Acoustic Interference (on ADCP data)

- ADCP data requires averaging

  – to reduce ping-to-ping (bin-to-bin) random noise

- "seeing interference" (visible amplitude spikes)

  may not mean damage to ADCP velocities

- UHDAS single-ping processing can eliminate most asynchronous interference

Acoustic Interference on ADCP data

- Possible approaches:
  - Free-running (asynchronous) instruments
    - use single-ping editing
  - Triggering (Synchronized ping)
    - Your Mileage May Vary (depends on science needs)

Free-running (asynchronous)

- maximizes ADCP ping rate

- interference from other instruments appears in signal return as random hits

- interference from other instruments can usually be edited out by CODAS single-ping algorithms
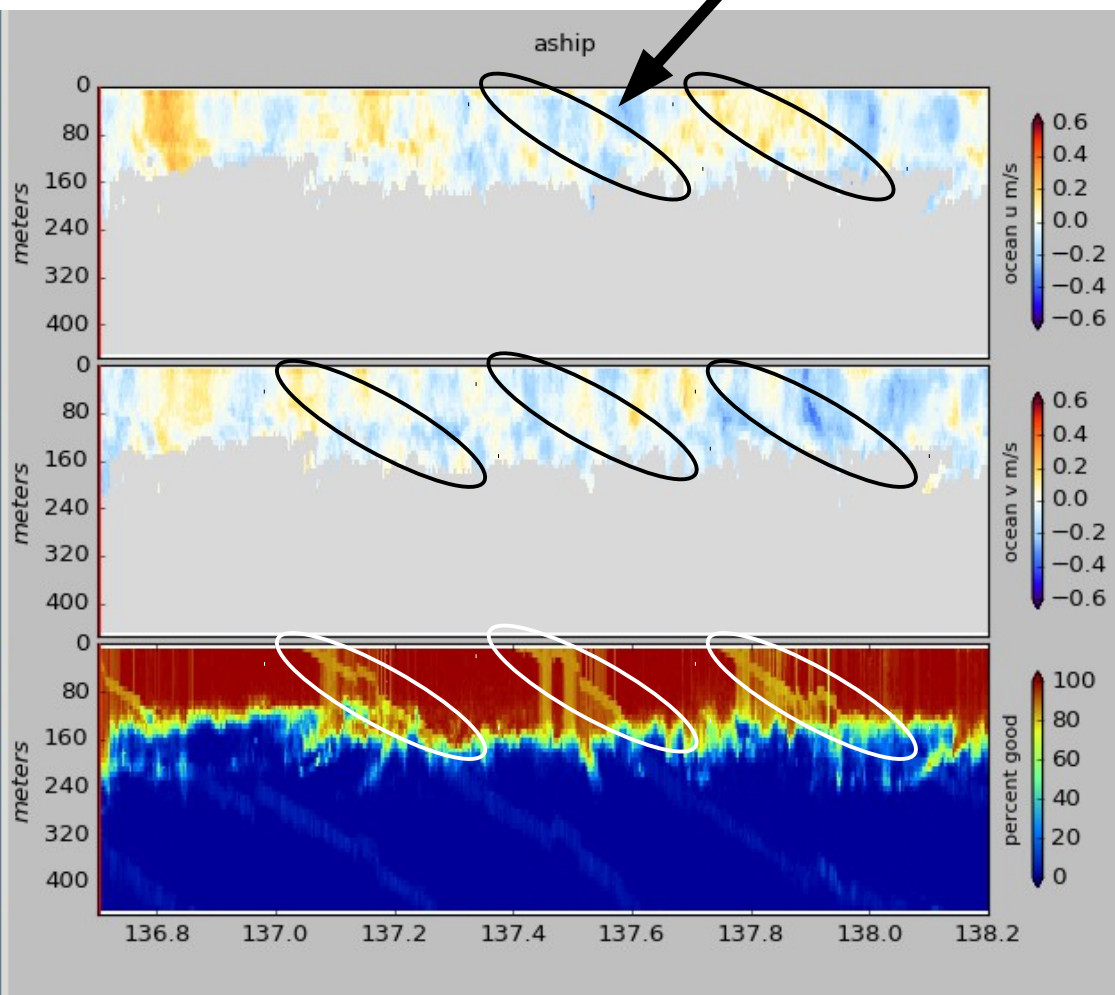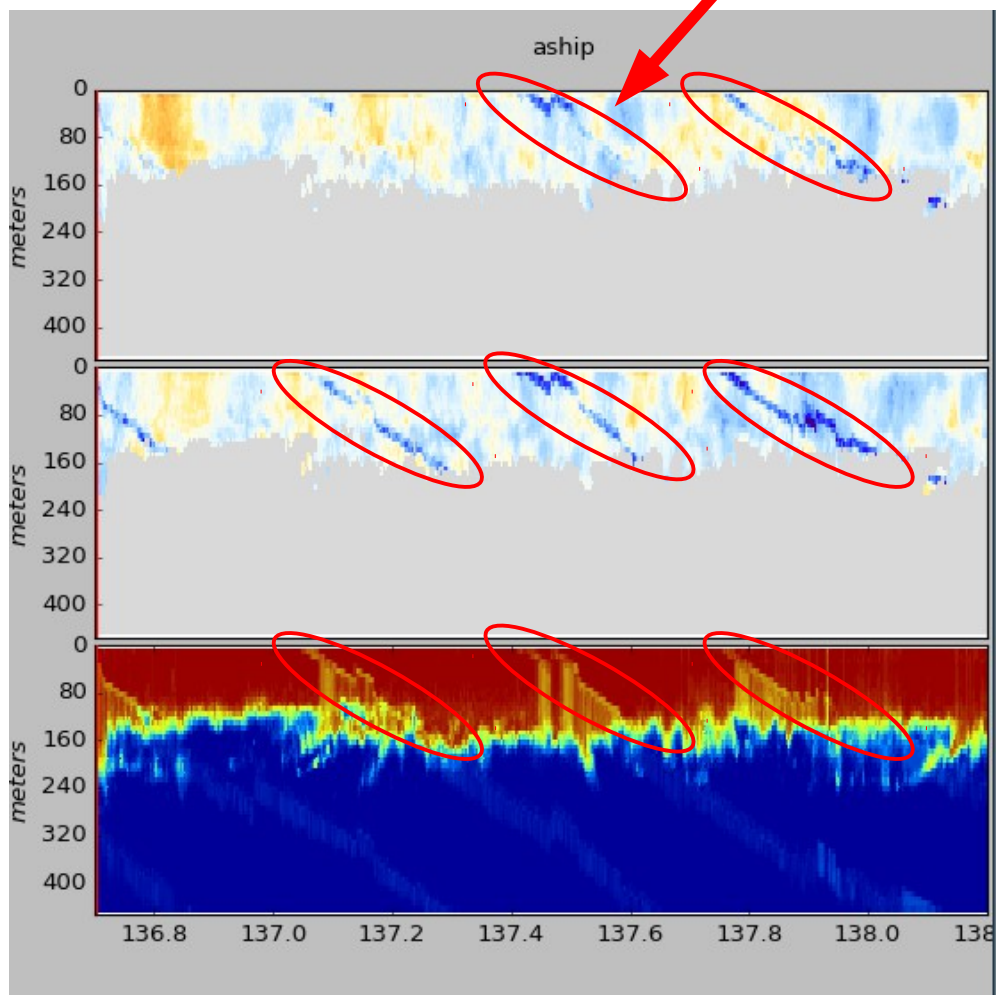
  Example....

Acoustic Interference caused bias in the along-track direction

(OS75NB visible on OS150B data)

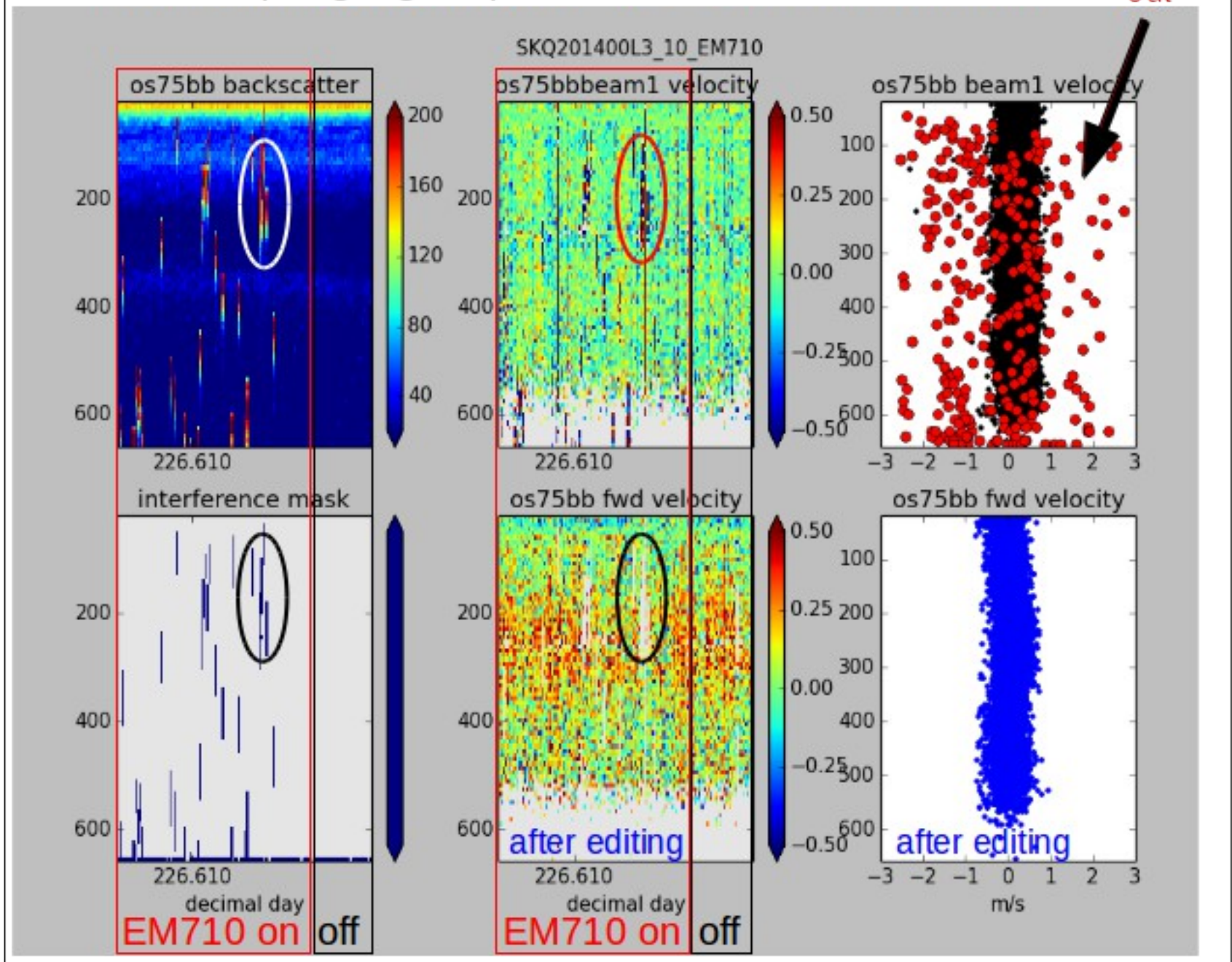Single-ping editing BEFORE averaging results in unbiased ocean velocities

NOT visible

Singleping editing
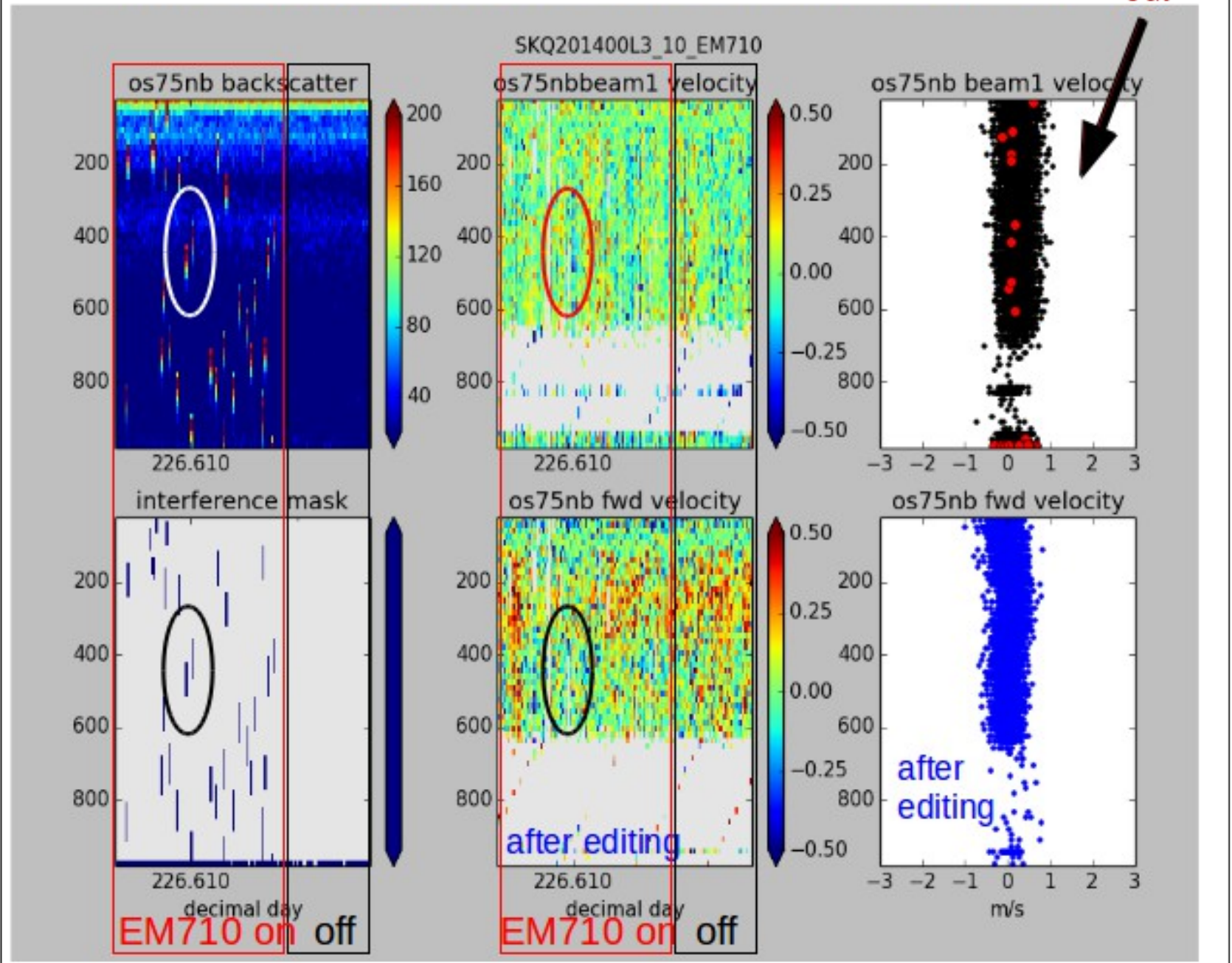

EM710 pinging impact on OS75 broadband

Singleping editing

EM710 pinging impact on OS75 narrowband

Pulse Synchronization (Triggering)

- can reduce ADCP ping rate (increase random error)
  - ONLY USE ONE TYPE OF PING if Synchronized
