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Na Lidar Scanning Beam Report

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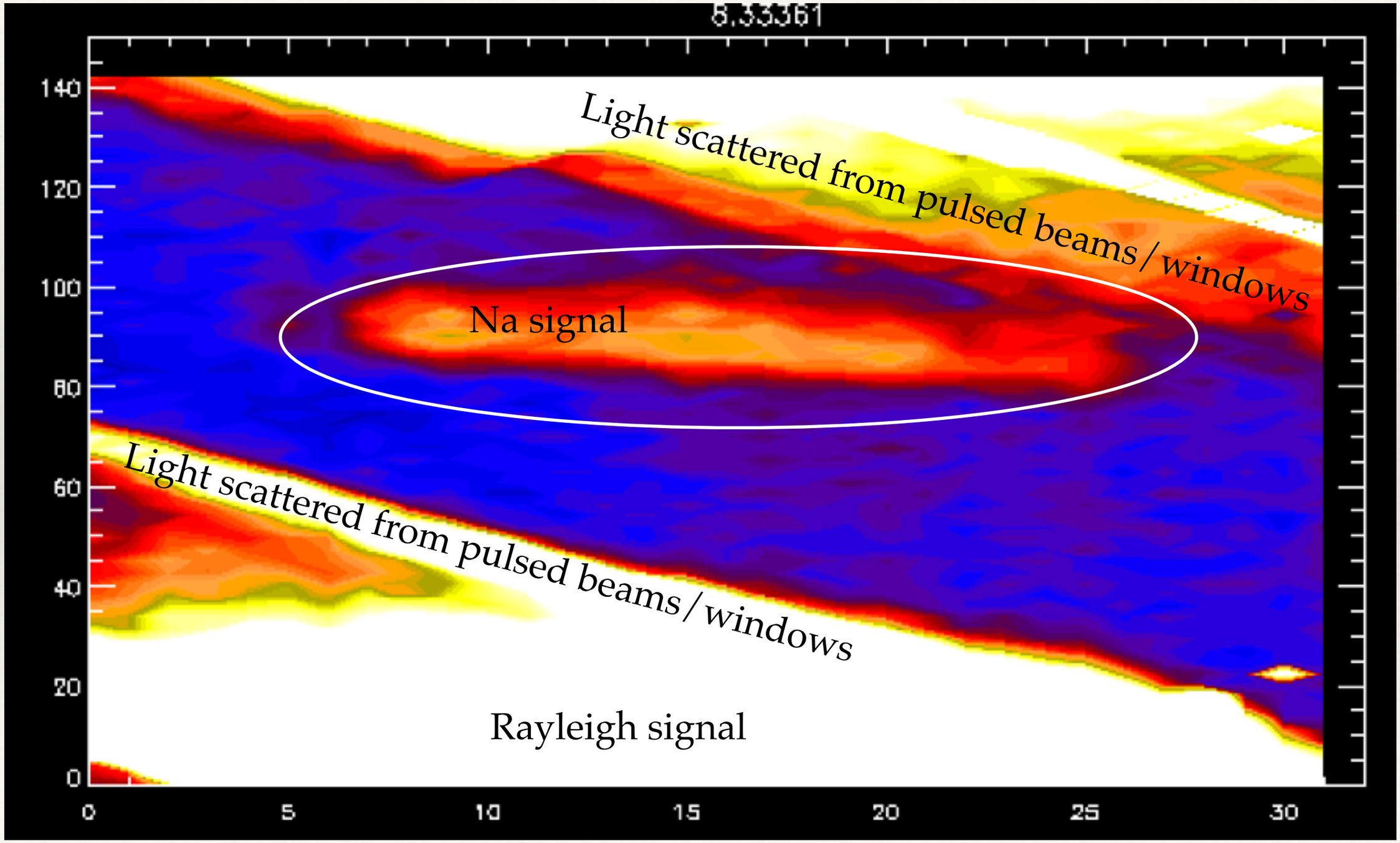
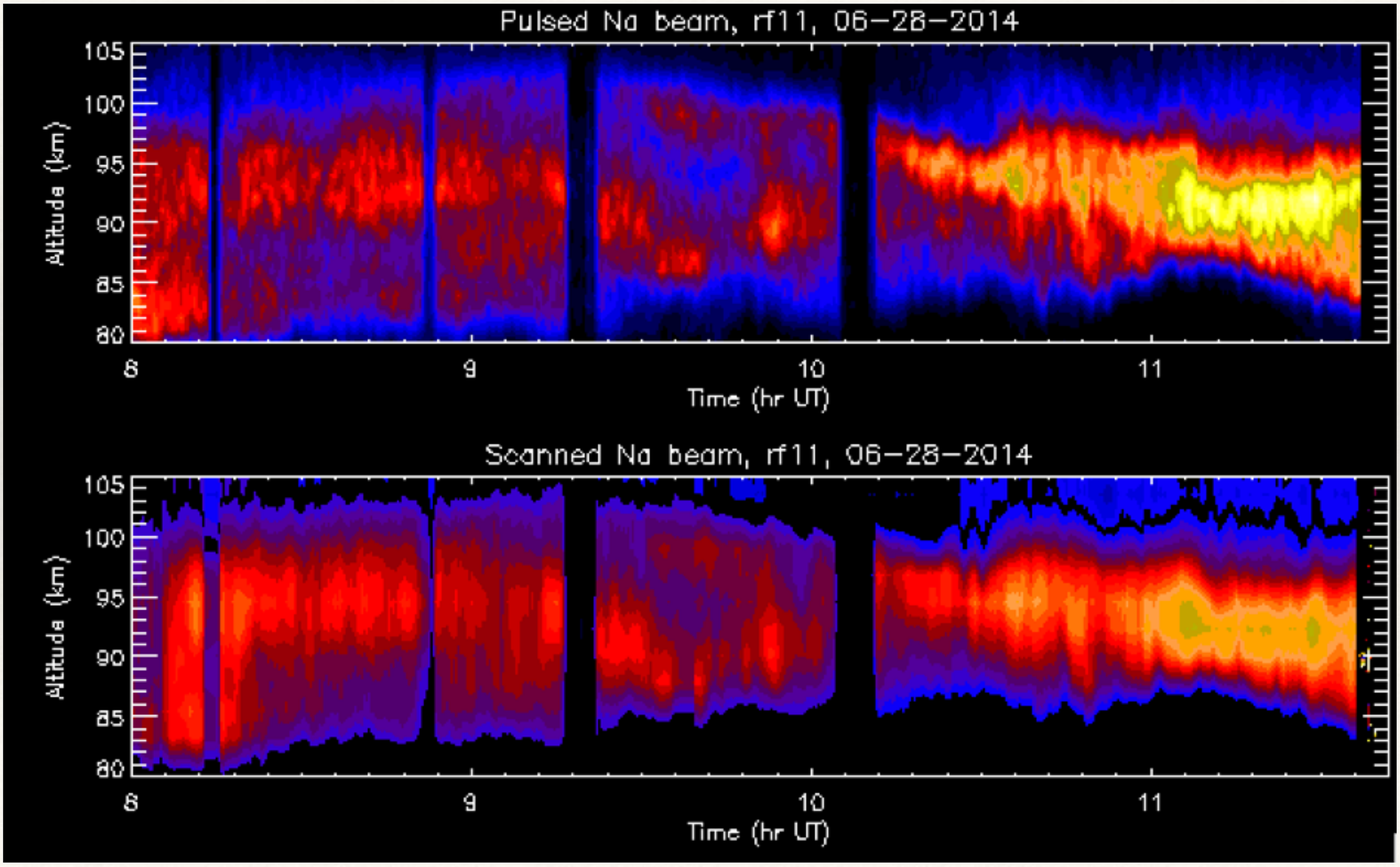
Scanning Beam Instrument Description

