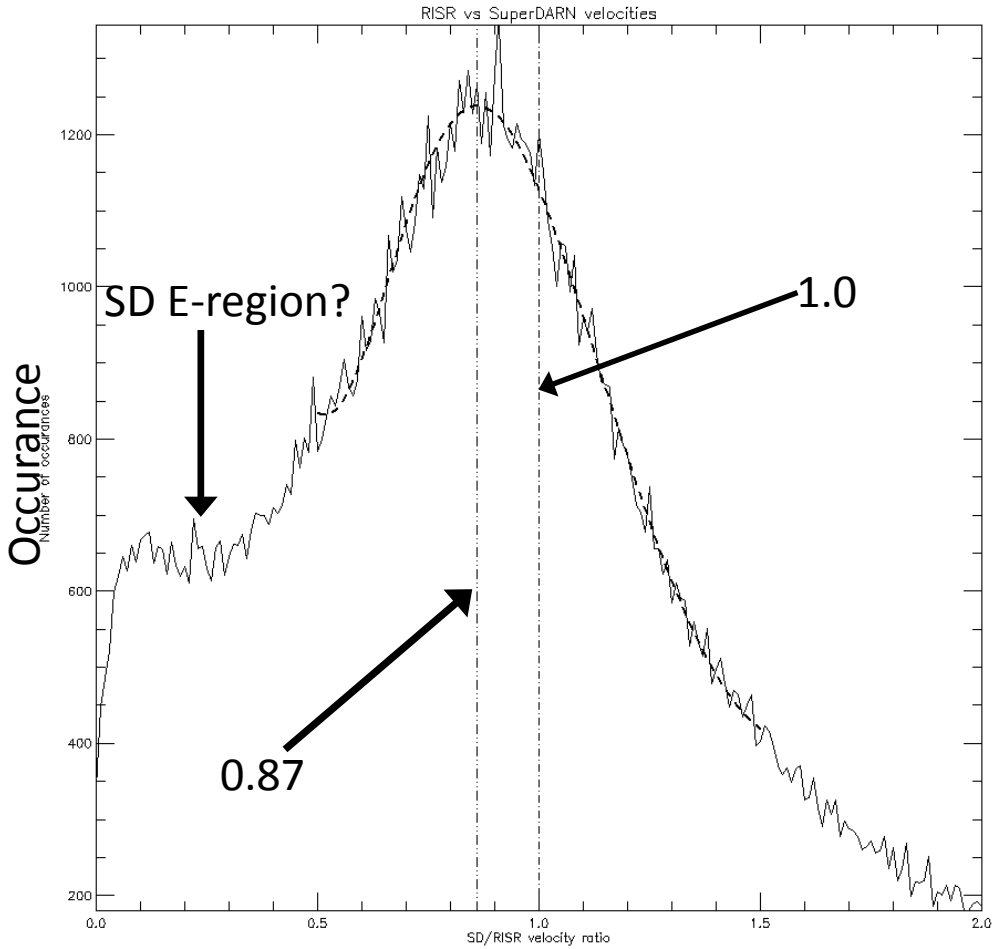


* Figure 5 *Bahcivan et al.* 2013

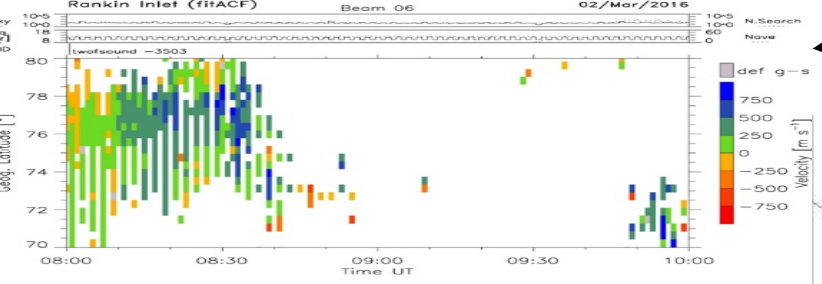
