

# Acoustic Interference (on ADCP data)

RVTEC 2017  
Duluth, MN

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- 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

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

# Free-running (asynchronous)

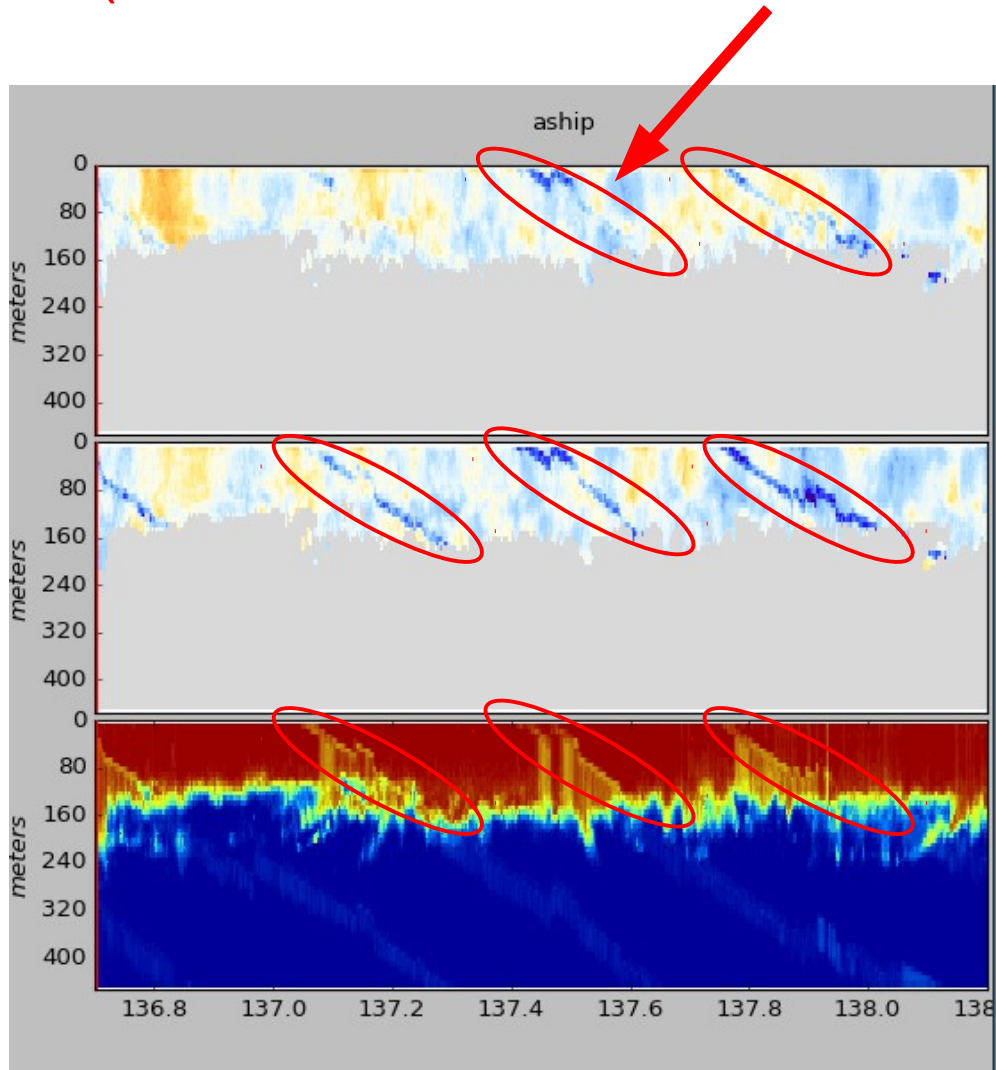
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- maximizes ADCP ping rate
- interference from other instruments appears in signal return as random hits
- interference from other instruments can usually be edited out by CODAS single-ping algorithms

Example....

