

# NOAA 2015 ADCP

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Part I: ADCP

Part II: UHDAS introduction...

Part III: Signatures of problems...

# NOAA 2015 ADCP

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## Part I: ADCP

- (1) Getting Ocean Velocity
- (2) ADCP Acquisition Systems (UHDAS, VmDAS)

## Part II: UHDAS...

## Part III: Signatures of problems...

# NOAA 2015 ADCP

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## Part I: ADCP...

## Part II: UHDAS

- (1) ADCP Processing with CODAS
- (2) UHDAS:
  - What it does
  - Operations
- (3) Monitoring
  - At sea
  - On Land
- (4) What can be changed, tested

## Part III: Signatures of problems...

# NOAA 2015 ADCP

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Part I: ADCP...

Part II: UHDAS...

Part III: Signatures of problems:

- (1) ADCP systems (components)
- (2) Data flow (where is the problem)
- (3) Ocean Velocity signatures

# Links to the documentation

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## Part I: ADCP

- [Getting Ocean Velocity](#)
- ADCP Acquisition Systems:
  - [VmDAS \(TRDI\),UHDAS](#)

## Part II: UHDAS

- [ADCP Processing with CODAS](#)
- [UHDAS: What it does](#)
- [Monitoring \(at sea, from shore\)](#)
- [UHDAS GUI Tour](#)

## Part III: How things can go wrong

- [What can go wrong](#)

# NOAA 2015 ADCP

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## Part I: ADCP

- (1) Getting Ocean Velocity
- (2) ADCP Acquisition Systems (UHDAS, VmDAS)

## Part II: UHDAS...

## Part III: Signatures of problems...

# NOAA 2015 ADCP

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## Part I: ADCP

- (1) Getting Ocean Velocity
- (2) ADCP Acquisition Systems:  
UHDAS, VmDAS

# (1) ADCP: Getting Ocean Velocity

## **ADCP :**

**A**coustic (it pings along beams at a frequency)

**D**oppler (uses frequency shift to get velocity along the beam)

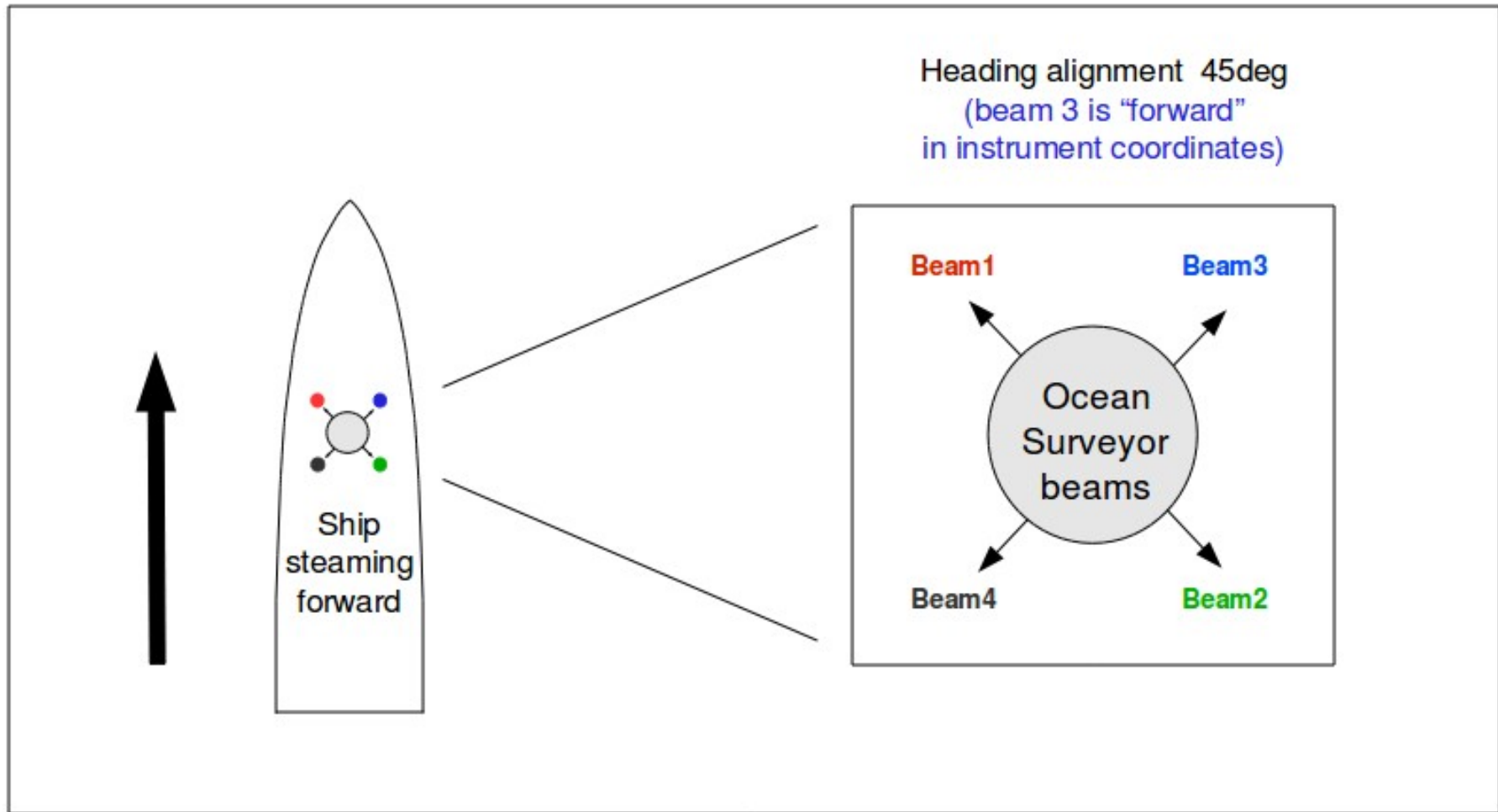
**C**urrent (include many more steps to get ocean velocity)

**P**rofiler (listen for the return in small chunks of time to create a vertical profile)

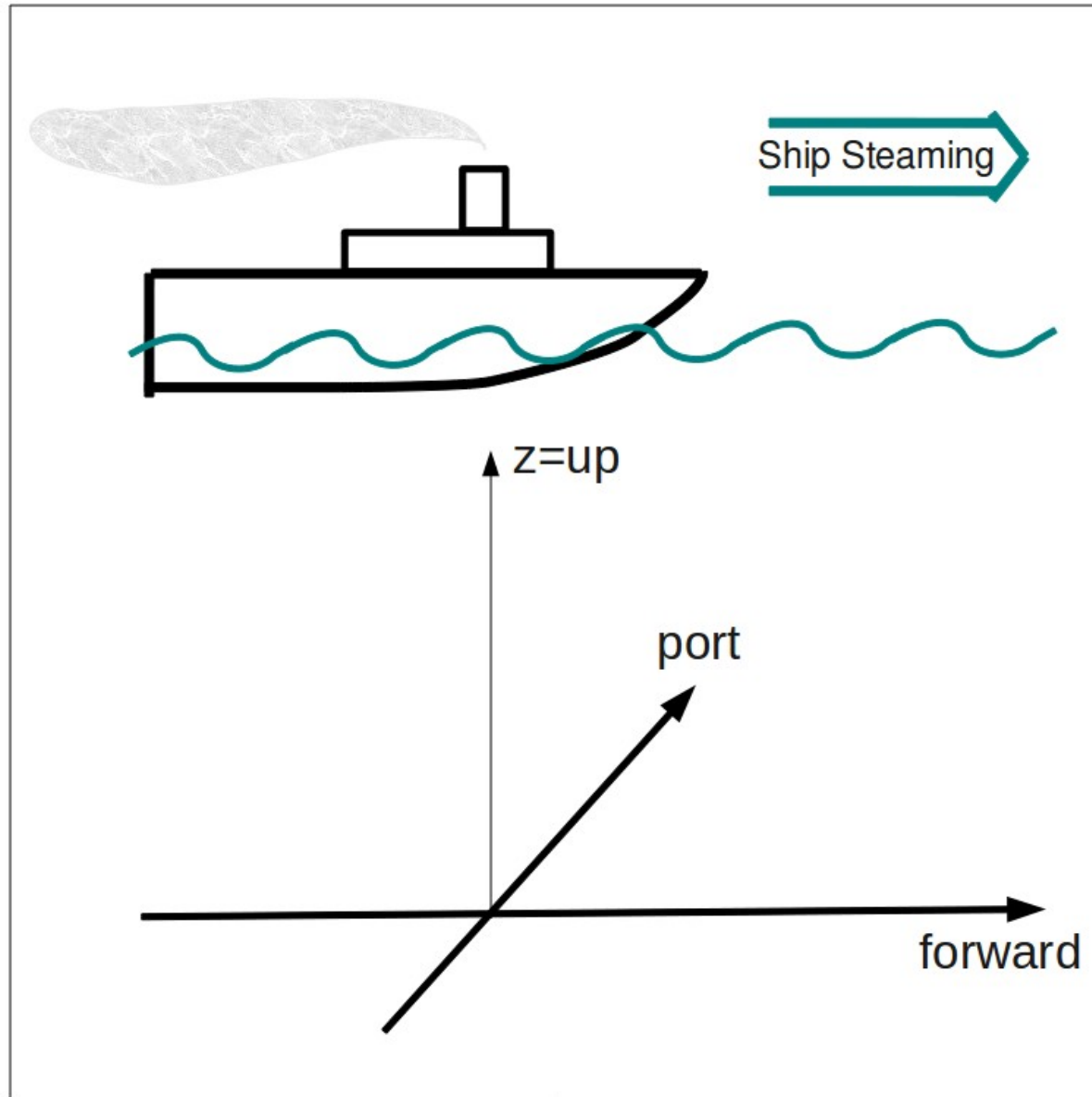


# ADCP : Getting Ocean Currents

## Plan View



# ADCP : Getting Ocean Currents

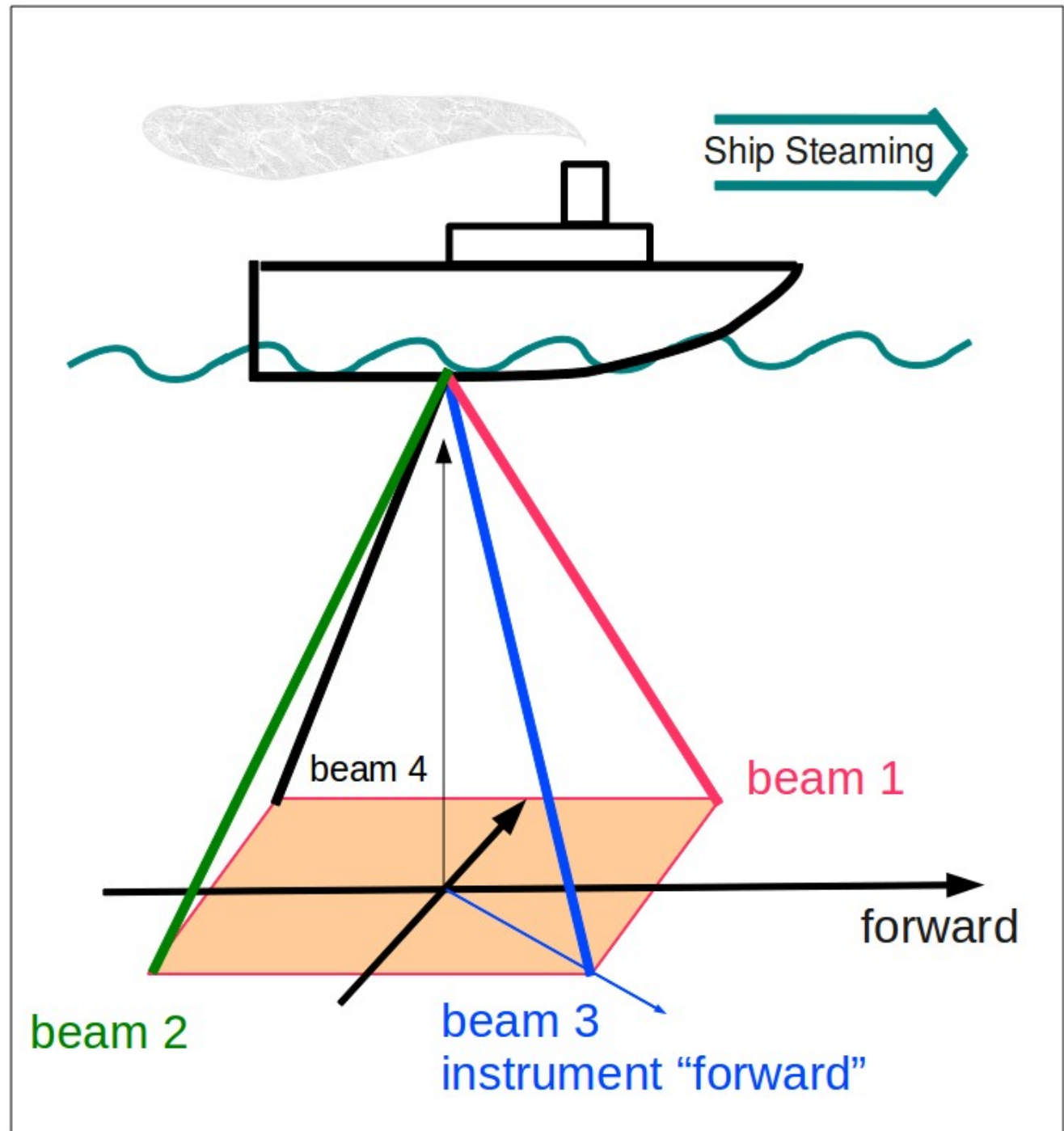


# ADCP

## Getting Ocean Currents

Four beams

- 90deg apart
- 30 (or 20)deg up from vertical
- “forward beam” is #3
- usually 45deg starboard of forward

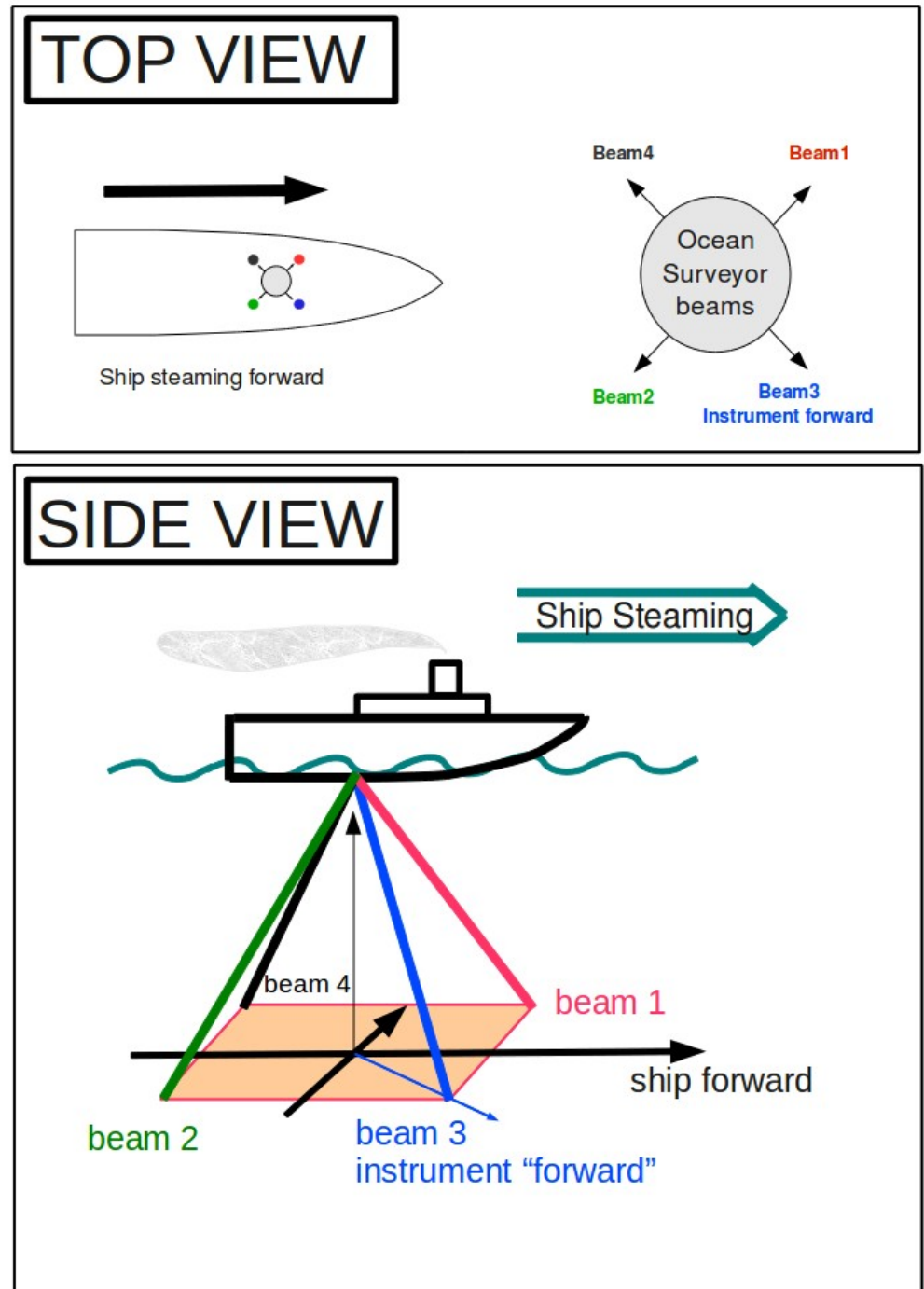


# ADCP

## Getting Ocean Currents

### Four beams

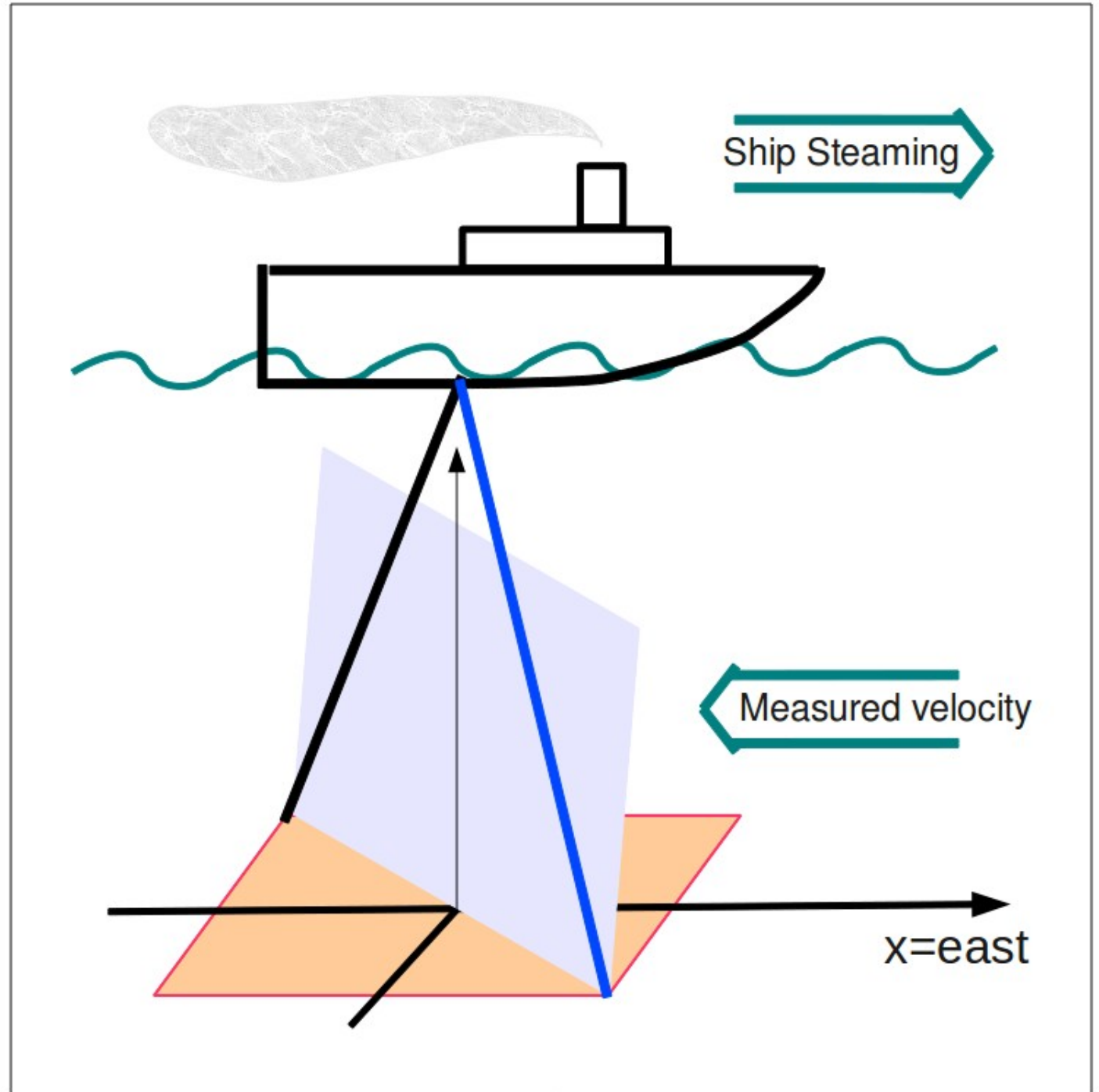
- 90deg apart
- 30 (or 20)deg up from vertical
- “forward beam” is #3
- usually 45deg starboard of forward



# ADCP

Getting Ocean Currents

Two opposite beams make a vertical plane



# ADCP

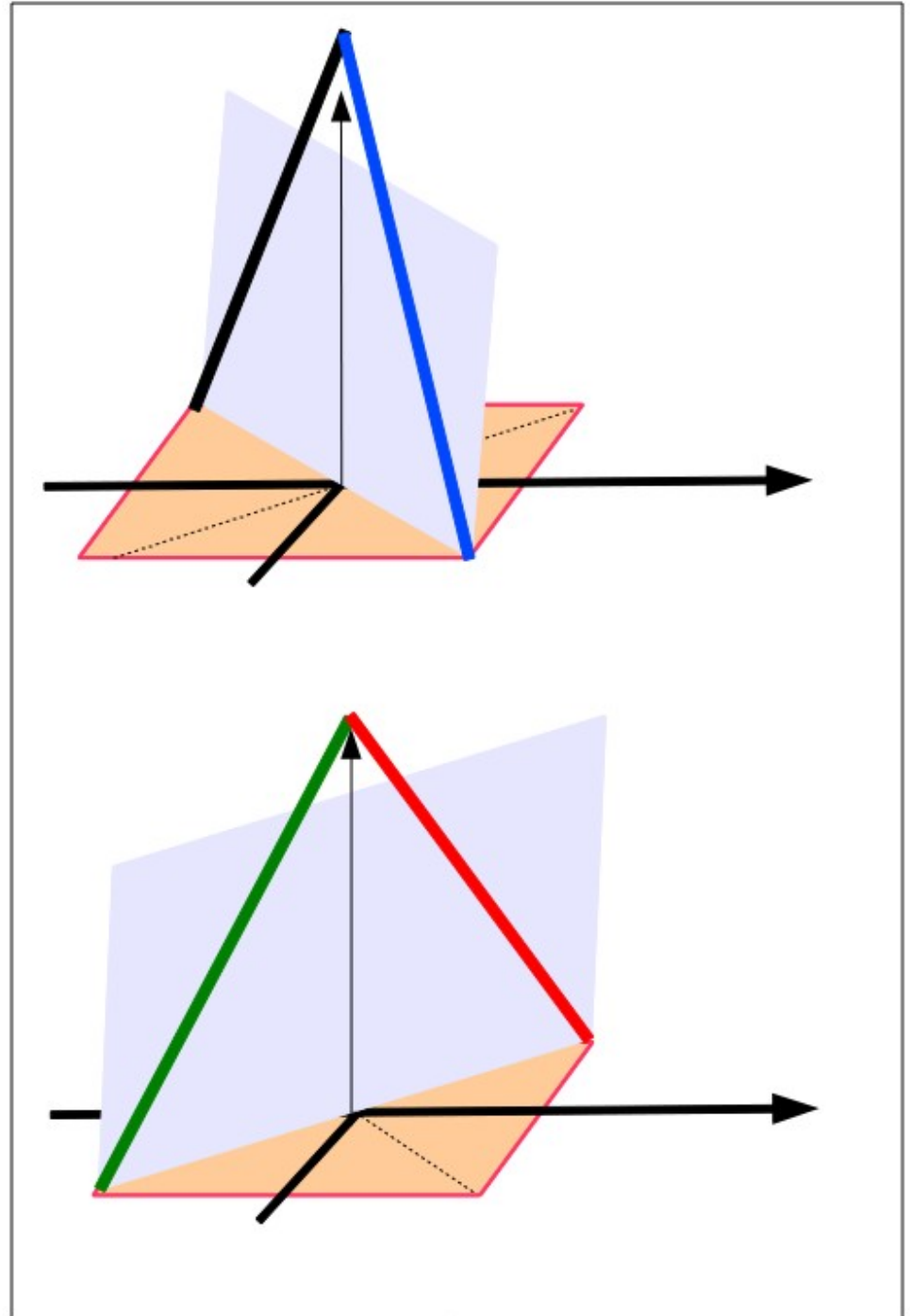
## Getting Ocean Currents

Now we have two vertical planes at 90deg to each other

These are the basis of the horizontal and vertical velocities

Horizontal velocities will be used to get ocean velocities

Vertical velocities will be used for error-checking



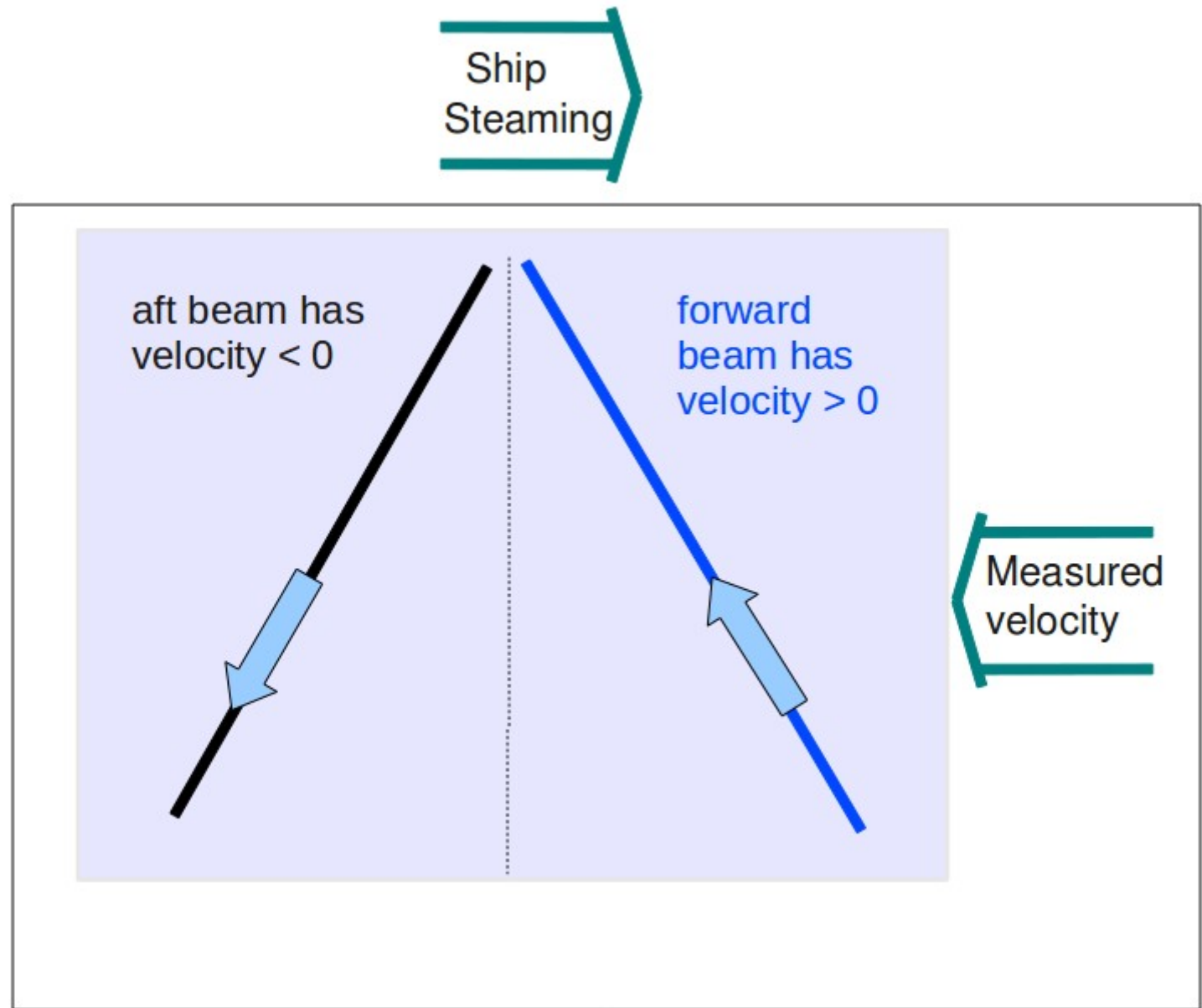
# ADCP

## Getting Ocean Currents

Two beams make one vertical plan

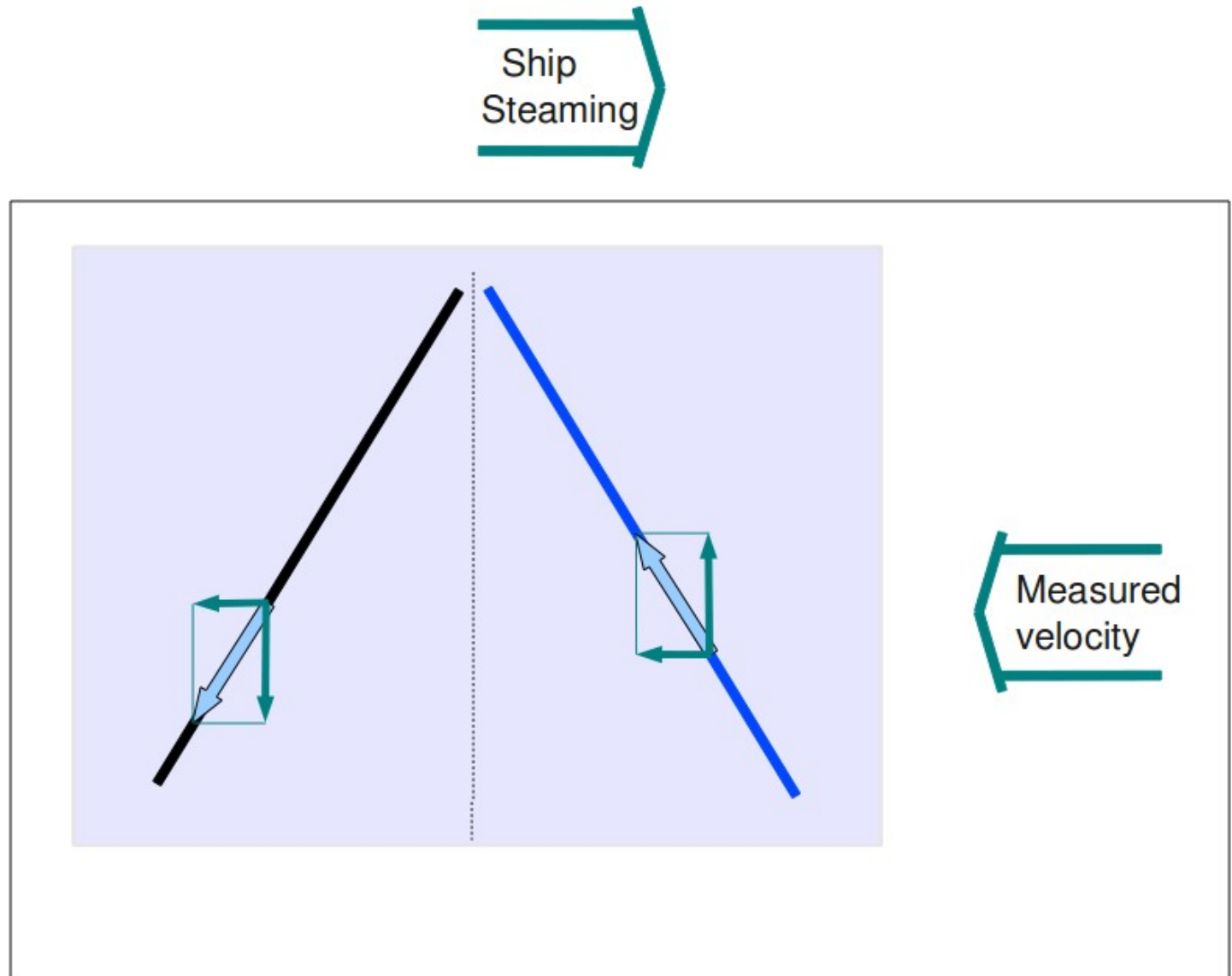
This shows the velocities determined by the Doppler shift

“beam velocities”



# ADCP: Getting Ocean Currents

Interpret the two beam velocities one horizontal and one vertical velocity



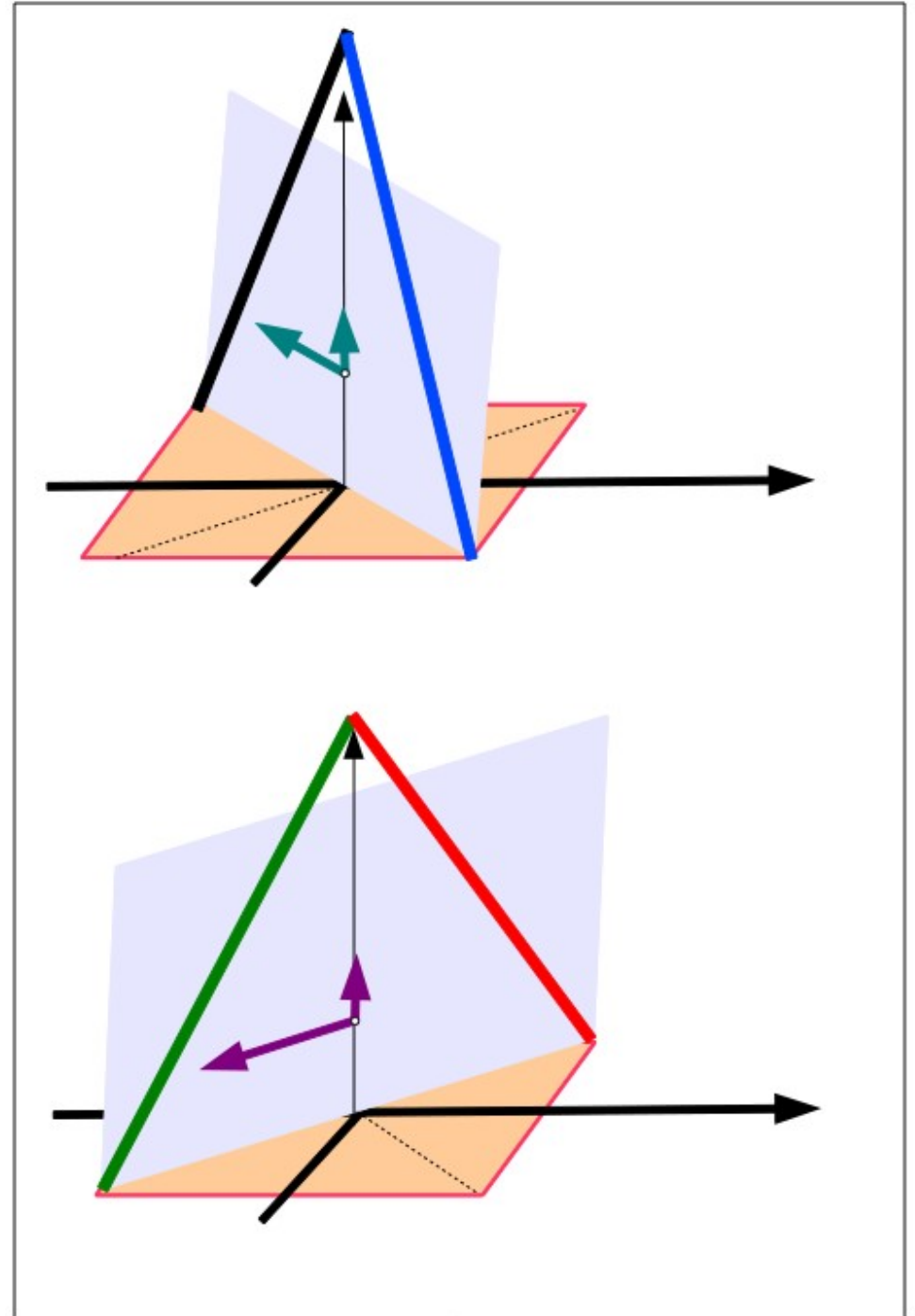


# ADCP:

Getting Ocean  
Currents

Now we see the horizontal and  
vertical velocities on the two  
planes

Use the horizontal velocities  
for determining ocean velocities  
requires more steps.



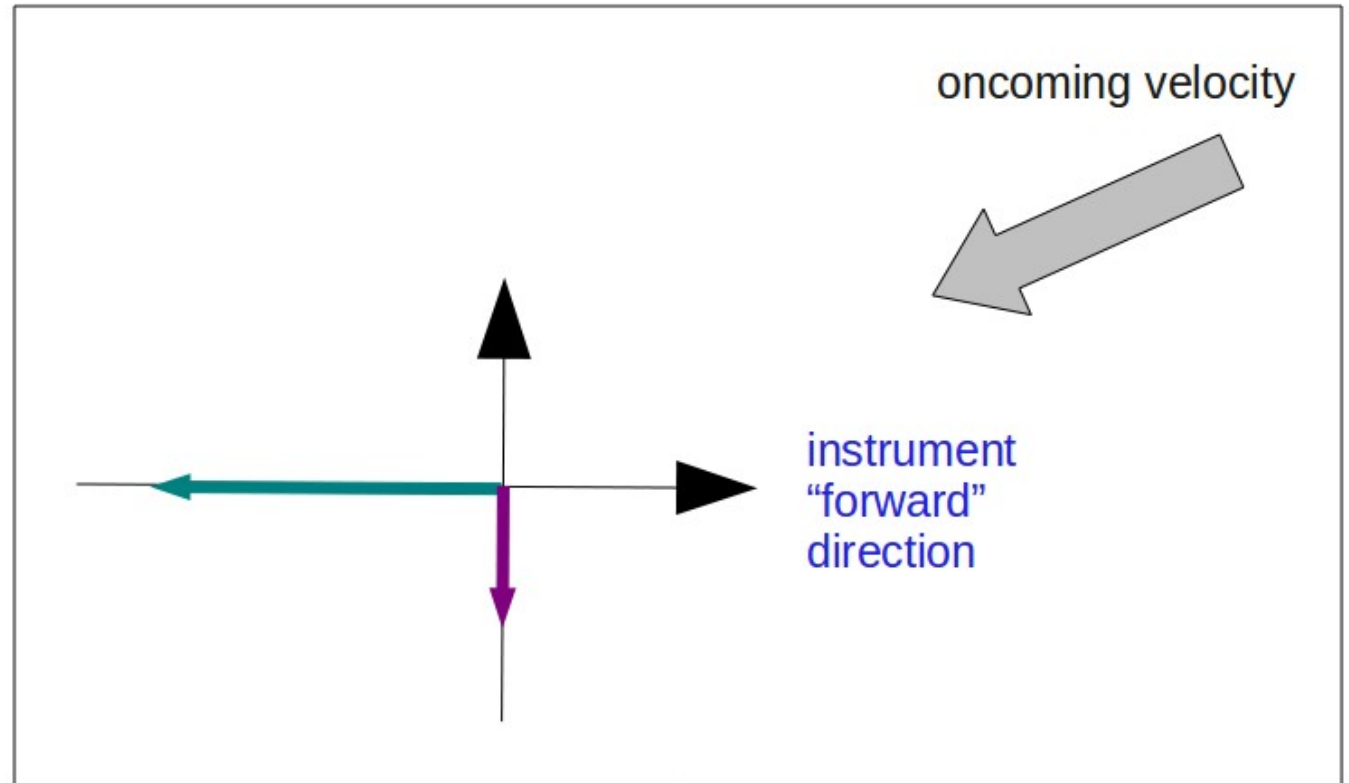
# ADCP:

Getting Ocean  
Currents

## Instrument coordinates

This is a top-down  
view of the measured  
horizontal velocity in  
**instrument  
coordinates**  
(from the two planes  
made by the beams)

(determining ocean  
velocities requires  
more steps)



# ADCP:

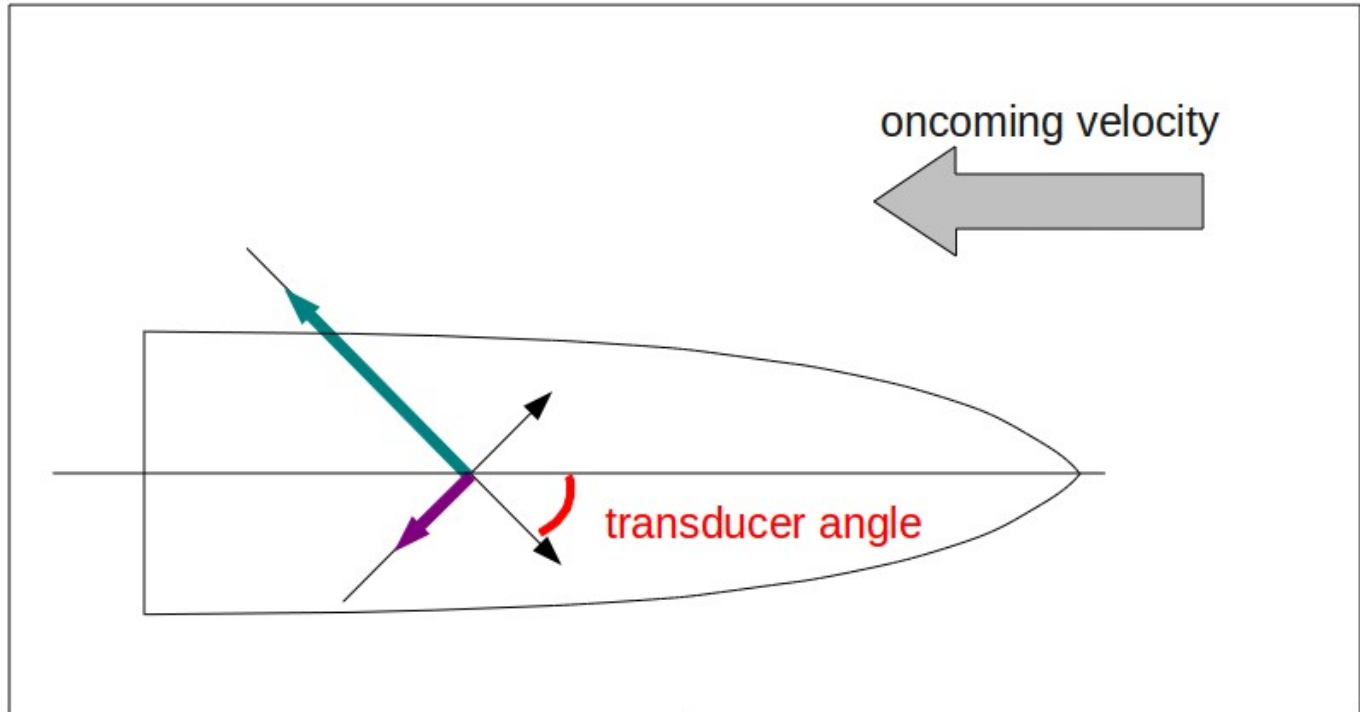
## Getting Ocean Currents

This is a top-down view of the measured horizontal velocity in ship coordinates.

The instrument coordinates values are rotated by the **transducer angle**.

(determining ocean velocities requires more steps)

### Ship coordinates





# ADCP:

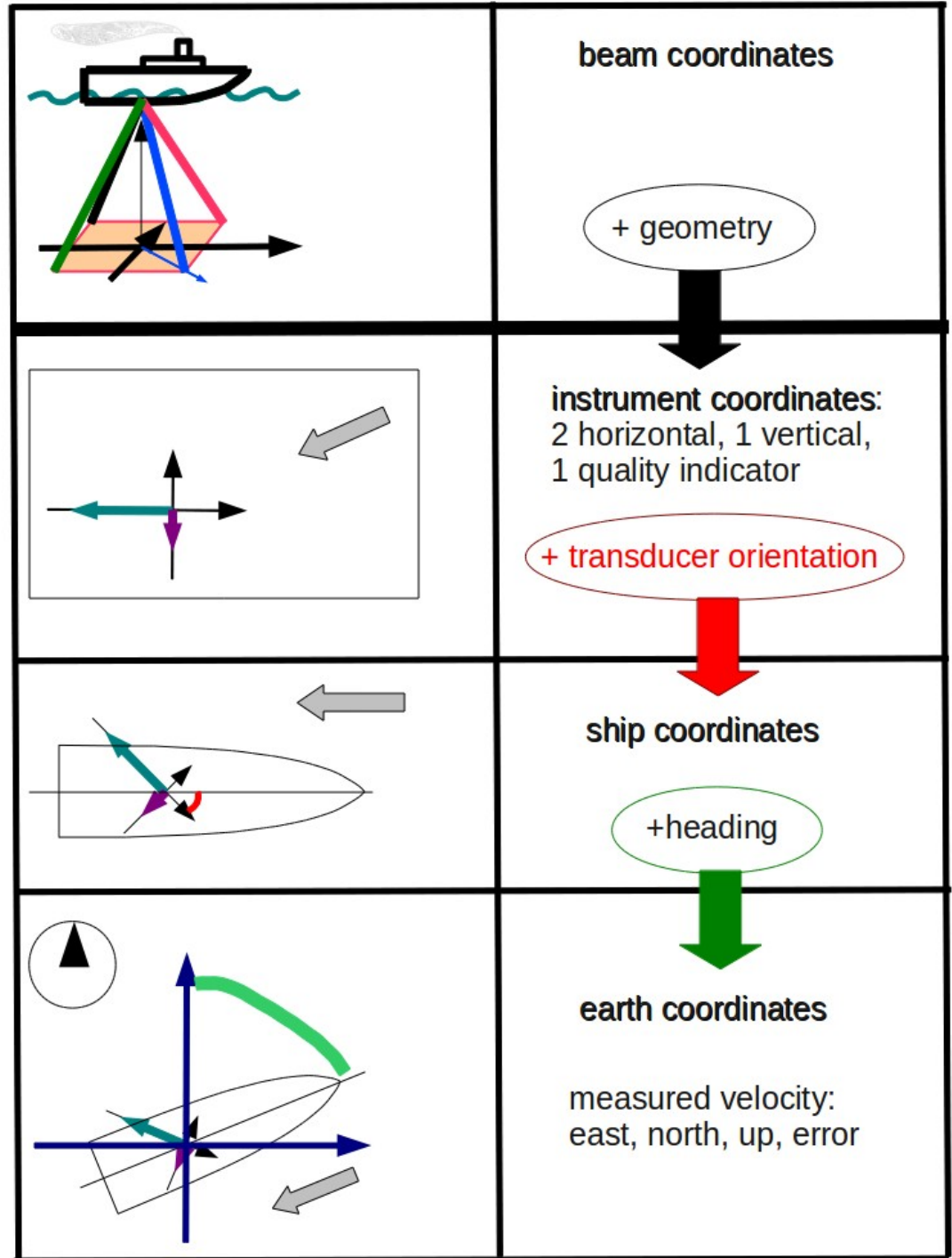
## Getting Ocean Currents

### Summary of steps:

Doppler to beam  
(not shown)

below here: horizontal+vertical

- beam to instrument
- instrument to ship
- ship to earth



# ADCP:

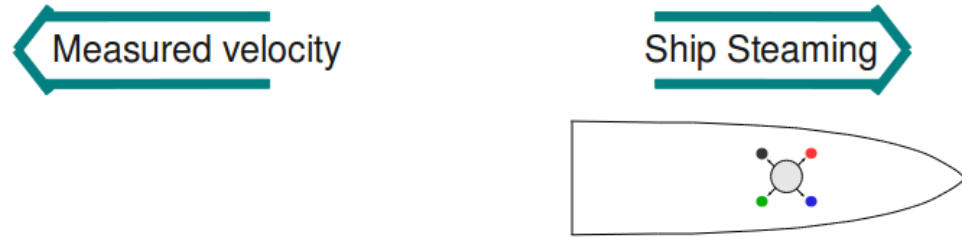
Getting Ocean  
Currents

Earth coordinates + **GPS**  
gives ship speed

add ship speed to  
measured velocity  
to get  
ocean velocity

## Earth coordinates

If no ocean currents:



$$\underline{U_{meas}} = -\underline{U_{ship}}$$

With Ocean current



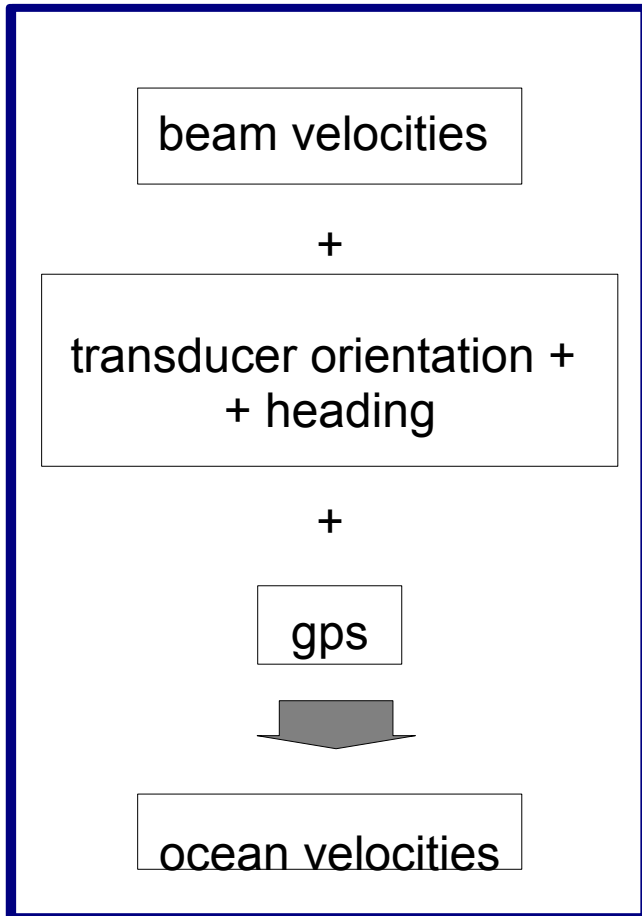
$$\underline{U_{meas}} = -\underline{U_{ship}} + \underline{U_{ocean}}$$

$$\underline{U_{meas}} + \underline{U_{ship}} = \underline{U_{ocean}}$$

# ADCP:

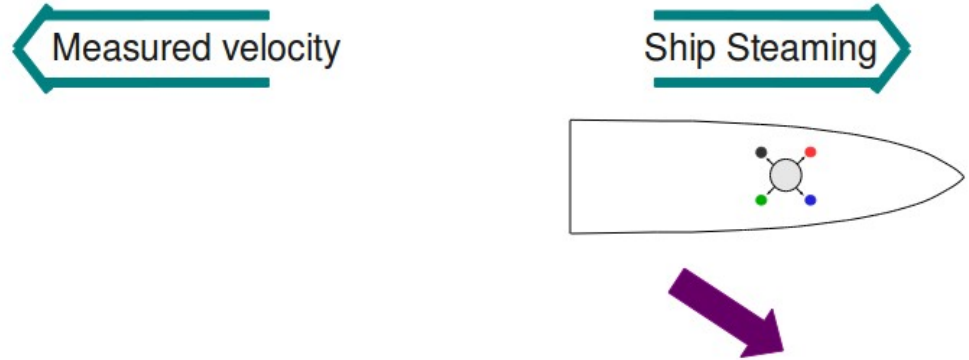
## Getting Ocean Currents

### Complete summary:



## Earth coordinates

### With Ocean current



$$\underline{U_{meas}} = -\underline{U_{ship}} + \underline{U_{ocean}}$$

$$\underline{U_{meas}} + \underline{U_{ship}} = \underline{U_{ocean}}$$

A diagram showing a red oval containing the text 'beam velocities', 'geometry', 'transducer orientation', and 'heading'. To its right is a plus sign '+', followed by a blue circle containing the text 'gps'. Below this is an equals sign '=' followed by the text 'U<sub>ocean</sub>'.

# NOAA 2015 ADCP

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## Part I: ADCP

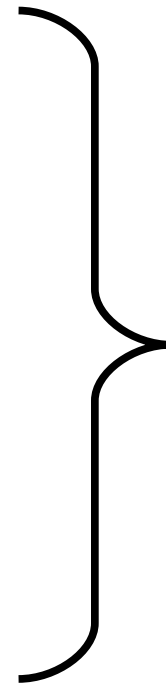
- (1) Getting Ocean Velocity
- (2) ADCP Acquisition Systems:  
UHDAS, VmDAS



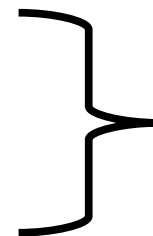
## (2) ADCP Acquisition systems

- Basic requirements:
    - Control ADCP settings
    - Acquire ADCP data
    - Acquire ancillary data
      - Position
      - Attitude (heading)
    - Timestamp all
- 

- Processing
- Monitoring



Core



Extra

# (2) ADCP Acquisition systems

- Basic requirements
- 
- Processing
    - Coordinate transformation
    - Editing
    - Averaging
    - Graphical Displays
  - Monitoring

## (2) ADCP Acquisition systems

- Basic requirements
- 

- Processing

- **Monitoring**

- Computer system
- Data acquisition
- Processing
- Access to data

## (2) ADCP Acquisition systems

- Basic requirements
  - Overview
  - Serial setup
  - Data logging
- Processing
- Monitoring

## (2) ADCP Acquisition Systems- Overview

	UHDAS	VmDAS
developer	Univ Hawaii	TRDI
style	linux system	windows application
source	open source	executable
purpose	seagoing oceanographers	all-purpose
goals	maximize usefulness at sea long-term value for research	off-the-shelf
evolution	continuous	incremental
setup	complex	confusing

## (2) Acquisition: Serial Setup

	UHDAS	VmDAS
ADCs	multiple	one (per instance)
feeds	any number	3 (older version=2)
messages	many types can add more subsample feed choose messages	fewer types  record all record all
gui controls	instrument settings	everything
- operation	simple	simple/confusing
- protected	serial processing	nothing protected

## (2) Acquisition: Data Logging

	UHDAS	VmDAS
data logging	separate processes	one big program
time tagging	buffered tag every line	unbuffered tag ensemble
data formats	multiple	TRDI ADCP
data directory	heirarchical	flat
time range	match per file	match for one logging period
filenames sort ( time=ascii)	always	one logging period
metadata	stored with data	text file elsewhere

# (2) ADCP Acquisition systems

- Basic requirements
  - Overview
  - Serial setup
  - Data logging
- Processing
  - Processing components
  - Accessing data products
- Monitoring



# Processing

	UHDAS	VmDAS
editing	CODAS	minimal
heading	reliable	primary
secondary heading	corrected to accurate	replaced by fallback
pings	interleaved	first
configure plots??	no	yes
plots	oceanographic: <ul style="list-style-type: none"><li>- profiles (E,N)</li><li>- vector (+topo)</li><li>- contour</li><li>- operational</li></ul>	profile (speed, dir) vector WinADCPC?

# Accessing Data Products

	UHDAS	VmDAS
access plots	ship's web console	console only
data formats	TRDI Matlab netCDF	TRDI
access data	ship's web windows share NFS	acquisition PC windows share
documentation	ship's web www	acquisition PC www
speedlog out	yes (serial, web)	yes

# (2) ADCP Acquisition systems

- Basic requirements
  - Overview
  - Serial setup
  - Data logging
- Processing
  - Processing components
  - Accessing data products
- **Monitoring**

## (2) Acquisition Systems: Monitoring

monitor	UHDAS	VmDAS
computer	daily report	?
serial	daily_report	LOG and console messages configure tables
ADCP	beam plots	configure plots
Processing	daily_report plots calibration ping rate bottom track	configure plots  no ? no
remotely	email to anyone	no

# NOAA Norfolk 2015 ADCP

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Part I: ADCP...

## Part II: UHDAS

- UHDAS: What it does
- Operational introduction
- Monitoring
- What can be changed

Part III: Signatures of problems...

# Part II: UHDAS

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- (1) UHDAS: What it does
  - at-sea “CODAS” processing
  - overview
- (2) Operational Introduction
  - computer
  - UHDAS GUI
- (3) Monitoring
  - at sea
  - on land
- (4) What can be changed

# Part II: UHDAS

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- (1) UHDAS: What it does
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# UHDAS: CODAS Processing Overview

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## CODAS: Common Ocean Data Access System

- Portable
- Self-descriptive
- aggregated files (vs/ netCDF which is one file)
- designed for ADCP data

“CODAS Processing” → produce ocean velocities

- tools to access and modify CODAS files

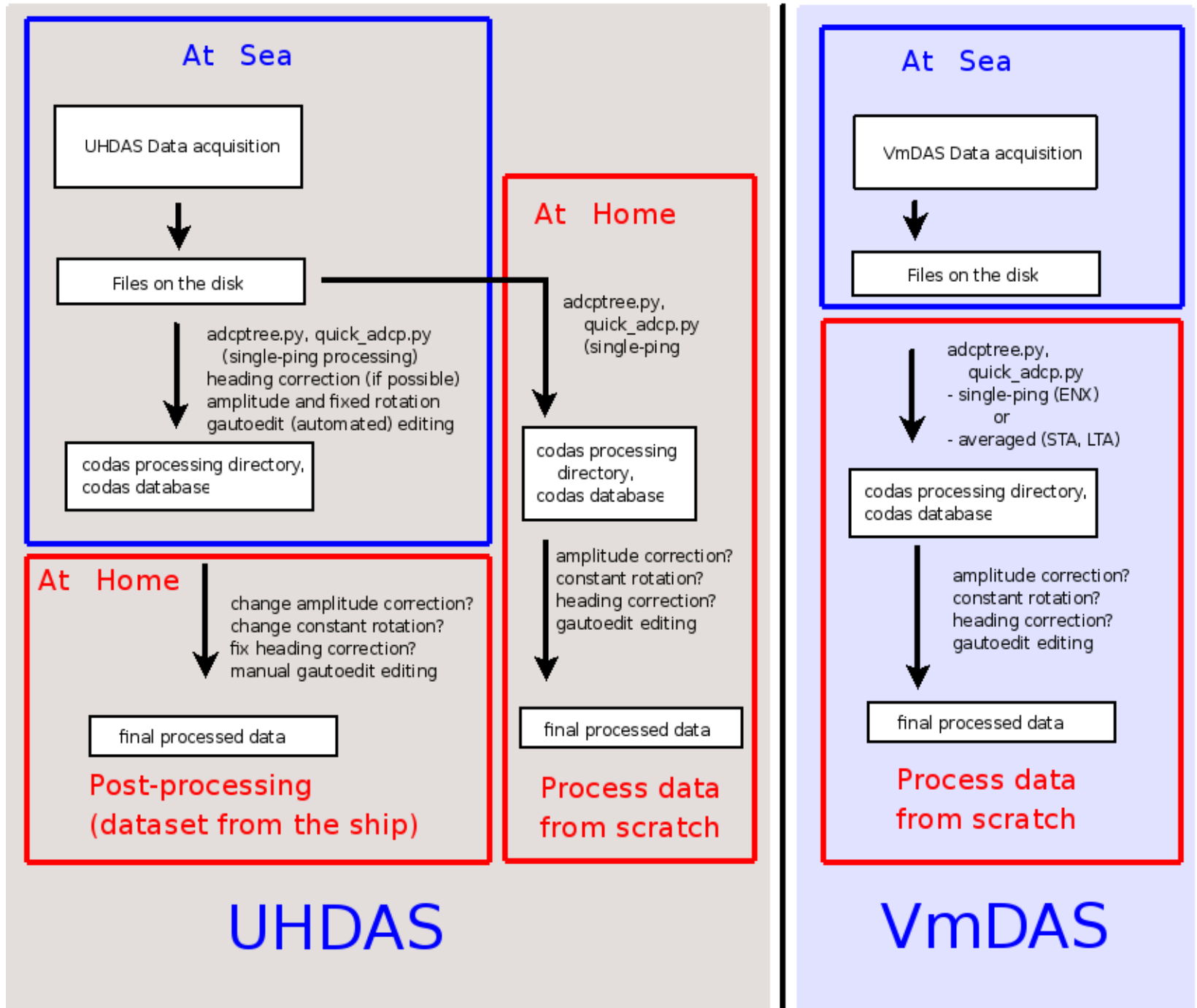


# UHDAS: CODAS Processing Steps

- read ADCP + ancillary data
  - [transform, edit single-pings, average]
  - load into CODAS database
- 
- nudge positions to get smooth reference layer
  - apply heading corrections (calculated from difference between gyro and accurate heading)
  - determine calibration values (angle, scale factor), apply angle and scale factor
  - edit out bad profiles of averaged data

At Sea

At Home



# Part II: UHDAS

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- (1) UHDAS: What it does
  - at-sea “CODAS” processing
  - **overview**
- (2) Operational Introduction
  - computer
  - UHDAS GUI
- (3) Monitoring
  - at sea
  - on land
- (4) What can be changed

# UHDAS: what it does (overview)

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- Data acquisition and processing
- Data access (for scientist at sea)
- Monitoring tools
  - at sea
  - from shore

# UHDAS: what it does (overview)

---

## Data acquisition ...

- logs and timestamps data
- parses NMEA data (Matlab, Python)

## .... and processing

- transforms (ADCP), grids (ancillary), edits (pings)
- averages, loads (into CODAS database)
- all CODAS processing

# UHDAS: What it does (overview)

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## Data Access for science

- web site on ship with
  - 5-minute profile (updated 5min)
  - 3-day vector and contour plot (updated 30min)
  - matlab files via web (used in 3-day plots)
- full-resolution processed (5min averages) via
  - samba (windows share), NFS
  - Files in Matlab, NetCDF, or CODAS (+access tools )

Example [at-sea web site](#)

# UHDAS: What it does (overview)

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## Monitoring...

- **at sea:**
  - processing (web plots)
  - health of accurate heading device (web plots)
  - data acquisition (UHDAS tool)
- **from shore:**
  - sends daily email with attachment
  - diagnostic files
  - data snippet
  - shore-based figures generated from snippet

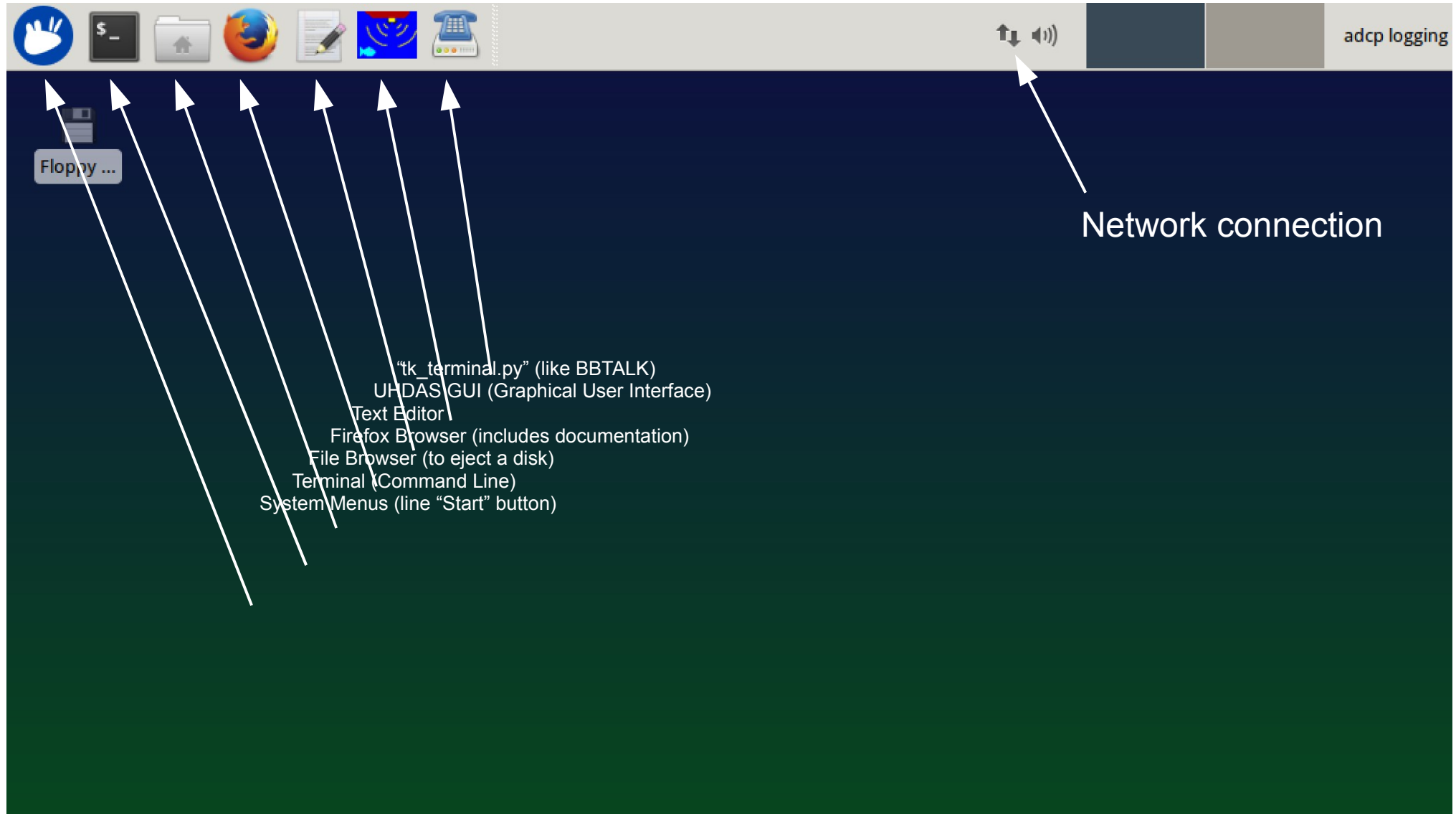
# Part II: UHDAS

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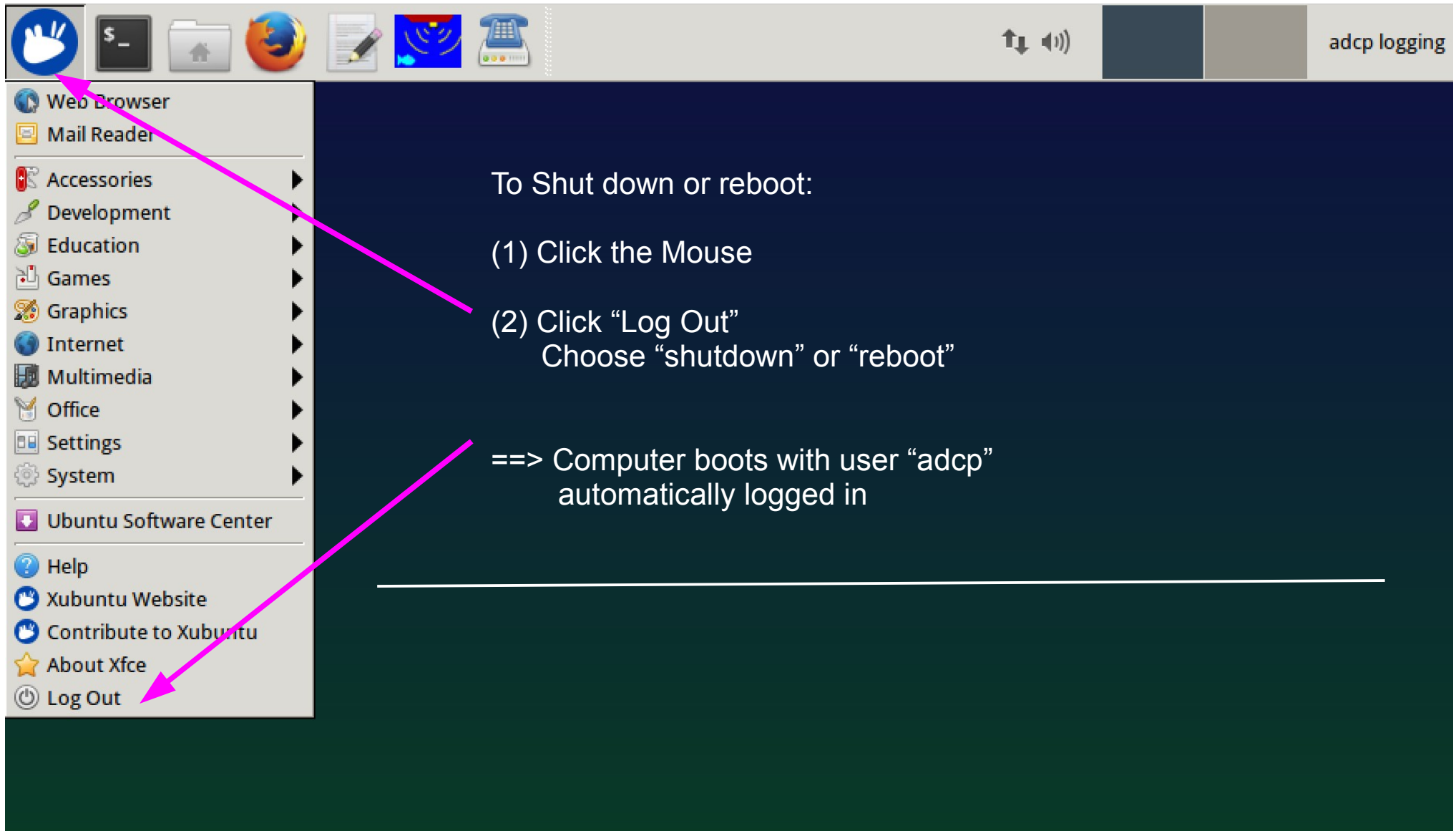
- (1) UHDAS: What it does
  - at-sea “CODAS” processing
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# UHDAS computer intro: Desktop



# UHDAS computer intro: Shutdown



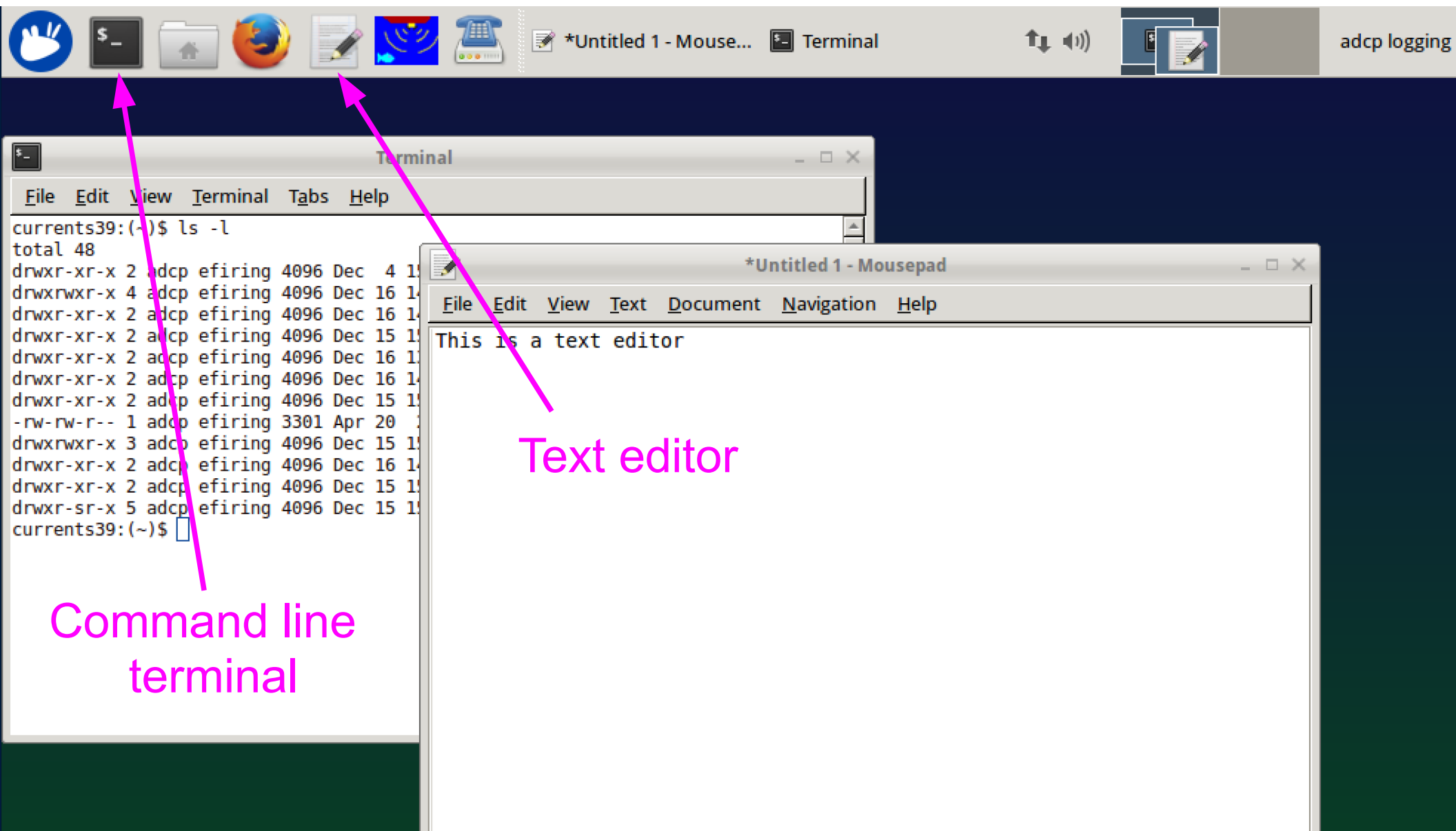
The image shows a screenshot of an Ubuntu desktop environment. The top panel contains several icons: a hand cursor, a terminal window, a folder, Firefox, a document, a network icon, and a telephone. On the right side of the top panel, there are volume and network indicators, and a system tray with the text "adcp logging". The application menu is open, showing a list of categories and applications. A pink arrow points from the top-left icon to the "Log Out" option at the bottom of the menu. Another pink arrow points from the "Log Out" option to the text "Log Out" in the instructions. The background is a dark blue gradient.

To Shut down or reboot:

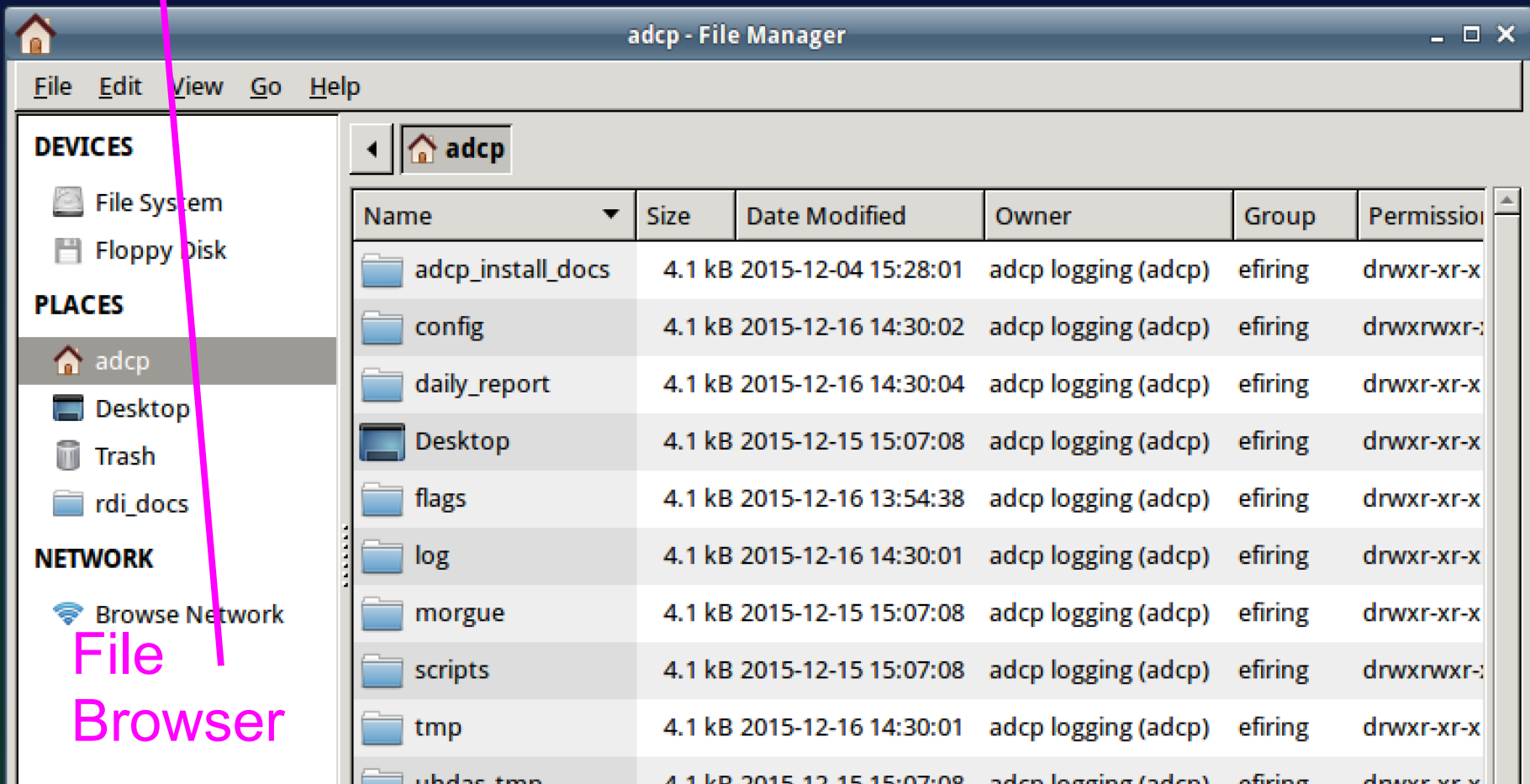
- (1) Click the Mouse
- (2) Click "Log Out"  
Choose "shutdown" or "reboot"

==> Computer boots with user "adcp"  
automatically logged in

# UHDAS computer intro: Command-line terminal and text editor



# UHDAS computer intro: File Browser



File  
Browser

# UHDAS computer intro: Web Browser

UHDAS ADCP web page - