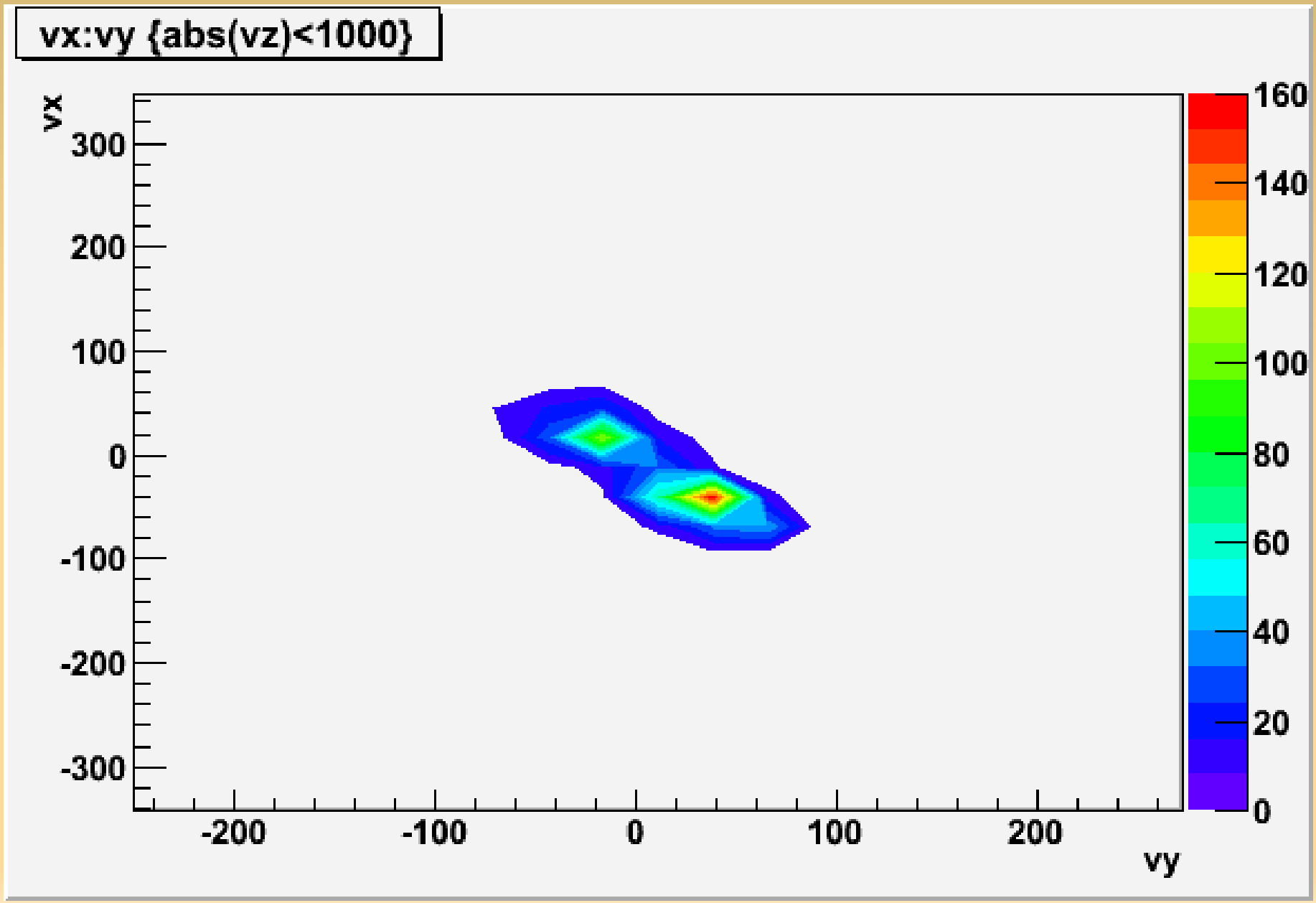
RICE experience

Bkgnds, monitored over 15 yrs show consistent yearly patterns:

- Summer activity often results in high RF rates (often saturating amplifiers)
  - May get better with the cessation if IC drilling
- VLF antenna pick-up at scope inputs (no Rx!)
- Winter bkgnds low: now 1 mHz @7 σ_{kT}
- Correlation of trigger rates with high winds
- Solar flares (in progress, with Weatherwax)