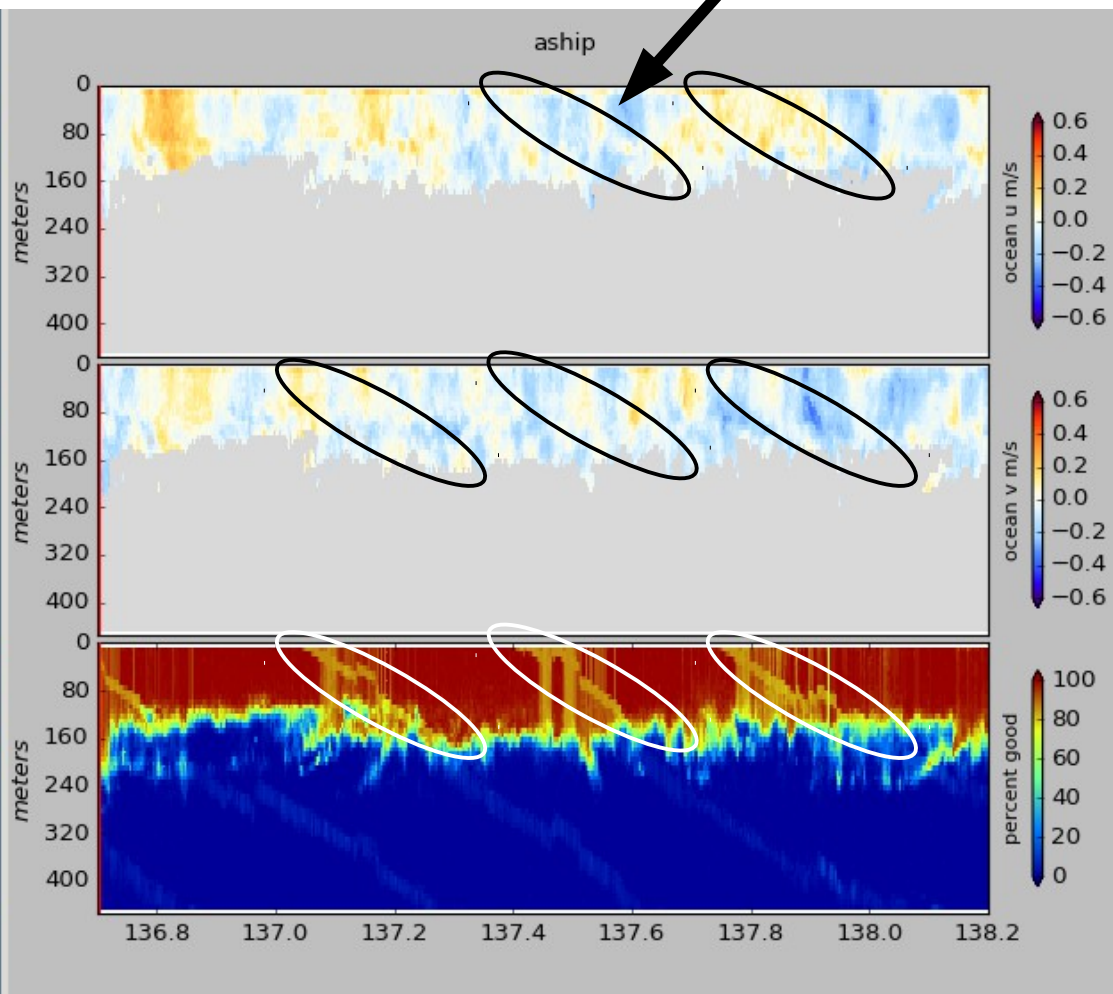
Acoustic Interference caused  
bias in the along-track direction

(OS75NB visible on OS150B data)