SuperDARN-RISR velocity comparison



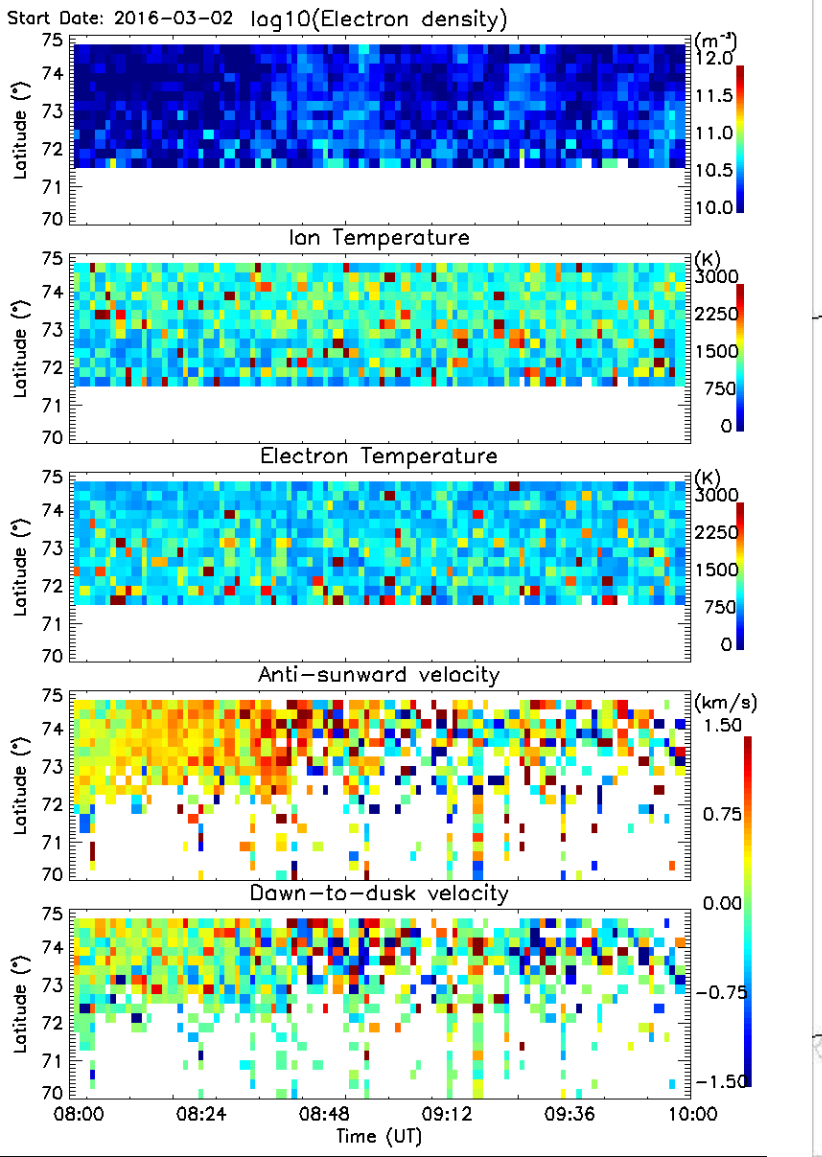
RISR N/S velocity (m/s)