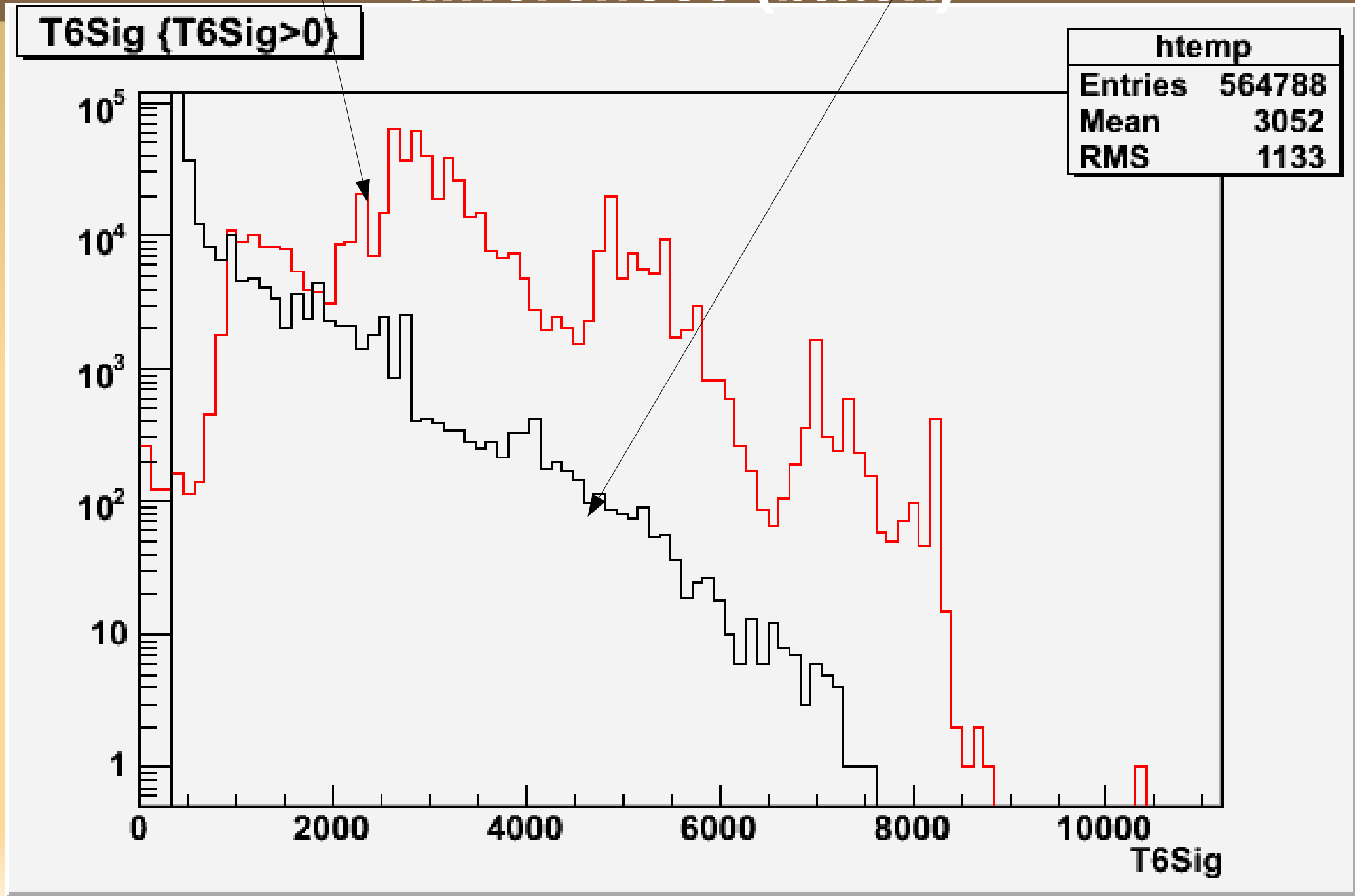
RICE source map / 3/10-3/12



Comments on bkgnds

- Typically, 60% of triggers saturate amplitude dynamic range
  - High-amplitude veto
- ~35% of backgrounds are repetitive (“double-pulses”); dt~3-4 us
- During winter, backgrounds are sufficiently sparse that we can release down-coming hardware veto