Single-ping editing BEFORE  
averaging results in unbiased  
ocean velocities

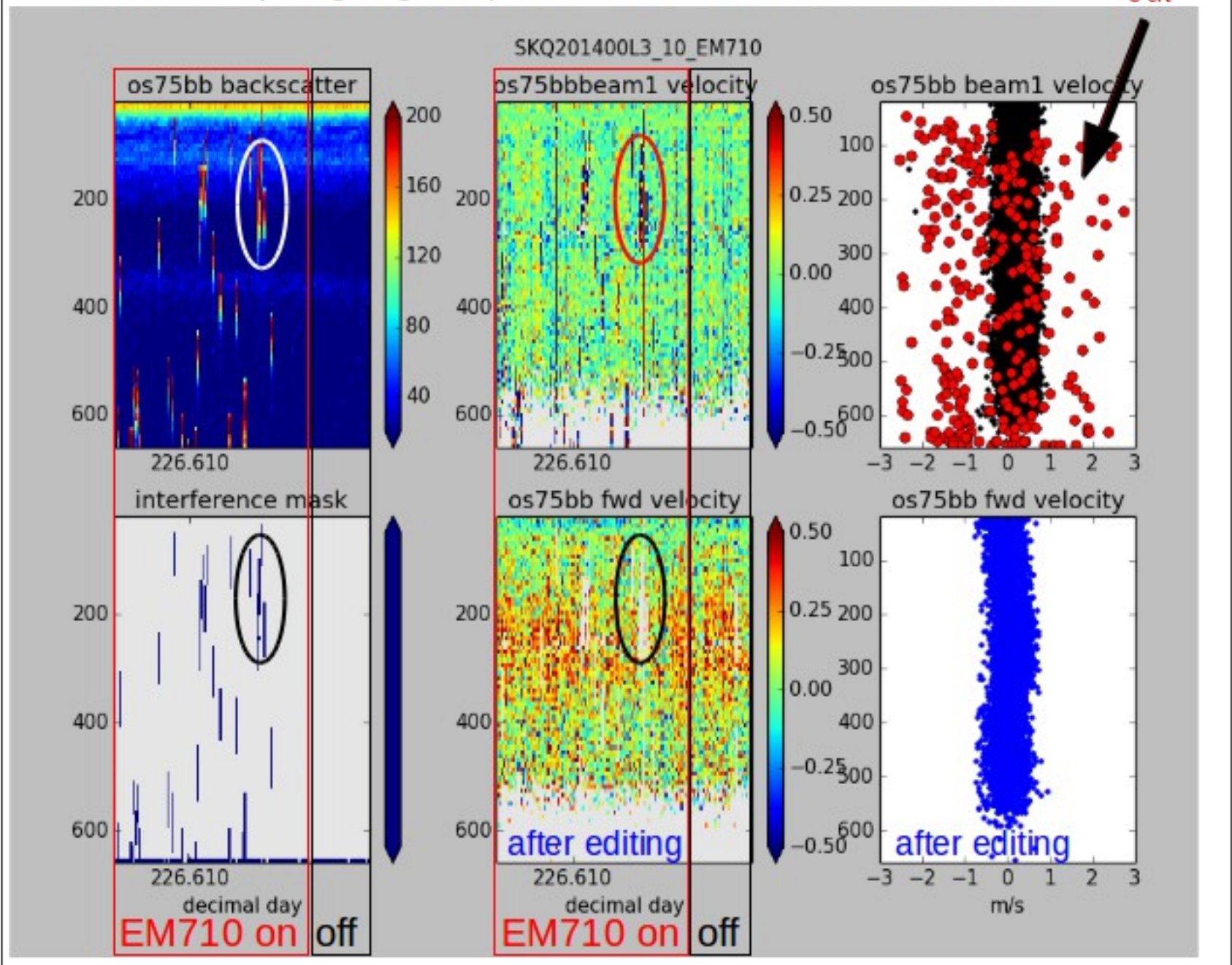
NOT  
visible



# Singleping editing

EM710 pinging impact on OS75 broadband

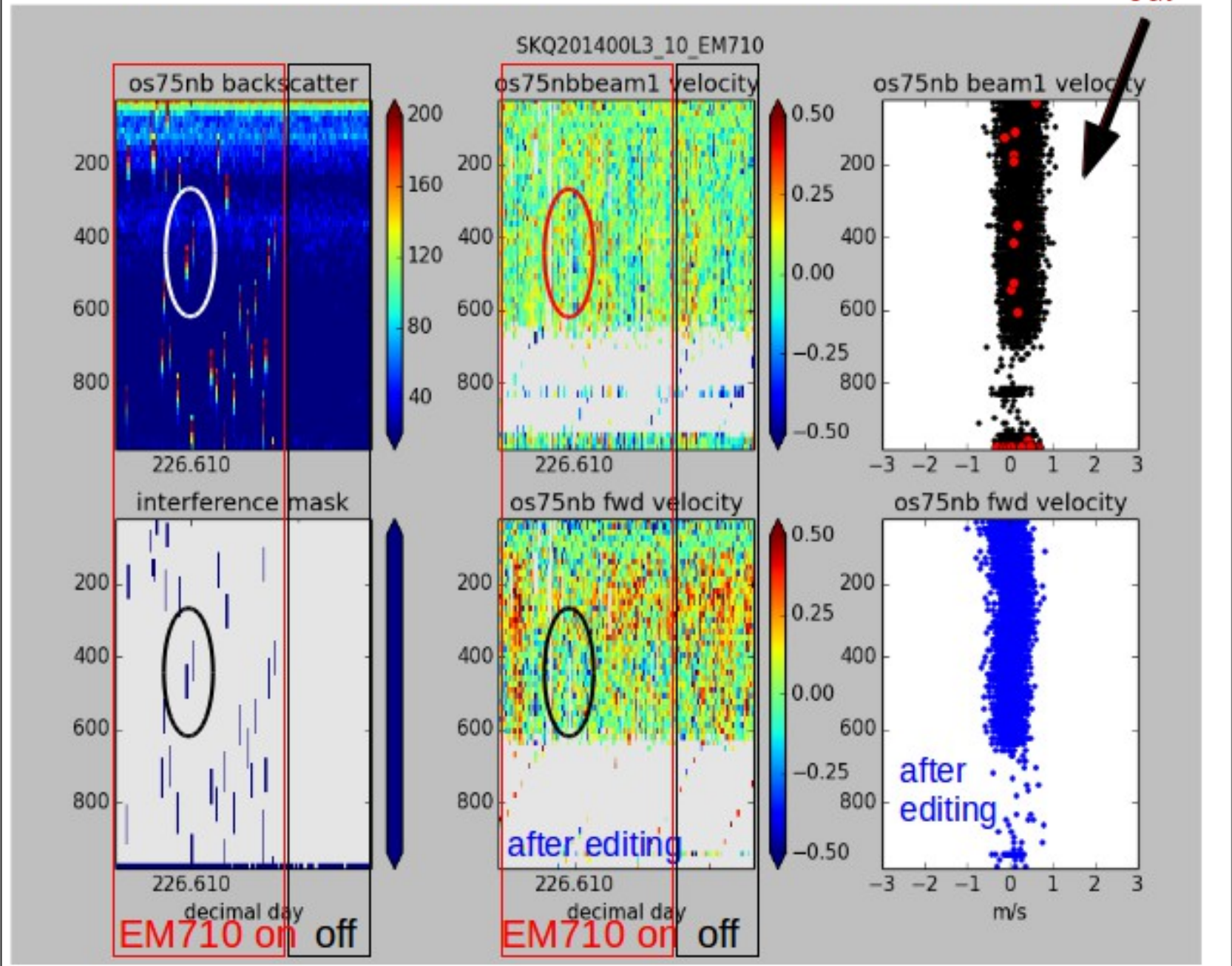
edited  
out



# Singleping editing

EM710 pinging impact on OS75 narrowband

edited  
out



# Pulse Synchronization (Triggering)

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- 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

