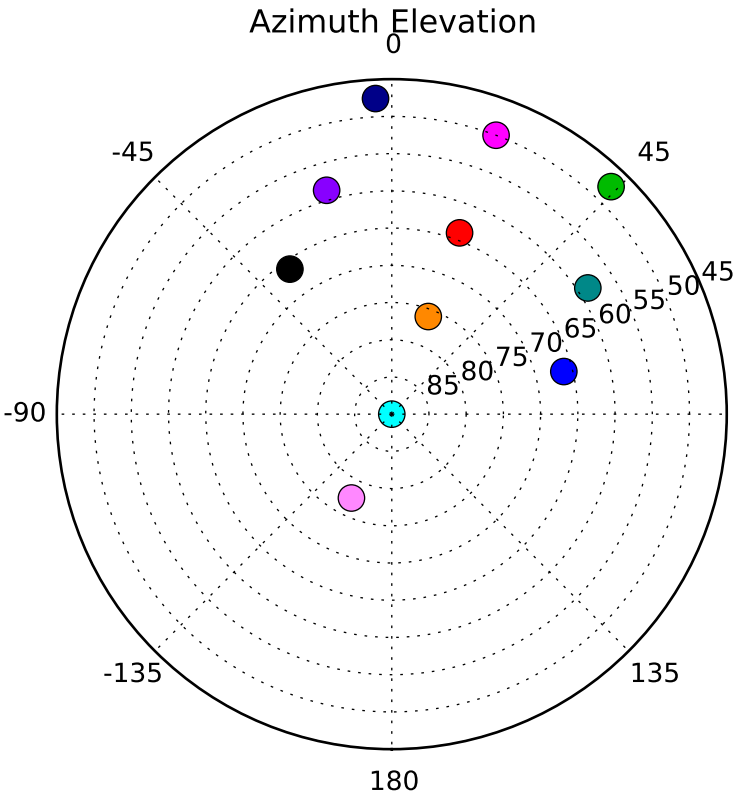
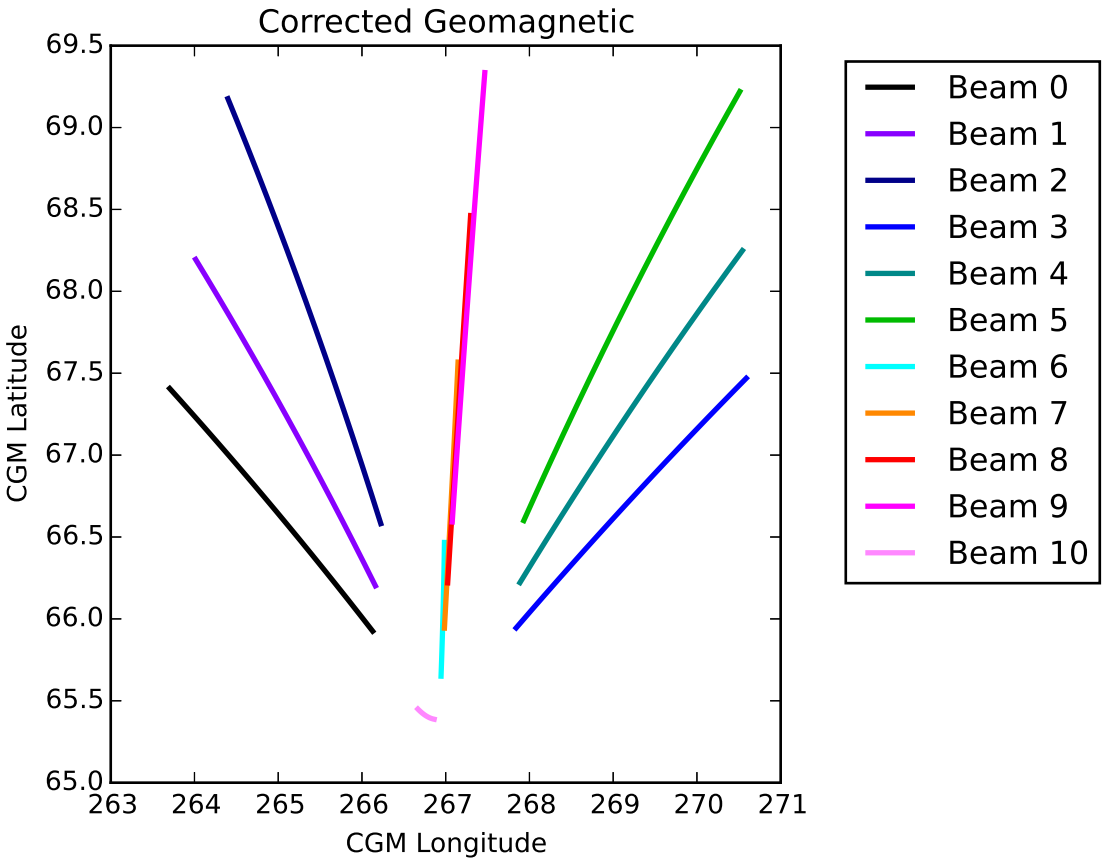
PFISR WorldDay35 Mode

- General purpose and synoptic world day mode
- 11 beam positions
- Fractional lag alternating codes for E-region (dtc0=449.3 MHz)
  - 480 μs pulse, 16-baud, 30 μs bauds
  - 30 μs short uncoded pulse for zero lags
  - Oversampled at 10 μs (1.5 km)
  - 0-390 km range
- Long pulses for F-region (dtc3=449.6 MHz)
  - 330 μs uncoded pulse
  - Oversampled at 20 μs (3 km)
  - 0-550 km range
- Down- and up-shifted plasma line channels (dtc1=440.6 MHz and dtc2=455.6 MHz)
  - Oversample long pulse at 0.28 μs (3.6 MHz-bandwidth)
  - Down-shifted channel covers $-10.8 \leftrightarrow -7.2$ MHz
  - Up-shifted channel covers $+4.2 \leftrightarrow +7.8$ MHz

Look in Madrigal at March 18, 2015 for an example of this mode.

Beam Geometry





Beam 10 is pointed up-**B**.

Pulse Sequence

- IPP 0 (5 ms)
  - Beam 0
  - Tx 1^{st} AC @ 449.3 MHz
  - dtc0 takes data samples
  - dtc3 takes noise / cal samples
- IPP 1-10
  - Same as IPP 0 on Beams 1-10
- IPP 11 (4.9 ms)
  - Beam 0
  - Tx 330 μs long pulse @ 449.6 MHz
  - Tx 30 μs short pulse @ 449.3 MHz
  - dtc3, dtc1, dtc2 take data samples
  - dtc0 takes data samples (zero lag), noise / cal samples
- IPP 12-21
  - Same as IPP 11 on Beams 1-10

Pulse Sequence Cont.

- IPP 22-32
  - Same as IPP 0-10 but using 2^{nd} AC
- IPP 33-43
  - Same as IPP 11-21

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- IPP 682-692
  - Same as IPP 0-10 but using 32^{nd} AC
- IPP 693-703
  - Same as IPP 11-21

Record Summary

- Each record is 4× through the 704 pulse sequence (2816 pulses, 13.9392 s)
- 4× through all 32 AC in all 11 beams (128 pulses / beam)
- 128 long pulses / beam
- Products computed and averaged over each record in real time:
  - 76-different AC lag-products for each range-gate (dtc0/IncohCodeFI)
  - AC zero lag power from short pulse (dtc0/S/ZeroLags)
  - 16-different LP lag-products for each range-gate (dtc3/S)
  - 1024-point plasma-line FFTs (dtc1/PLFFTS and dtc2/PLFFTS)
- 50 records per output data file.

LP Processing Summary

- Records integrated to $\sim$1 min resolution (5 records = 69.696 s, 640 pulses)
- ACFs binned into 24 km range-gates
- ACFs fit at 24 km range-resolution for:
  - N_e, T_e, T_i, V_{LOS}

Fitter assumptions:

- 5-ion chemistry model for composition (O^+,O_2^+,NO^+,N_2^+, N^+)
- Collision frequencies ν_{in} computed from MSIS
- T_i identical for all ions
- $v_i = v_e$ for all species

AC Processing Summary

- Records integration to $\sim$3 min resolution (13 records = 181.2096 s, 1664 pulses)
- Fractional-lag ACFs binned to 4.5 km range-resolution
- ACFs fit at 4.5 km range-resolution for:
  - N_e, T_e, T_i, V_{LOS}

Fitter assumptions:

- 5-ion chemistry model for composition (O^+,O_2^+,NO^+,N_2^+, N^+)
- Collision frequencies ν_{in} computed from MSIS
- T_i identical for all ions
- $T_e = T_i$ below 140 km
- $v_i = v_e$ for all species

Vector Velocity (Electric Field) Processing

- LP V_{LOS} from all 11 beams are post-processed into vector electric fields
- V_{LOS} converted to 2-component electric field, assumed to map along magnetic field lines
- 2-component electric fields binned and fit in 0.25° magnetic latitude bins
- 3-component vector velocities fit as well