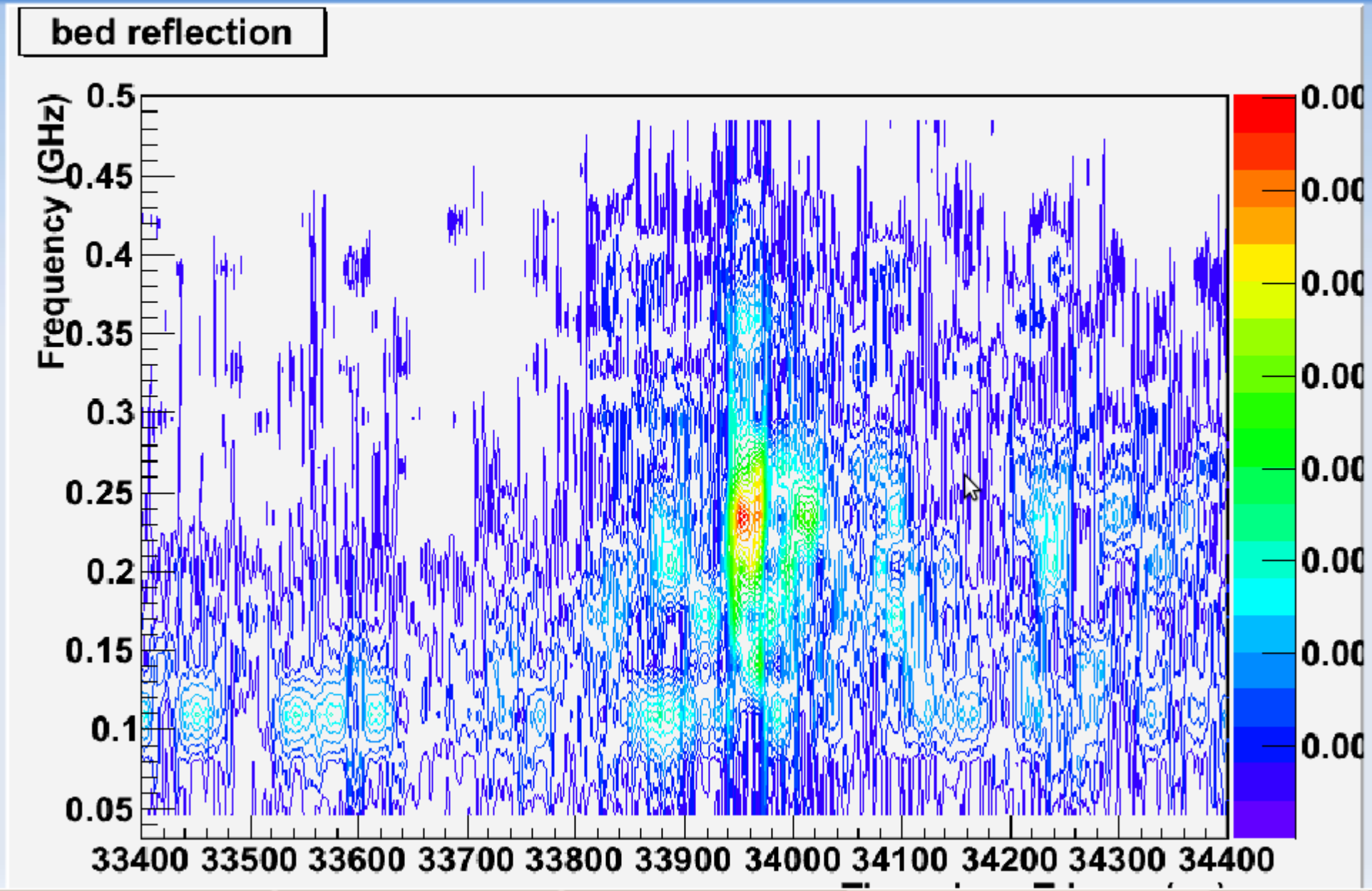
All hit times (red) vs. double-pulse time differences (black)



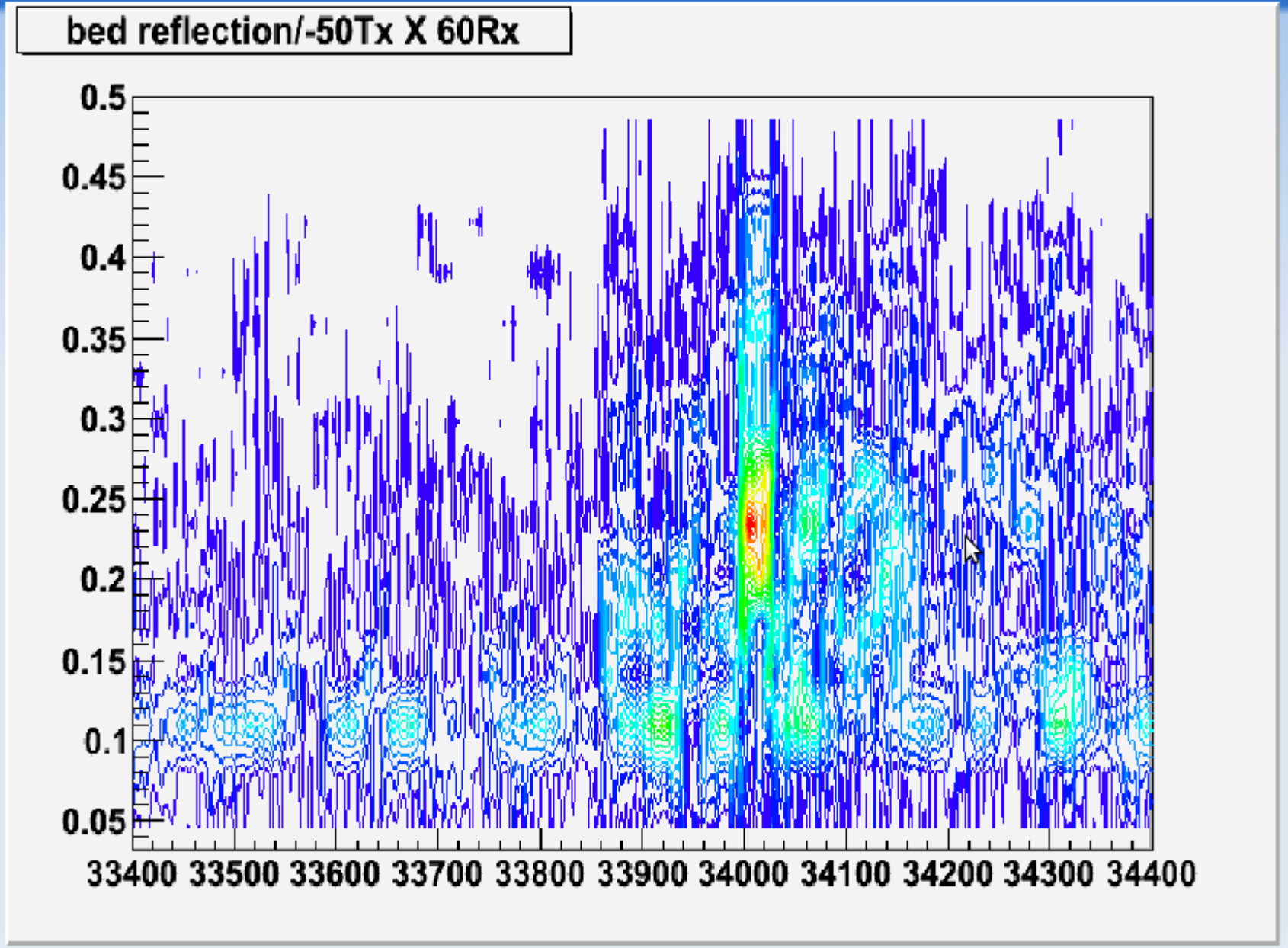
RICE experience

- 1 channel failure post-freeze-in (amplifier durability)
- Within the limits of our amplitude calibration (factor of 2), no performance distinction between dry-hole deployments and wet-hole deployments
  - Holes close over finite timescale:
  - 1 yr: antenna (on styrofoam base) movable in hole
  - 2 yrs: antenna frozen in at bottom
  - 5 yrs: 200-m deep hole is constricted at ~100 m depth
- Ice is clear and non-birefringent down to ~1800 m
  - Birefringence in lower km