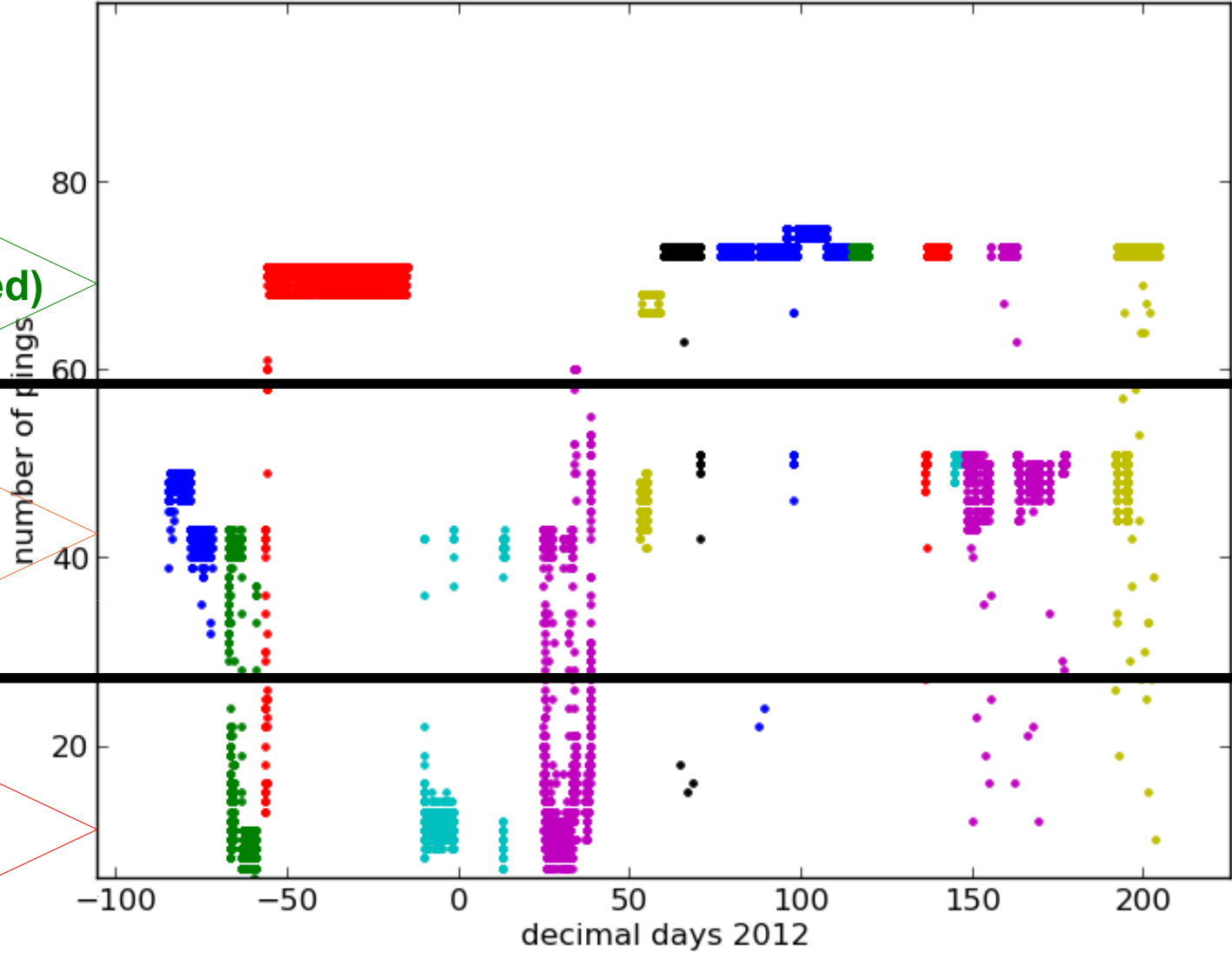
# Reduced ping rate due to triggering

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