- can damage the ADCP data (where the other ping hits)
- makes it nearly impossible to edit out (single-ping)
- **if "lucky"**:
  - ocean currents have lower resolution (and higher error)
- **if unlucky**:
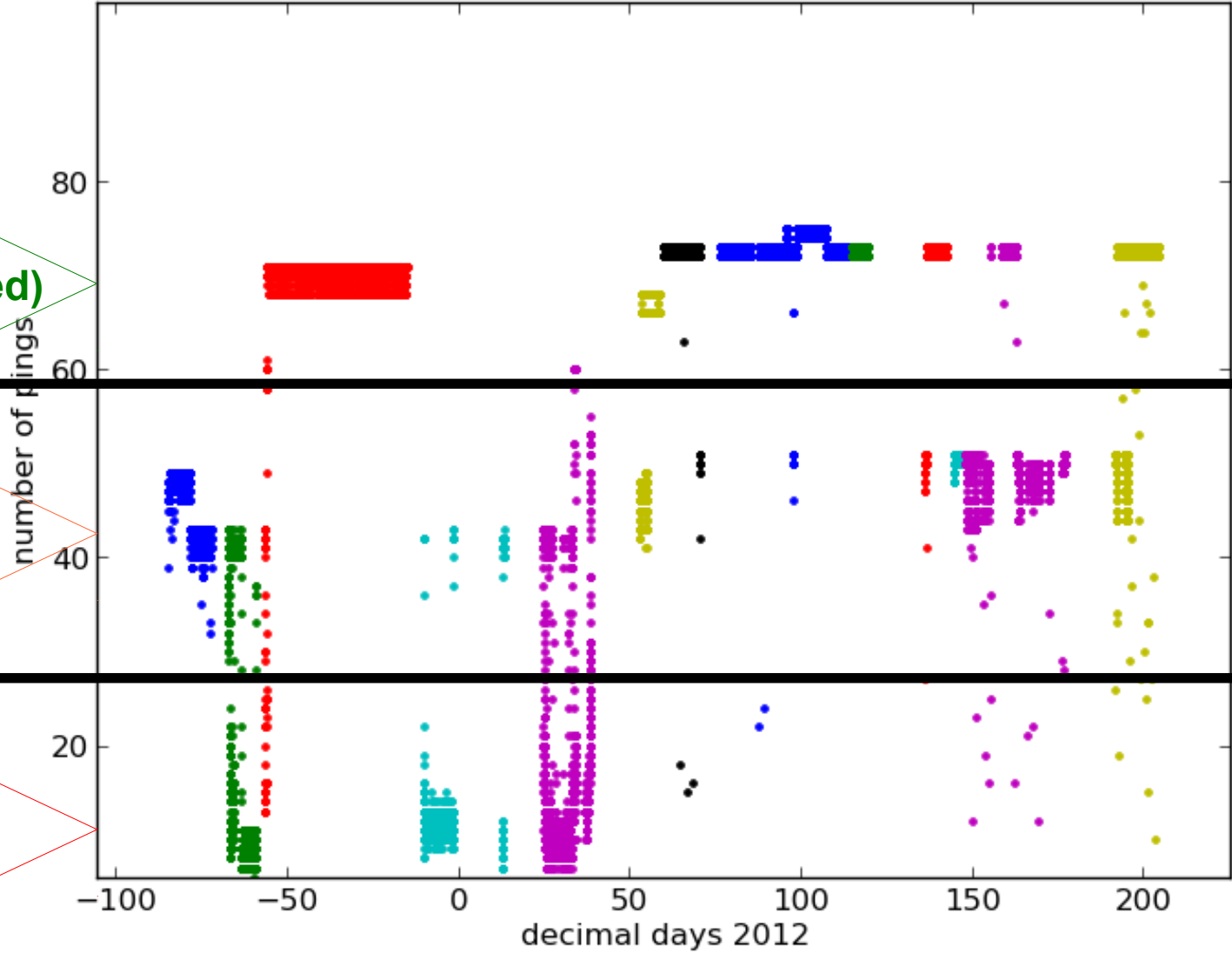 - too few pings to be useful
  - damage the pings that remain

Reduced ping rate due to triggering

300 pings is the magic goal

pings per 5-min ensemble: OS75NB

70 pings

expected (for interleaved)

40-45 pings

BARELY MARGINAL
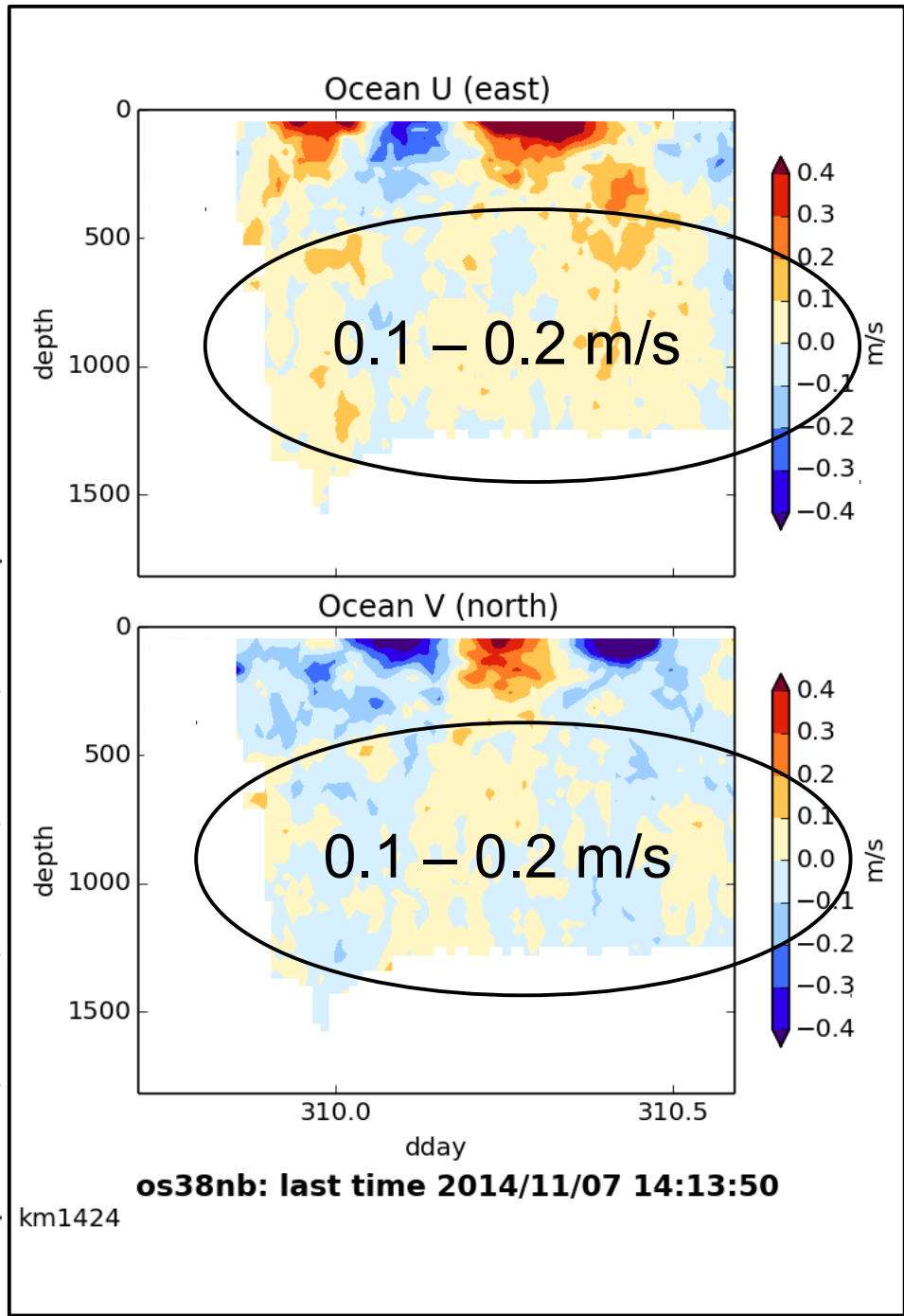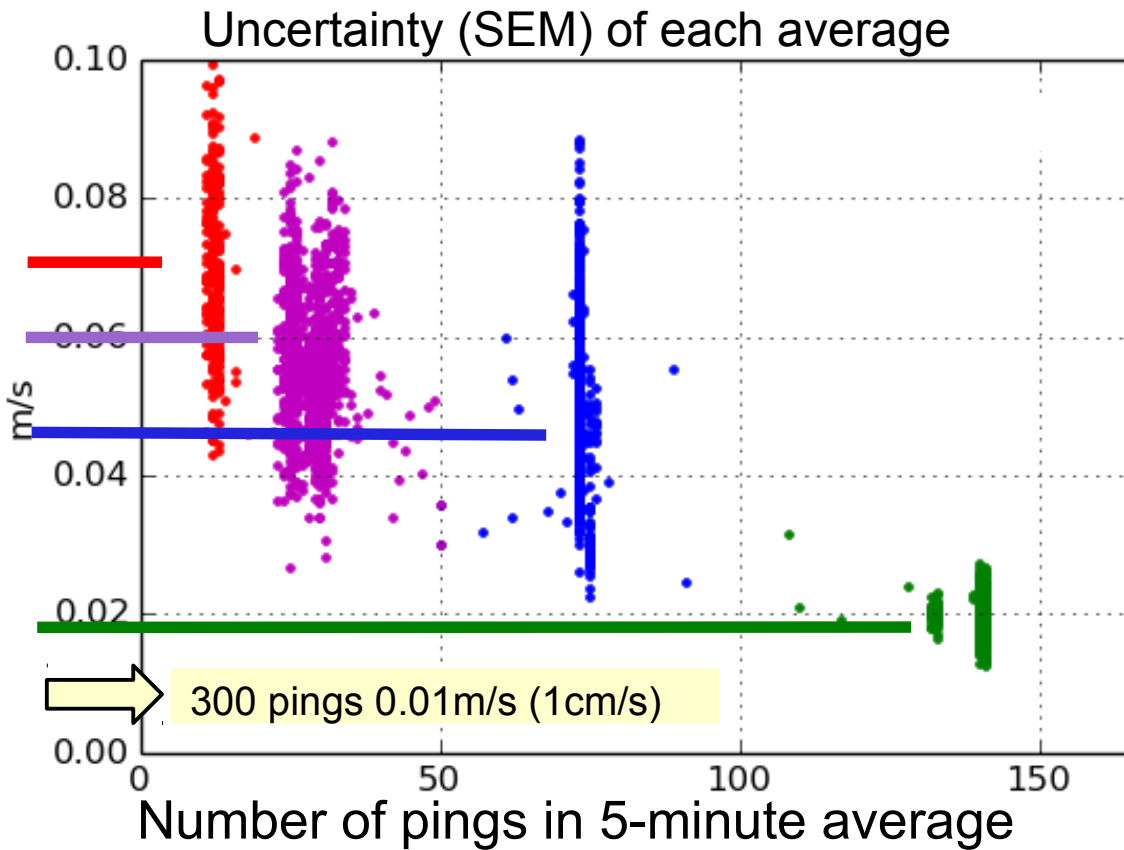
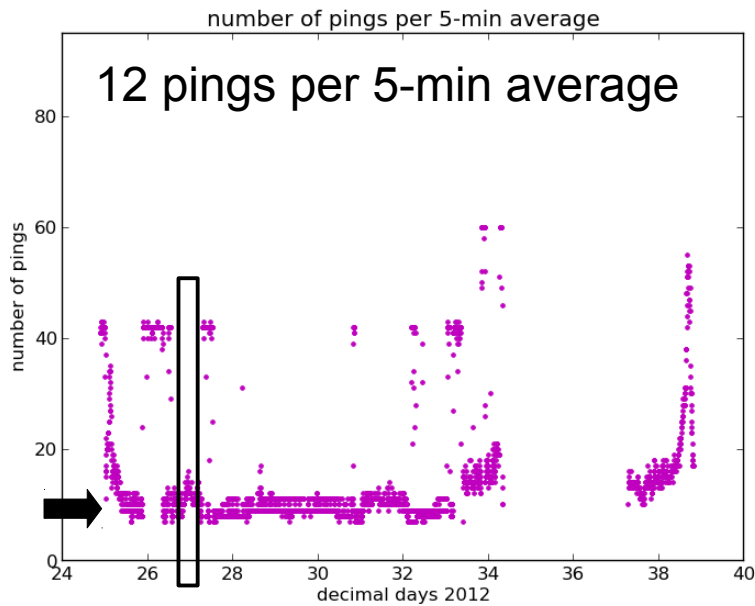**10-15 pings**