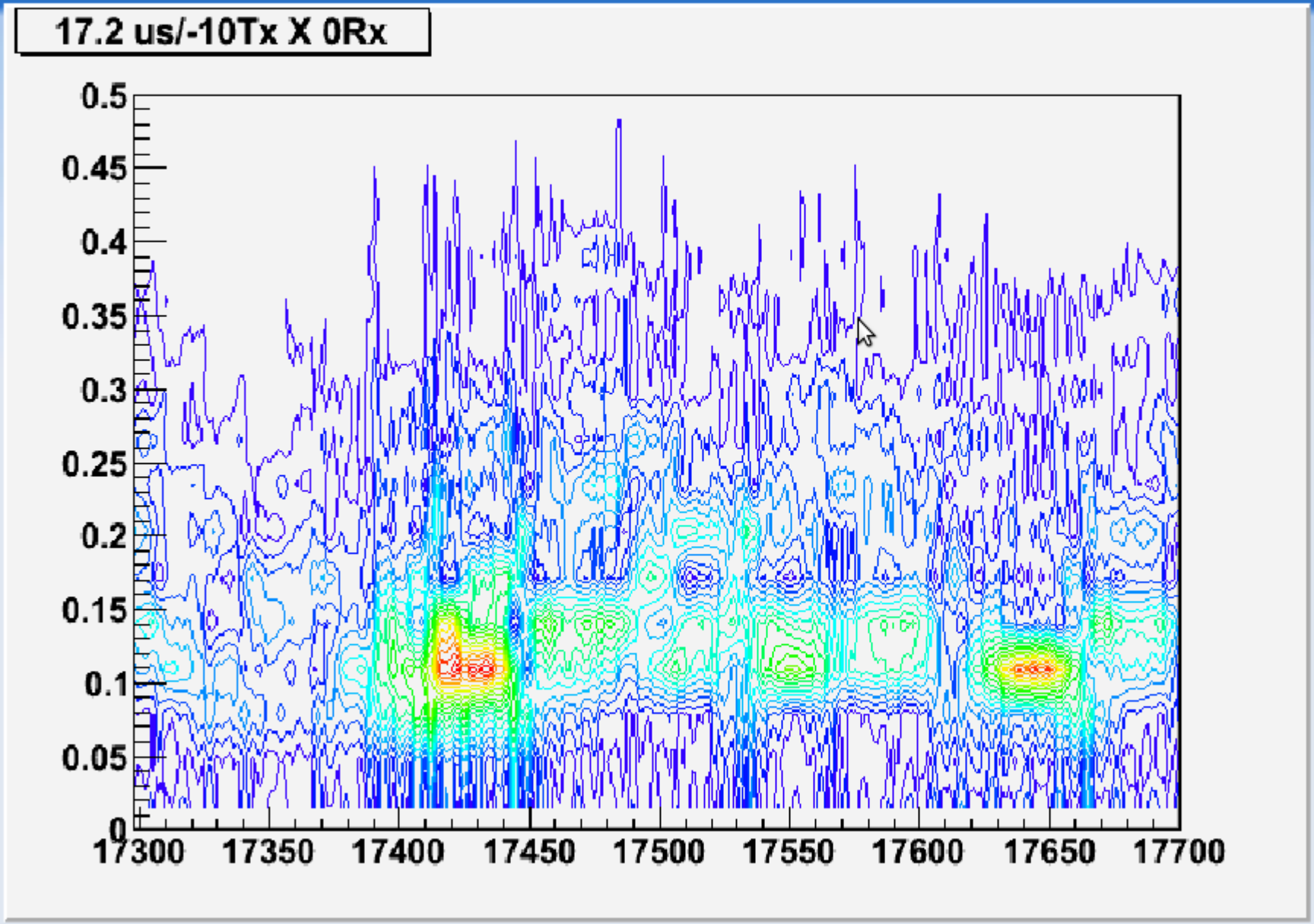
Freq. domain: -10x0 (below)/30x60 (next) bed reflections offset by 50 ns