- Na lidar uses two innovative techniques to obtain range-resolution with a CW laser:
  - Amplitude modulation with an acousto-optic crystal
  - Angle modulation
- 11W beam is divided in parallel into two beams:
  - Pulsed beam: Acousto-optic modulator makes a 150mW pulsed beam at 2% duty cycle and 1kHz pulse repetition rate. Full range 150km, range resolution: 3km (full width)
  - 10W beam scanned in 1.50º rectangle repeating at 1kHz, Full range 150km, range resolution 3km (FWHM)
- Pulsed beam uses exact same fiber coupled receiver (40% PMT, filter) as some of the current Na lidars -> safe design
- Scanned beam shape is produced with a 70,000 point-per-second galvo scanner and the forward scan edge is aligned with a new 32 channel PMT with an integrated 32 channel counter board
- Each of the 32 PMT channels sees a pulsed 150mW profile staggered in time, these can be shifted and co-added to get very high signal strengths and good time resolution

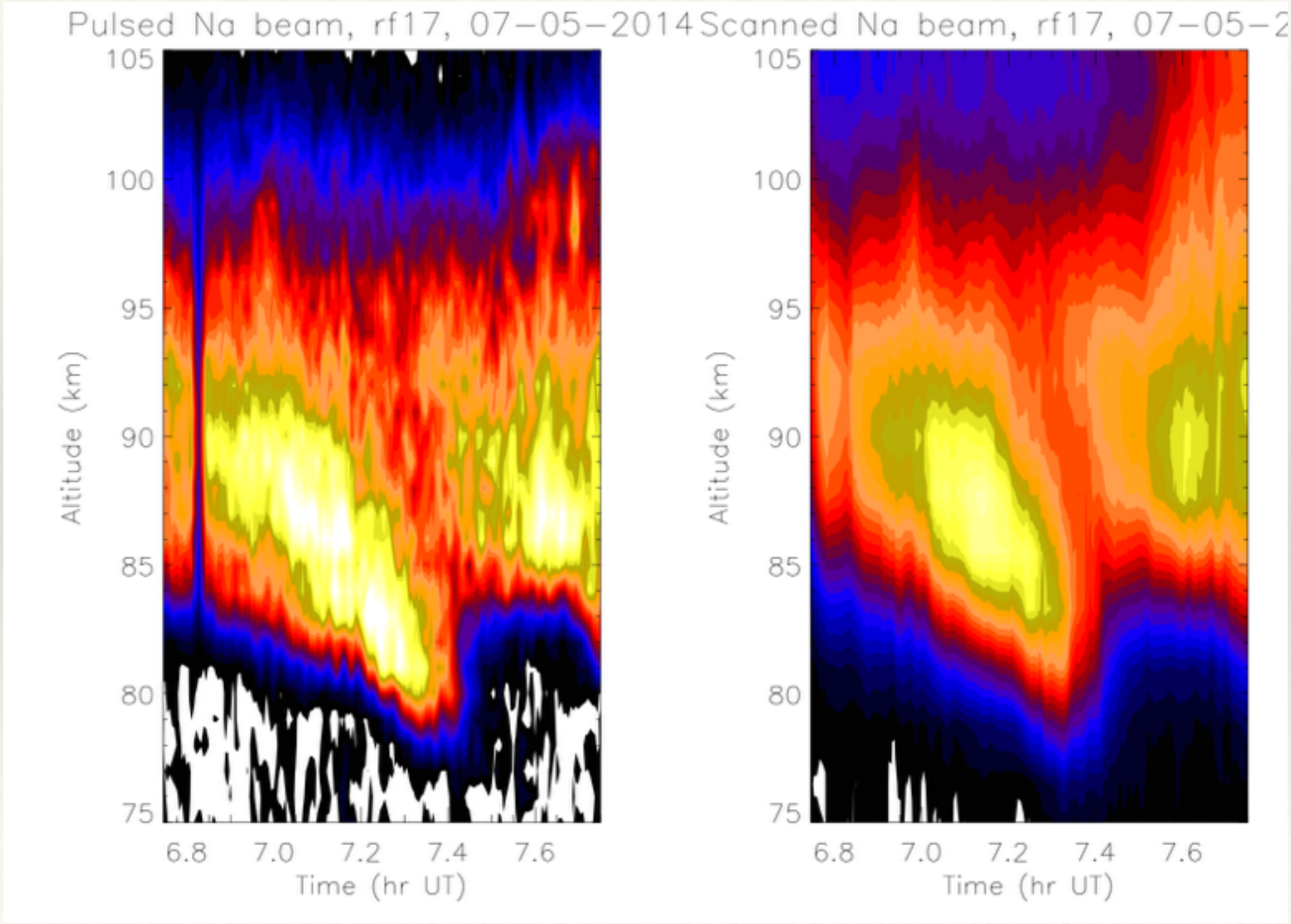
Example 32 channel raw data: rf10, 3 sec integration