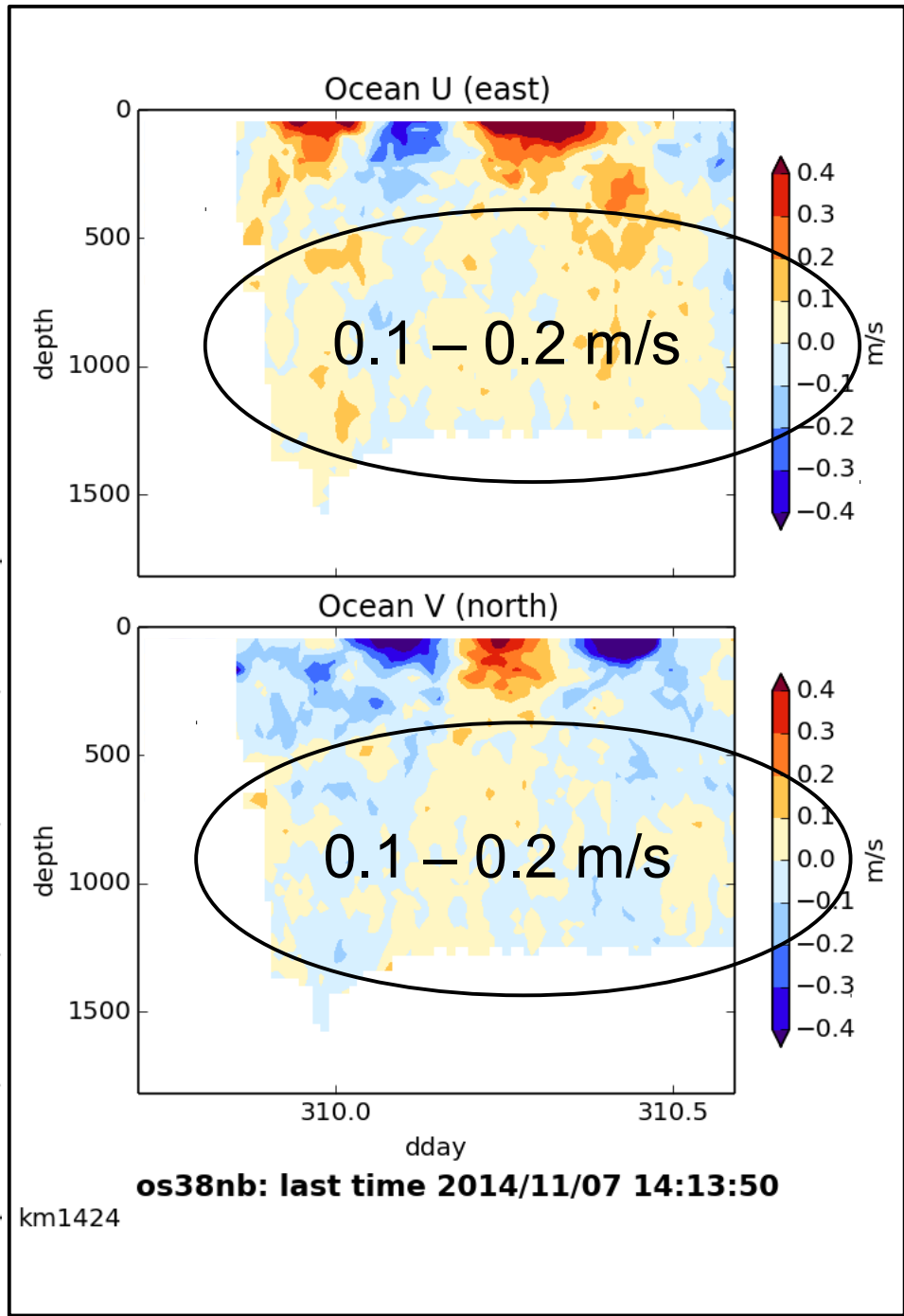
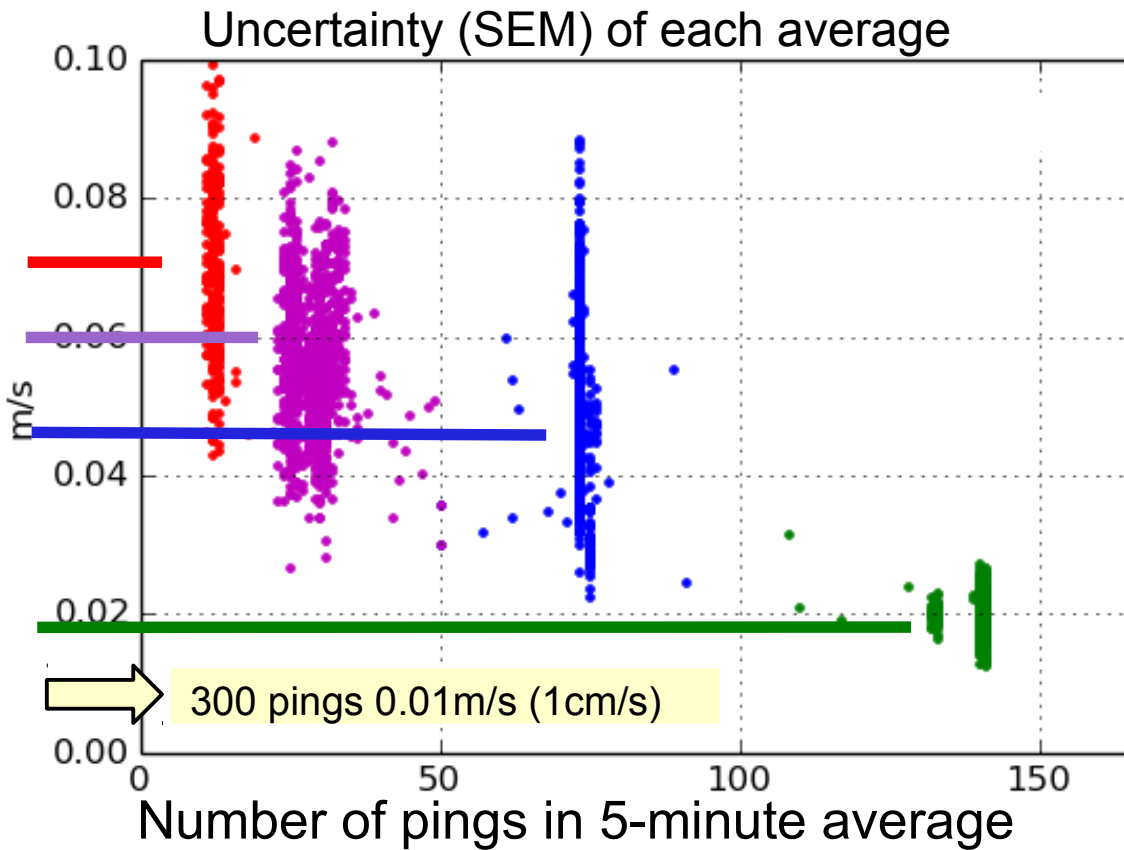