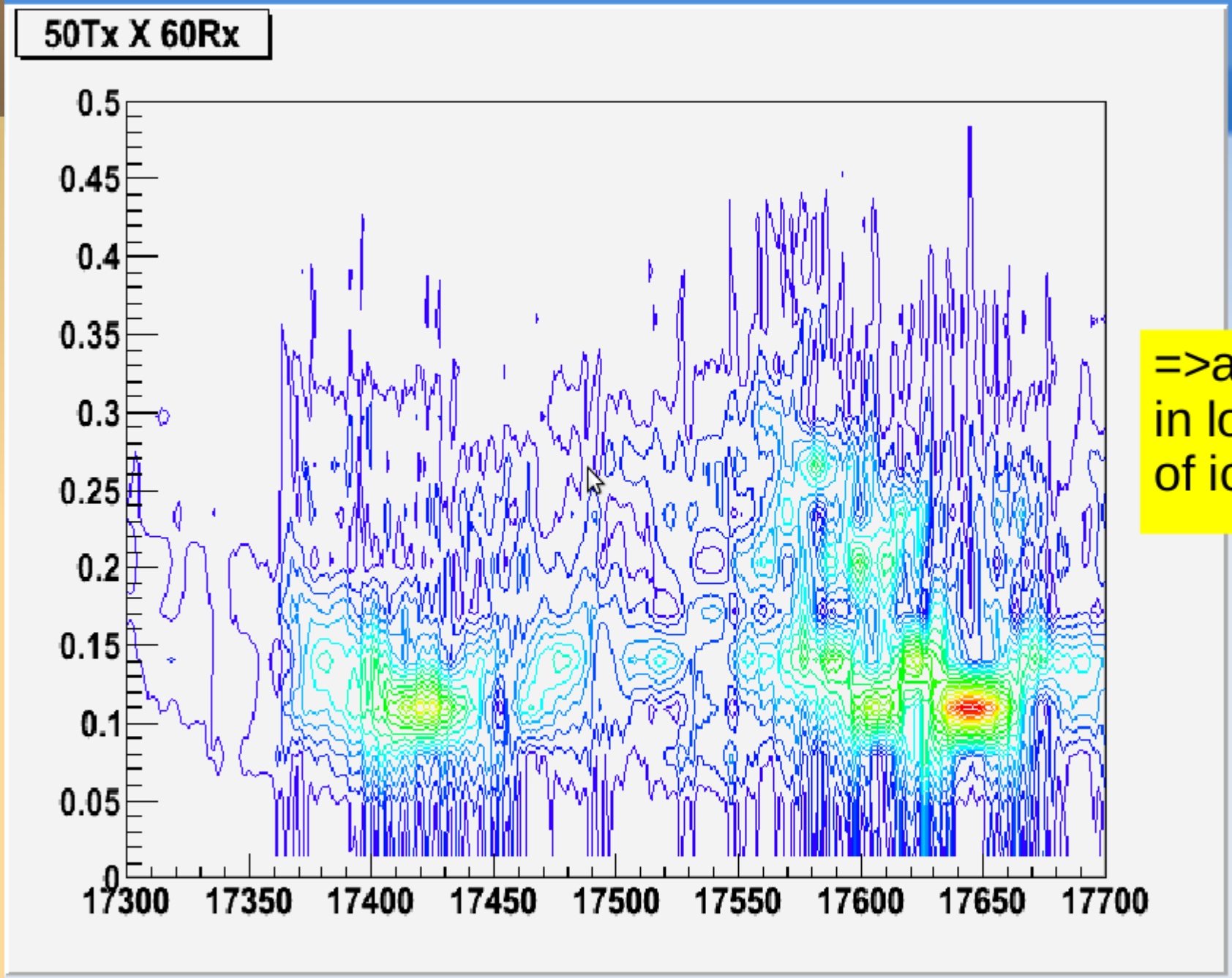


50Tx X 60Rx


bed reflection/-50Tx X 60Rx
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
33400 33500 33600 33700 33800 33900 34000 34100 34200 34300 34400

But echoes around 17.2 us synchronous!





=>asymmetry in lower half of ice sheet

Surface Backgrounds

- 2-3 surface horn antennas present in RICE data since 1999
- Used primarily as a veto of surface activity
  - Signal exceeding threshold 'blanks' data for subsequent 1.5 us
- December 2008-horns replaced by four low-frequency antennas (Wuppertal)
  - Two at MAPO, two at SPASE
  - Use four antennas to image surface sources!
  - Data not yet analyzed

Surface Antennas, cont.

- Feb. 2010: Two surface antennas replaced by two antennas at MAPO
- 3/3 coincidence trigger installed into RICE DAQ
- Unfortunately, insufficient to fully image sources in 3d

RICE/AURA utility in initial yr of ARA

- In-ice analog transmitters
  - 10 m—200 m depth
  - Horizontal range only 1 km!
- Surface pulsers
- Redundant monitor of backgrounds
- Cross-check on ARA event reconstruction