UNACCEPTABLE

Effect of Reduced Ping Rate:

• fewer pings means more uncertainty
• too few pings: error is similar to signal

example:
- 1 ping per 10 seconds
- 30 pings per 5-min average
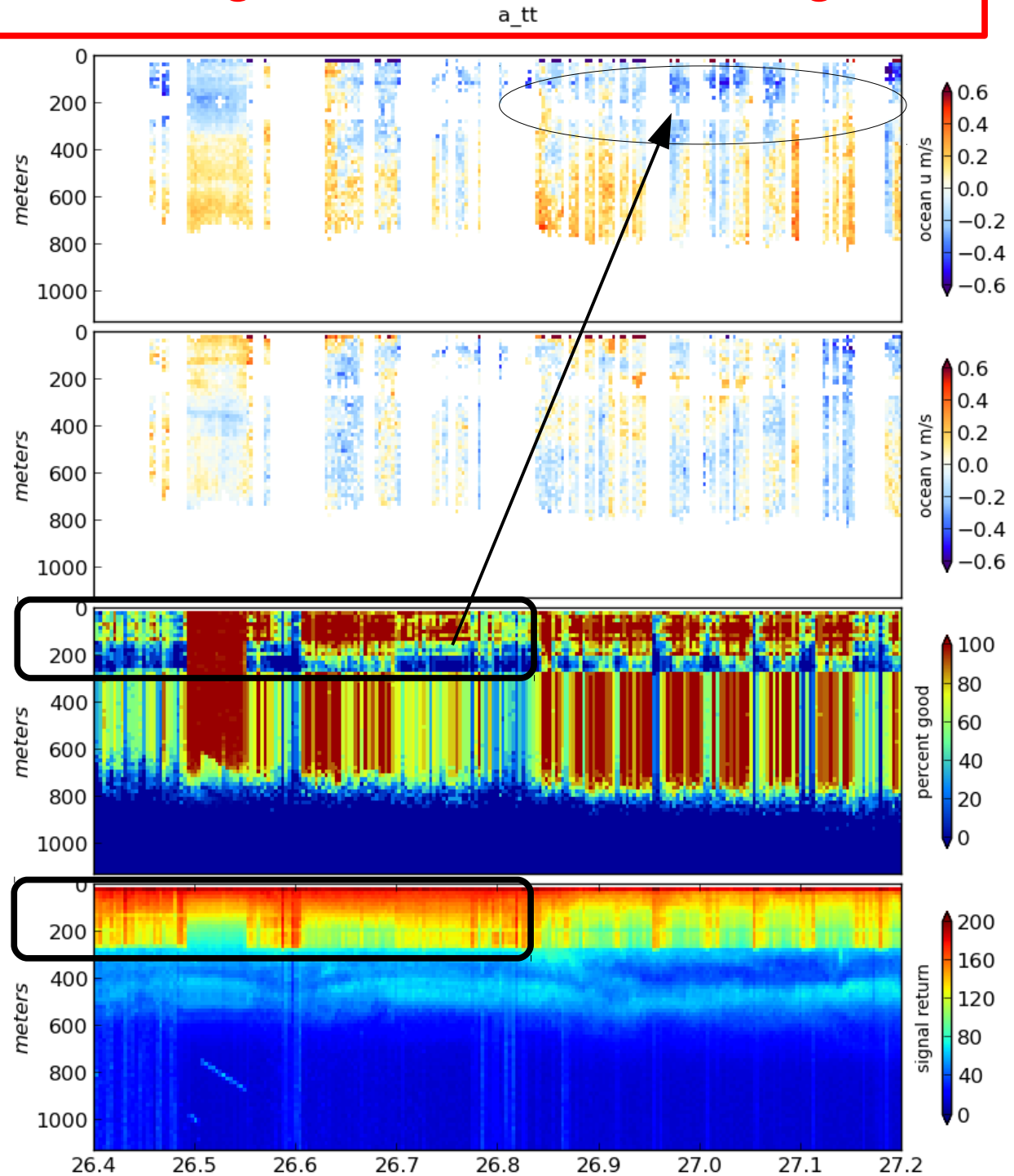- uncertainty is about 50% of signal

