AMISR experiment design

Asti Bhatt

SRI International

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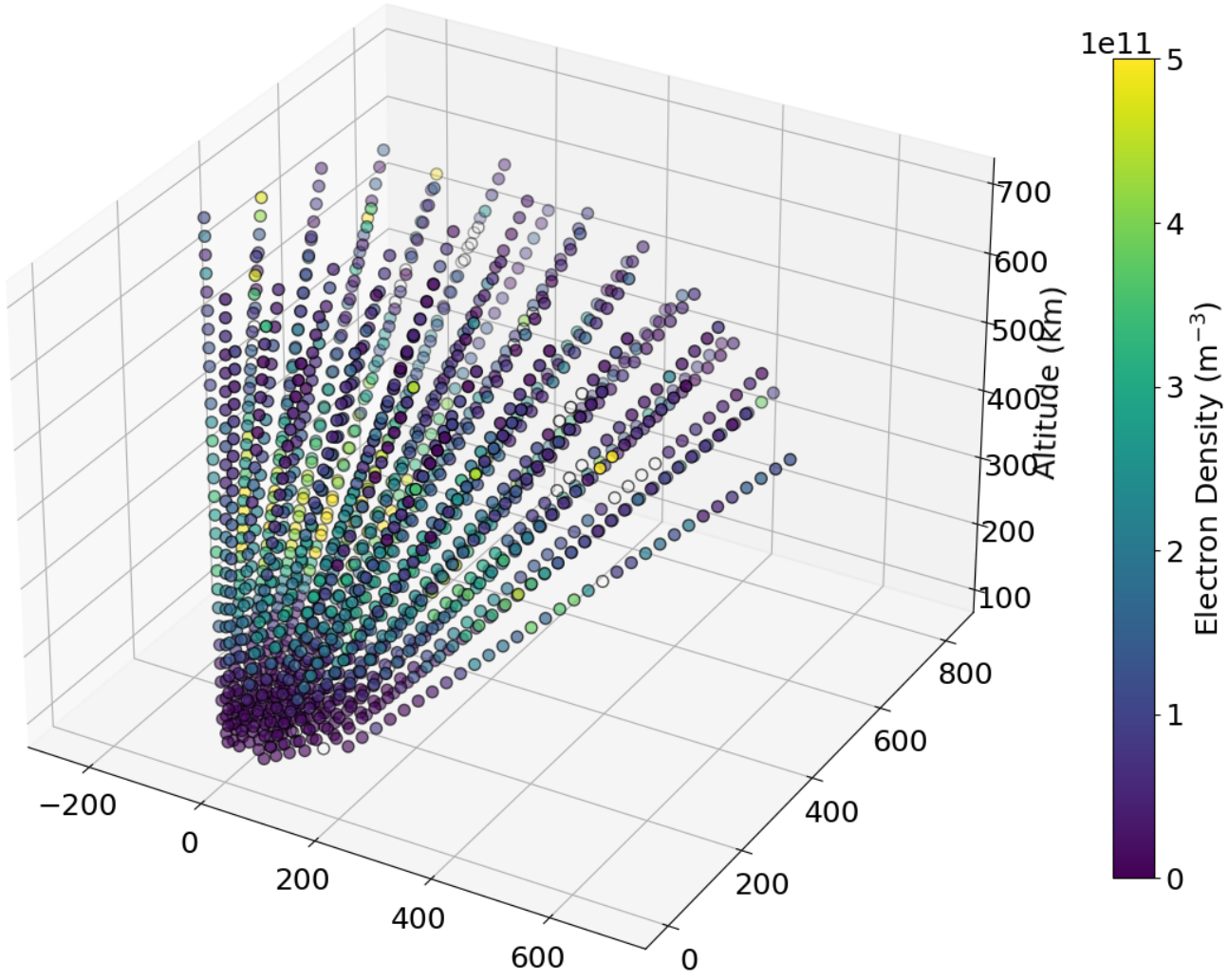
AMISR can volumetrically image the ionosphere



Key things to keep in mind

- What region are you interested in?
- What is the time resolution you need?
- What is the spatial extent and resolution?
- Do you want to look in a specific direction?

Types of pulses

Long Pulse (LP):

- a long transmit pulse that is correlated against itself to resolve range
- low range resolution, high sensitivity

Alternating Code (AC):

- phase modulated pulses designed to avoid range ambiguity,
- high range resolution, medium sensitivity

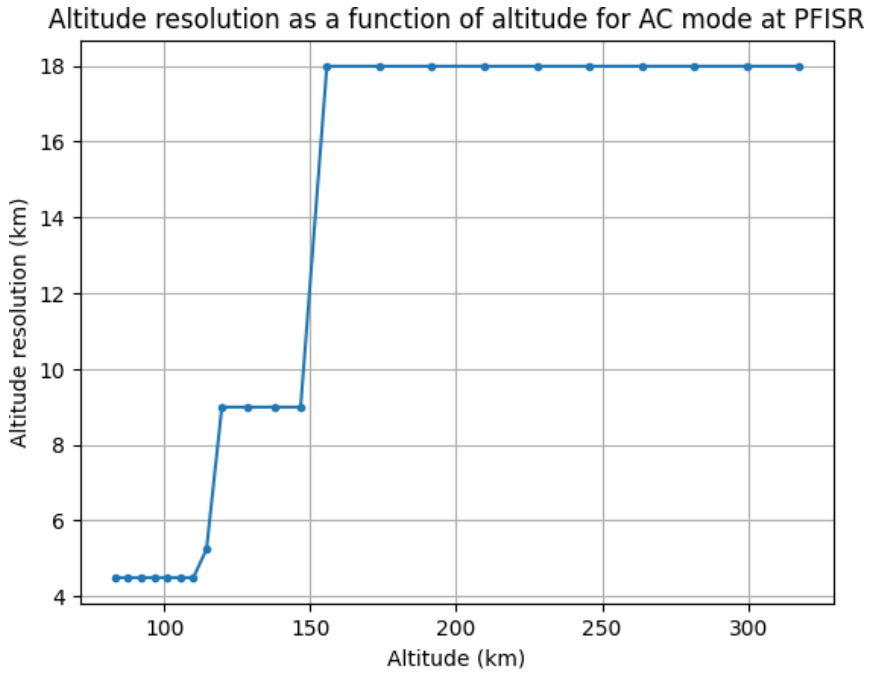
Barker Code (BC):

- similar to AC but applicable in D-region due to –
- highest range resolution, high sensitivity

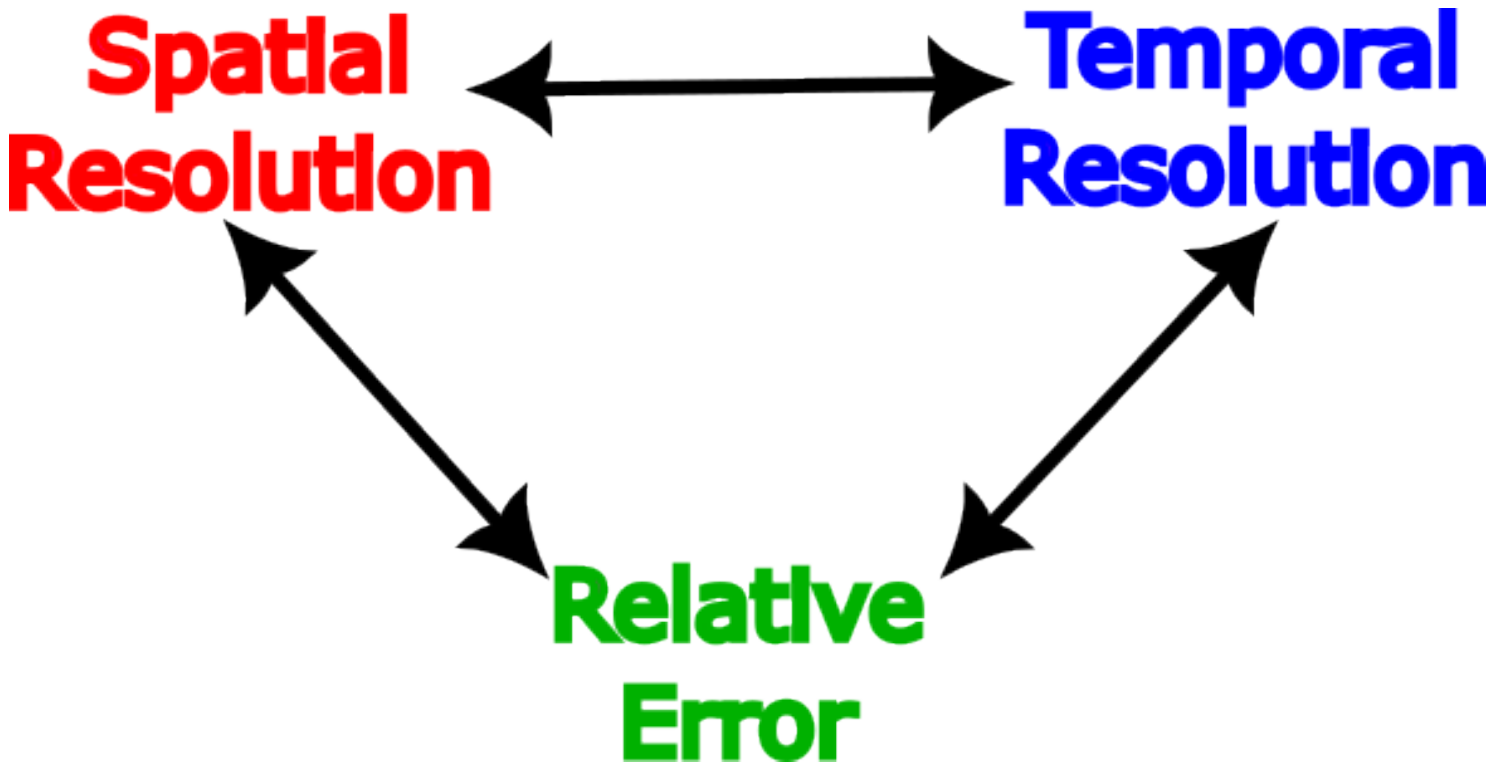
Modes can be interleaved

Regions and pulse types

- F-region only
  - Long pulse (~6km range resolution)
- E- and F-regions
  - Alternating code
  - Long pulse
- D-region focus, sporadic E, E- and F-region context
  - Barker code (~750m range resolution)
  - Alternating code
  - Long pulse



Trade space for mode design



Trade space for mode design

Temporal resolution == integration period

- Long integration period means lower temporal resolution, less noisy data and less error
- Short integration period means higher temporal resolution, relatively higher errors

Spatial resolution == Beam positions

- More beam positions give higher spatial resolution, each beam is revisited less frequently, meaning longer integration time
- Fewer beam positions give better statistics but lower spatial resolution
- Option to revisit a single beam more often during the cycle

Signal-to-Noise ratio

- Time of the day is important when denser plasma may give higher SNR, allowing for lower integration times, better statistics

PFISR Mode menu

PFISR1. Long Pulse

- 330 us long pulse with multiple frequencies to improve statistics
- Good mode for F-region studies needing high time resolution (e.g. TID studies)

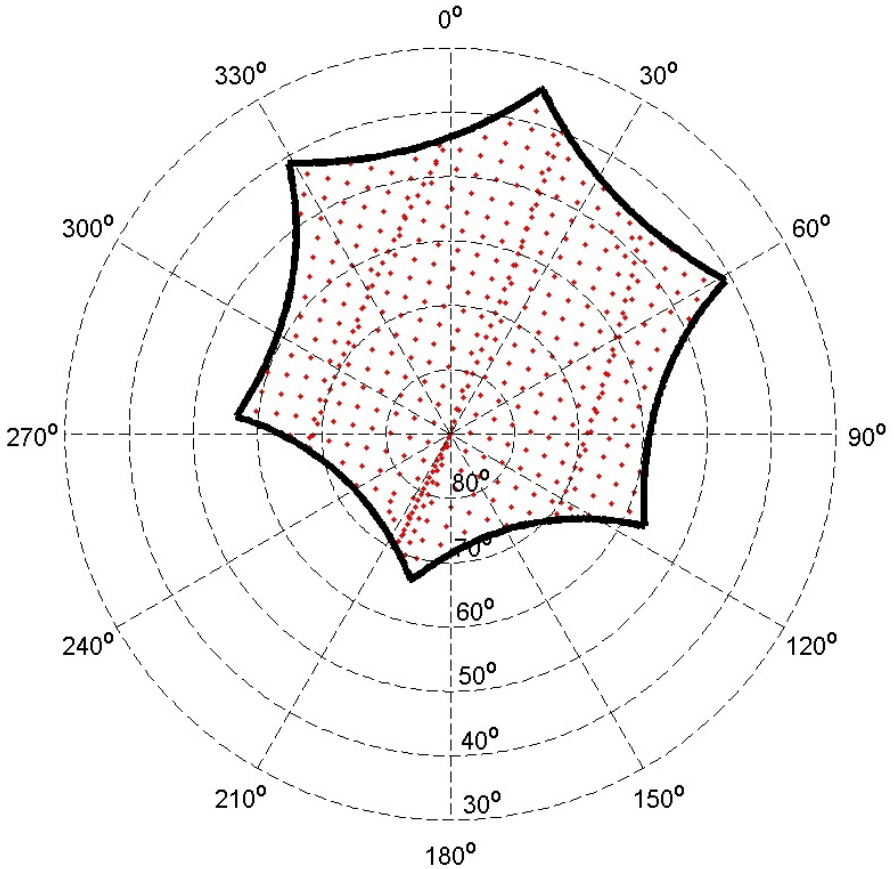
PFISR2. Long pulse + Alternating code (see WorldDay35)

- 330 us long pulse + alternating code
- Good mode for studies spanning E- and F-regions

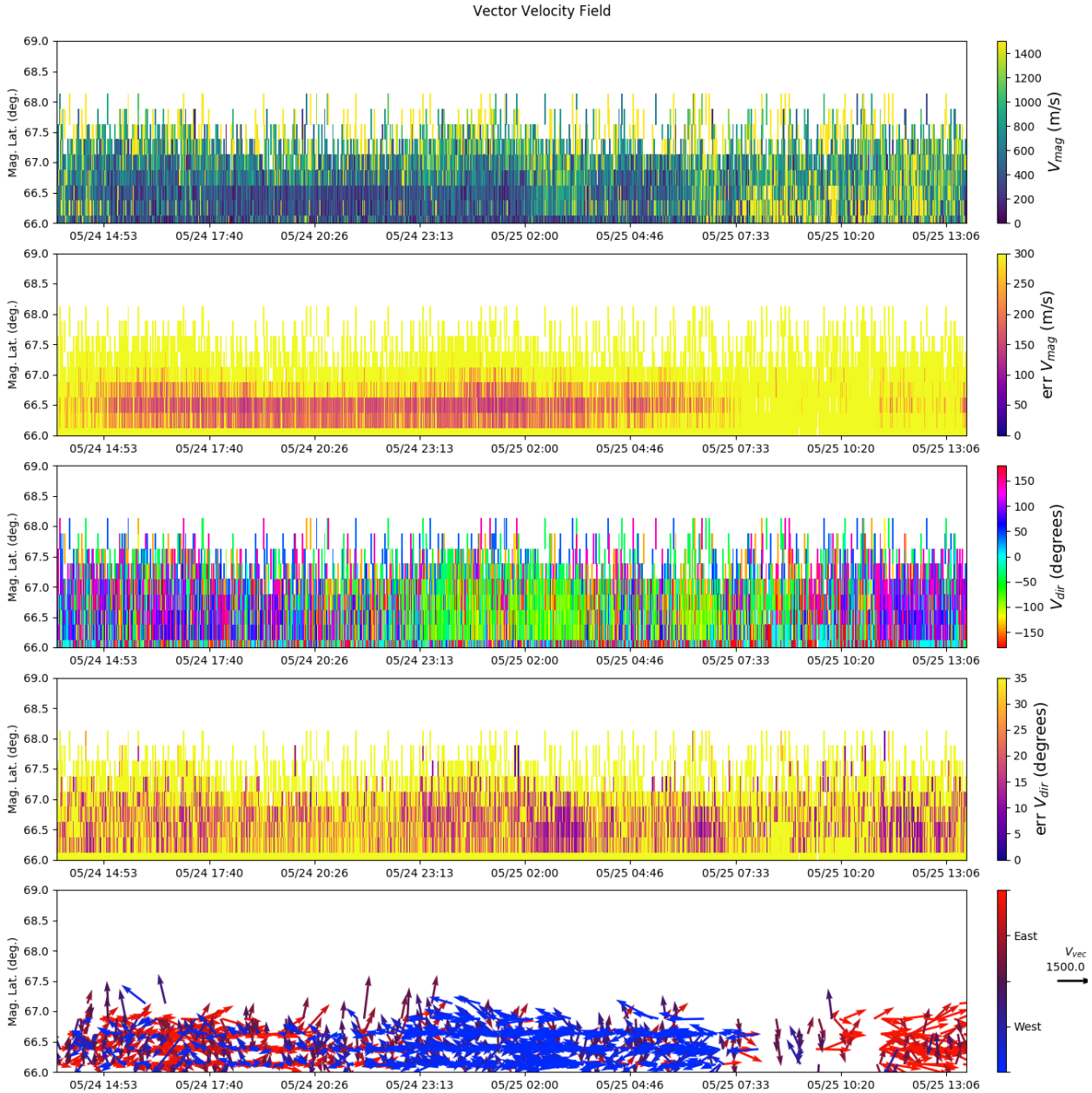
PFISR3. Long pulse + Alternating Code + Barker Code (see MSWinds26)

- 330 us long pulse + alternating code + barker code
- Good mode for studies needing D-region measurements with E- and F-regions for context

Beam positions and vector velocities



https://amisr.com/amisr/media/pfisr/bcotable.txt



You can get resolved vector velocities/electric field from any experiment with 3 or more beam positions

RISR-N Mode menu

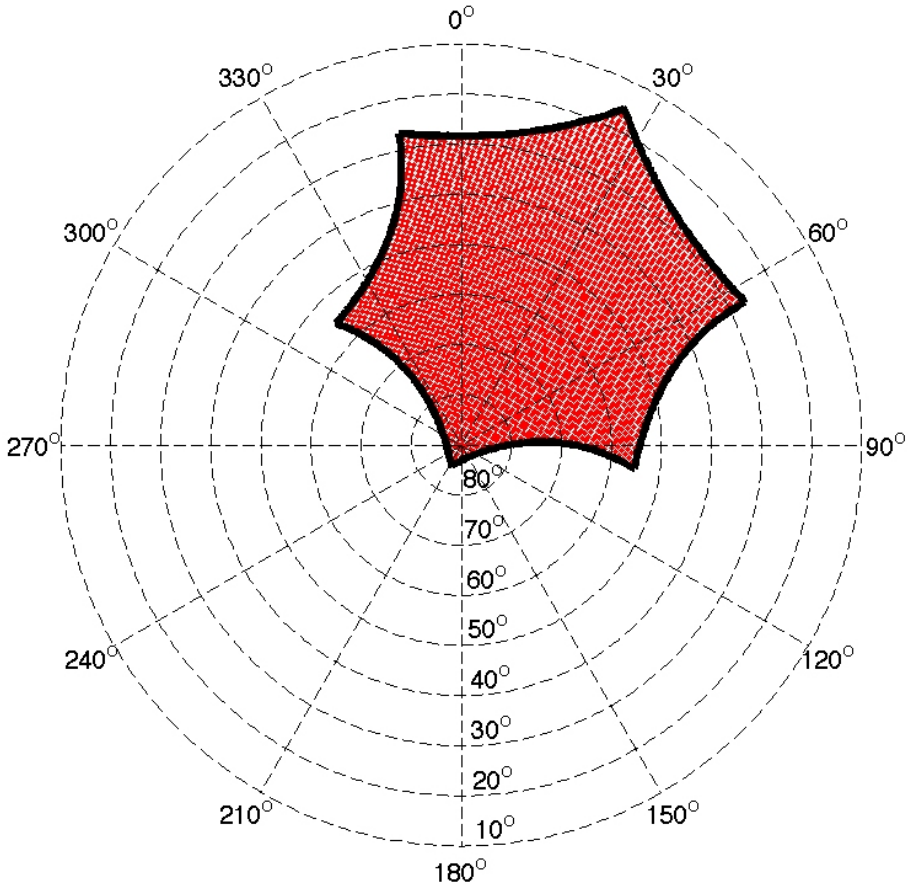
RISR1. Dual-frequency Long Pulse with 9 beams

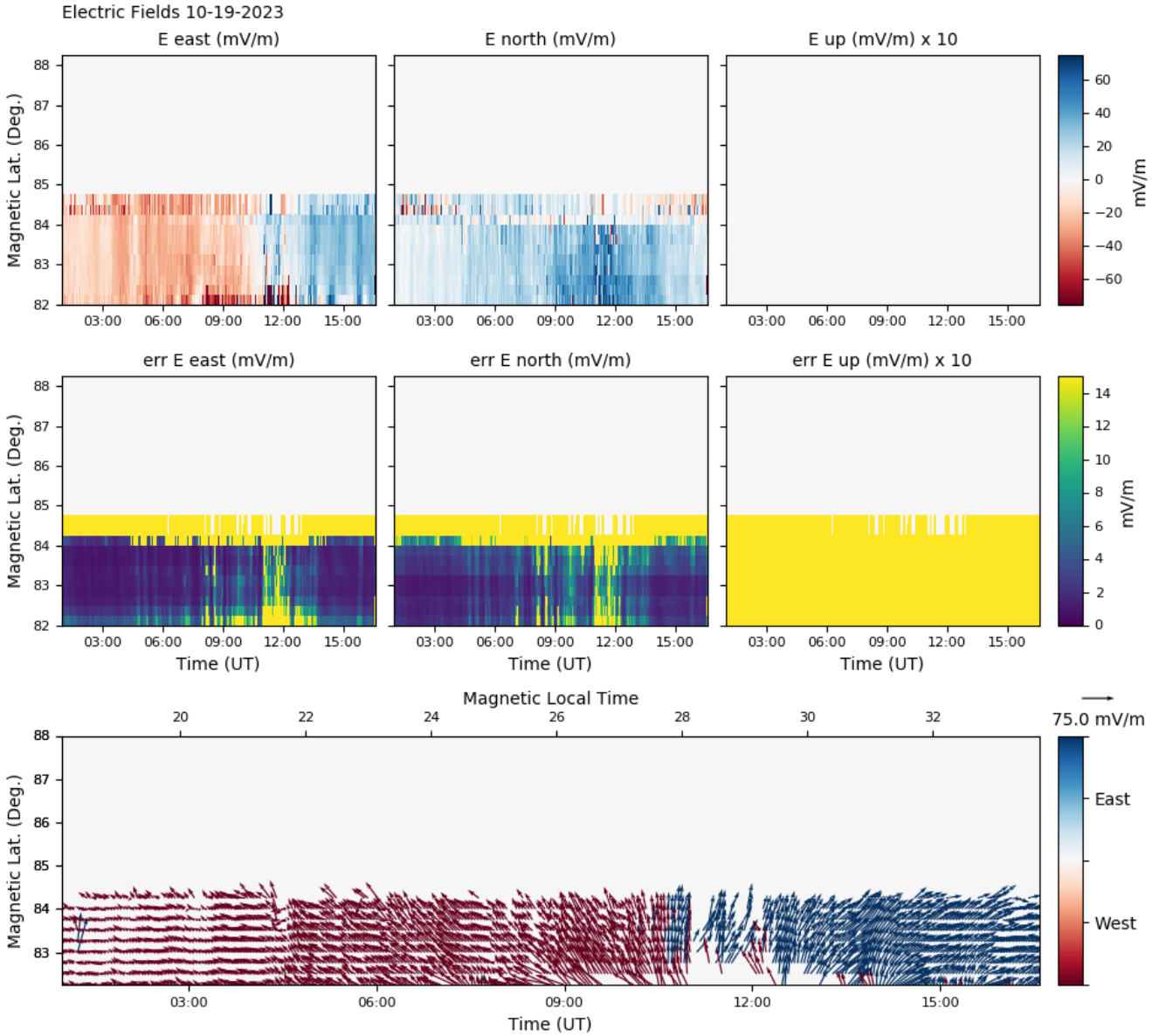
- 480 us long pulse with multiple frequencies to improve statistics
- Good mode for F-region studies needing high time resolution with spatial coverage

RISR2. Long pulse + Alternating code with 5 beams

- 330 us long pulse + alternating code
- Good mode for studies spanning E- and F-regions with high time resolution but low spatial coverage

Beam positions and vector velocities





https://amisr.com/amisr/media/risrn/RISRN_beamcodes.txt

You can get resolved vector velocities/electric fields from any experiment with 3 or more beam positions