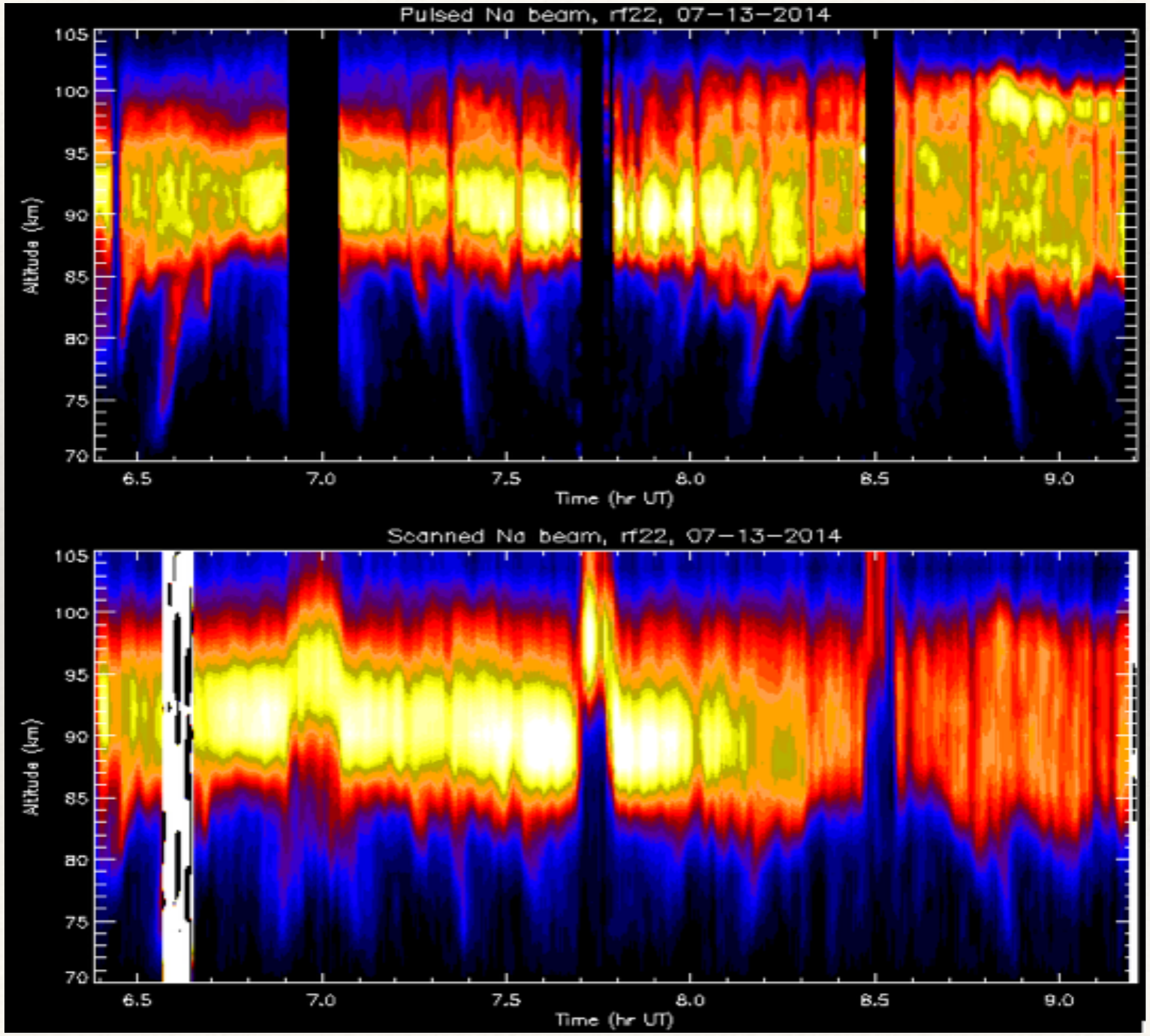
Pulsed vs. scanned, rf11



Pulsed vs. scanned, rf17



Pulsed vs. scanned, rf22



Scanning Beam Status

- 5-10 times more photons from sodium layer than pulsed beam
- Slightly worse altitude resolution, more photons -> better time resolution
- Scattered light affects background subtraction and Rayleigh normalization
  - Pulsed Na and UV beams scatter from exit windows, near field return
  - Scanned beam itself scatters dust/water drops on output windows -> changes with time
- Temperature calibration and analysis more difficult
- Shows same large horizontal changes in Na altitude (rf11, rf17, rf22, etc.)
- Analysis still in progress