Uncertainty (SEM) of each average

300 pings 0.01m/s (1cm/s)

Number of pings in 5-minute average

Ocean U (east)

0.1 – 0.2 m/s

Ocean V (north)

0.1 – 0.2 m/s

os38nb: last time 2014/11/07 14:13:50

km1424

Reduced ping rate and damage to 150m-250m range

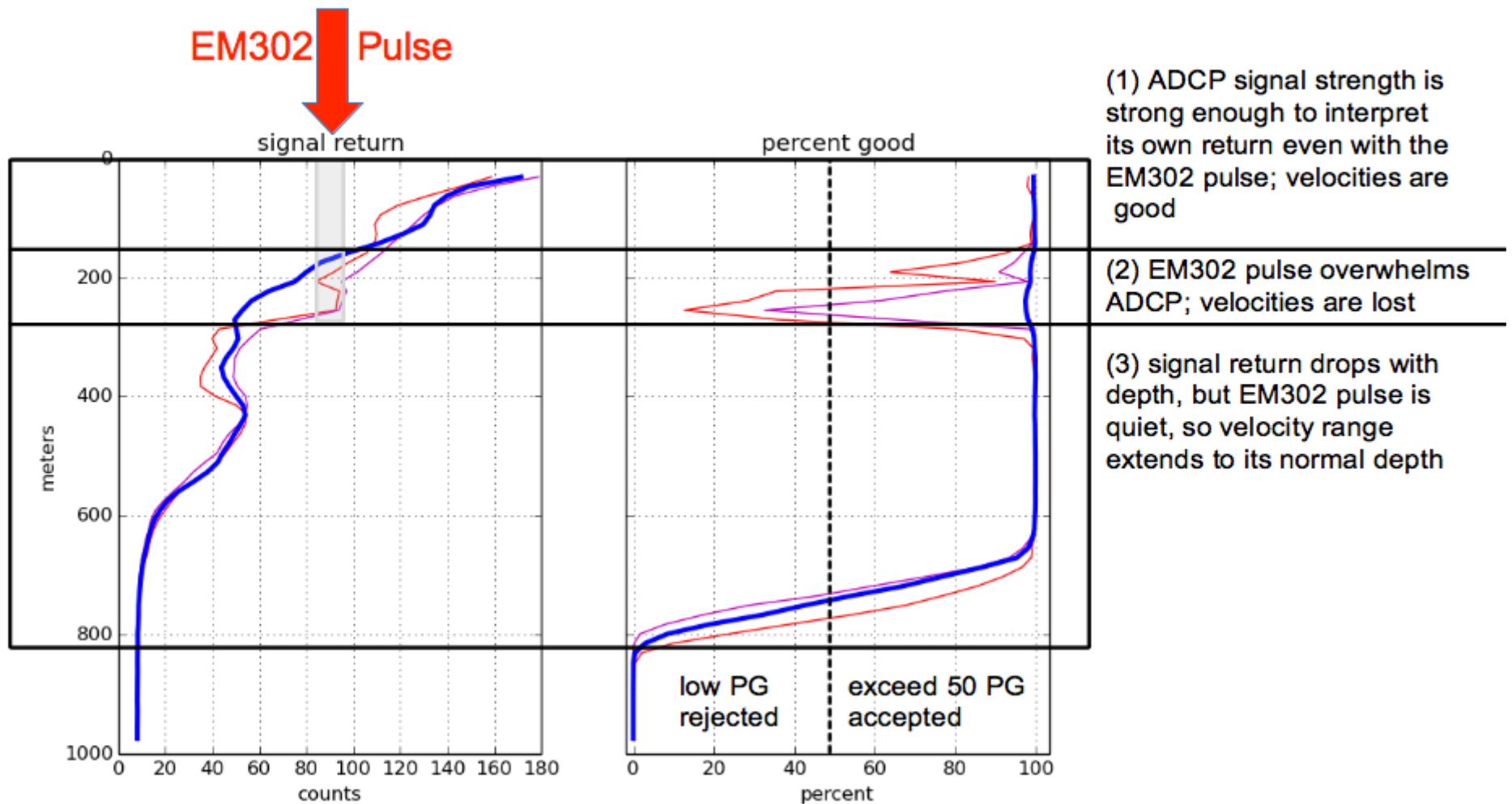12 pings per 5-min average

"hole" in ADCP data 150-250m

long pulse extends to 250m

Simultaneous ping, long pulse ➡ Damage to a chunk of ADCP data

Effect of EM302 pulse on ADCP data (OS75 narrowband) – simultaneous ping

summary: damage to ADCP data

- decreased ping rate

- long, loud pulse damages each ping

- interference lands at the same depth

    – UHDAS algorithm cannot detect the 'background'