SD/RISR velocity ratio

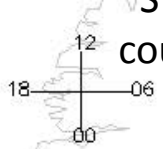


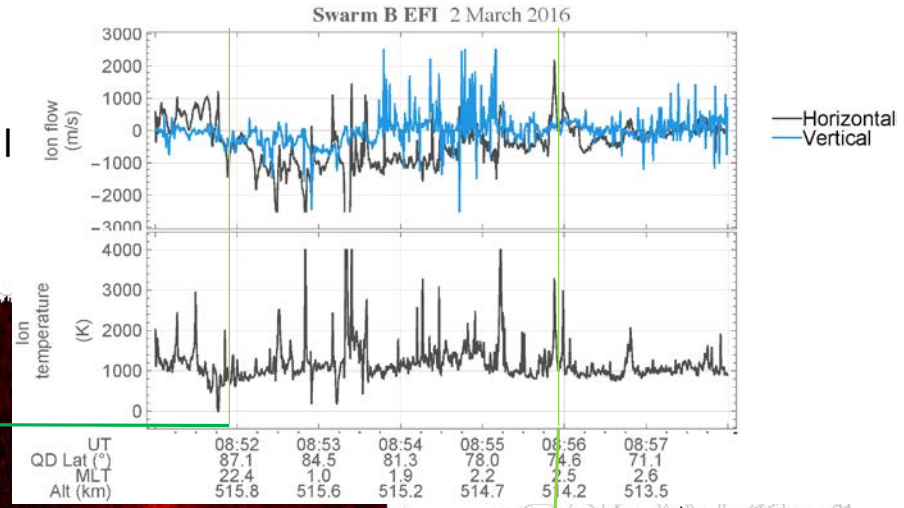
Rankin Inlet SD Beam 6

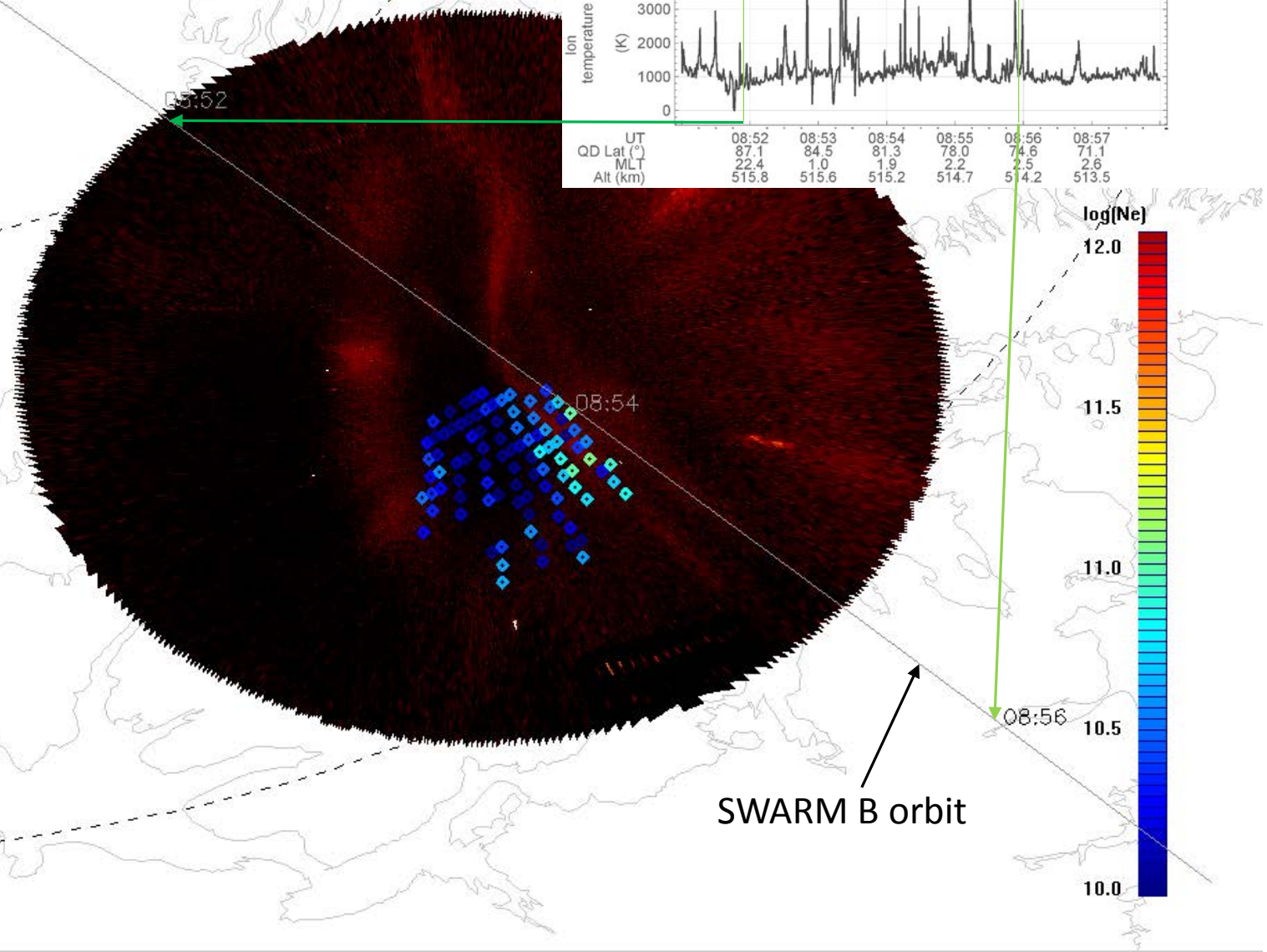


RISR data (150-200 km)
2016-03-02, 08:53 UT
02:33 LT (@ Resolute)

*SWARM data courtesy of J. Burchill







SWARM B orbit

Summary:

- Comparing/combining velocities estimated by ISRs and CSRs requires care
- RISR-C adds new dataset to compare to SuperDARN
- Other instruments (SWARM, ePOP, maybe REGO) can add further velocity information at different scales

References:
1) Bahcivan, H., M. J. Nicolls, and G. Perry (2013), Comparison of SuperDARN irregularity drift measurements and *F*-region ion velocities from the Resolute Bay ISR*, J. Atmos. Sol. Terr. Phys., 105-106, 325-331.*
2) Gillies, R. G., G. C. Hussey, G. J. Sofko, and K. A. McWilliams (2012), A statistical analysis of SuperDARN scattering volume electron densities and velocity corrections using a radar frequency shifting technique, *J. Geophys. Res.*, 117, A08320,doi:10.1029/2012JA017866.

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