# Effect of Reduced Ping Rate:

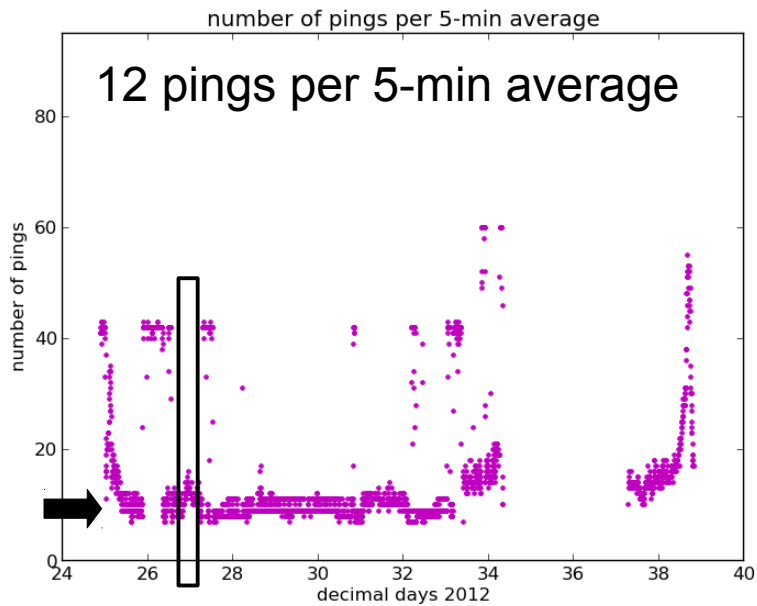
- fewer pings means more uncertainty
- too few pings: error is similar to signal

**example:**

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

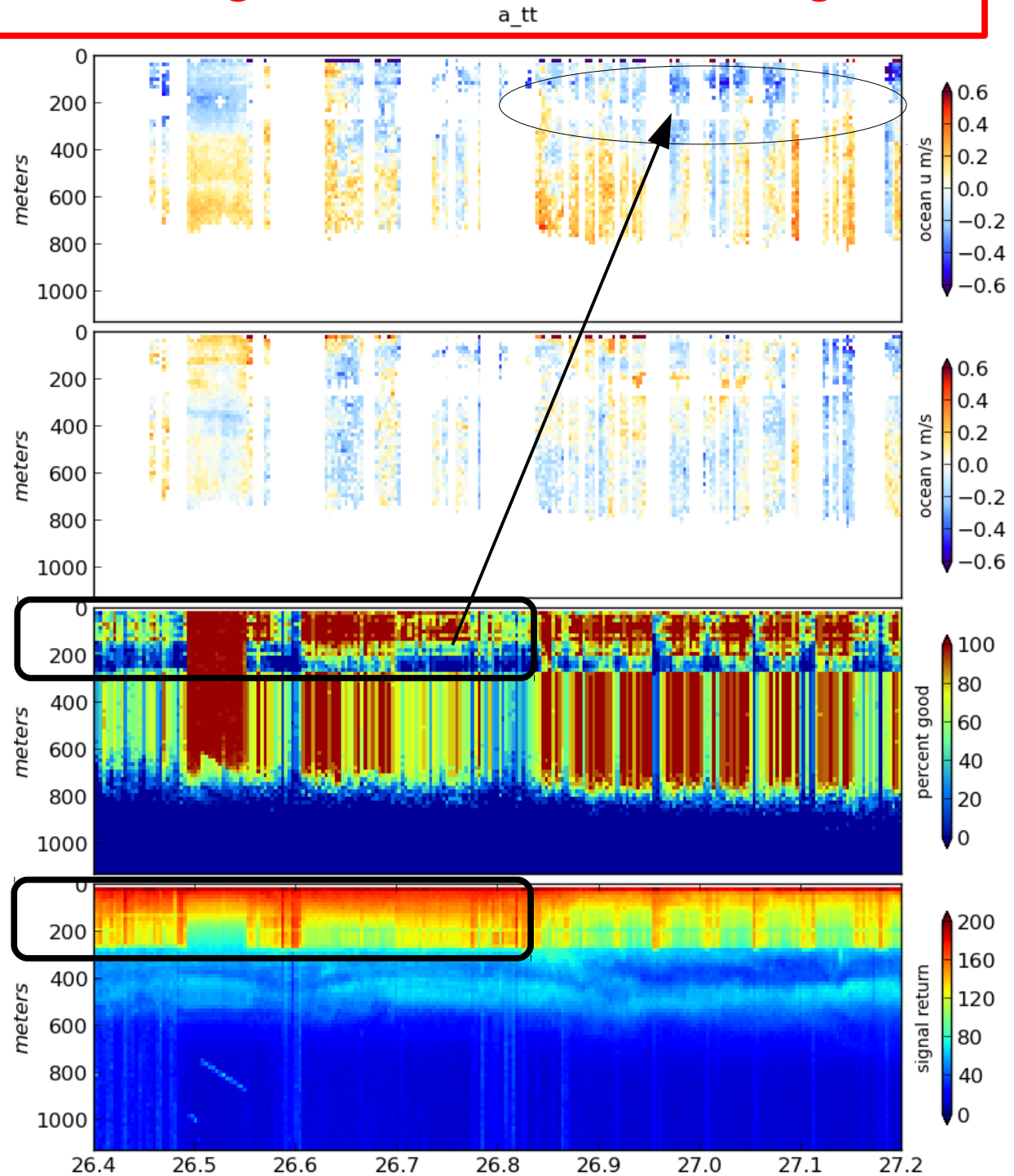


# Reduced ping rate and damage to 150m-250m range



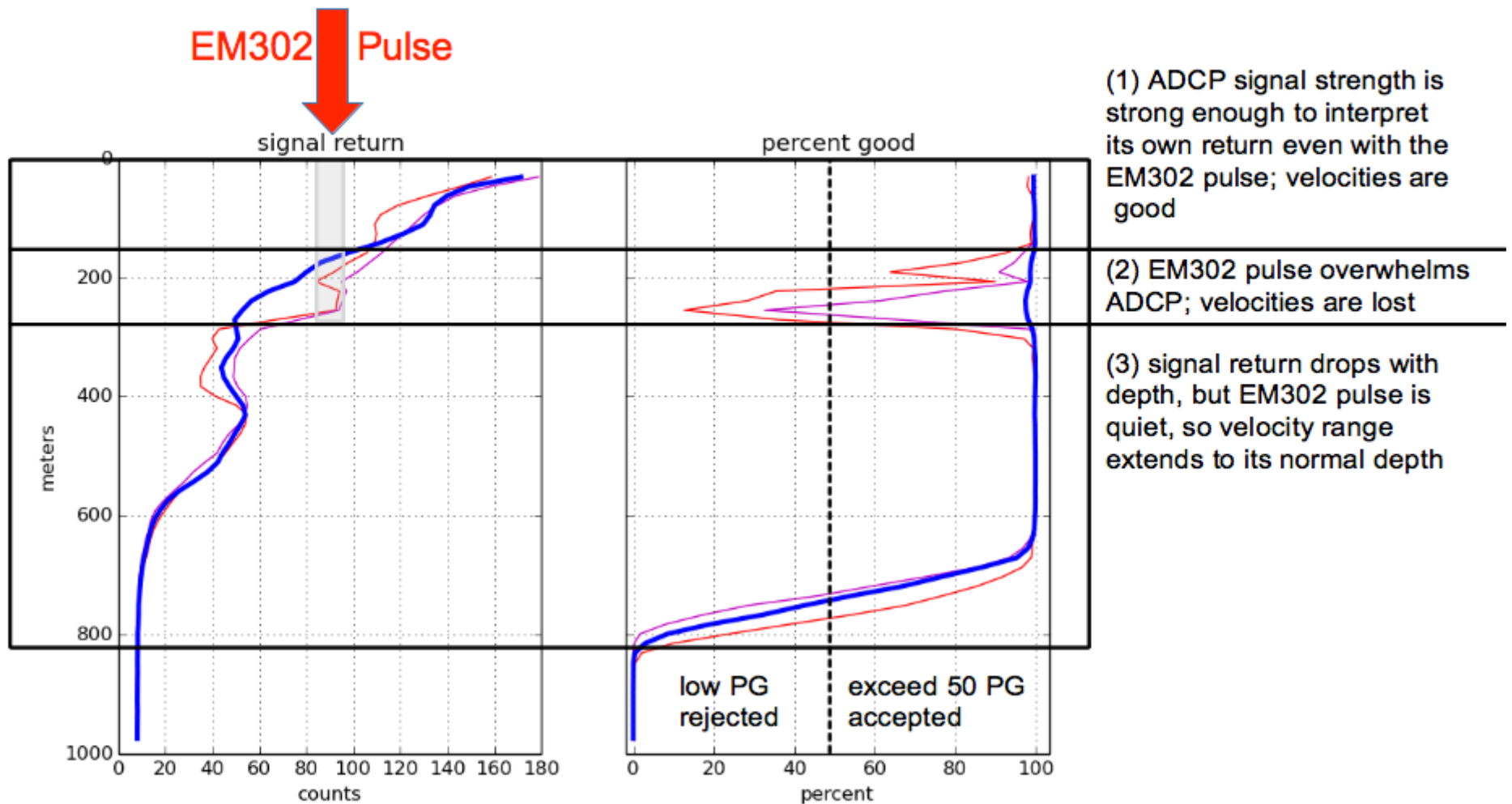
“hole” in ADCP data 150-250m

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'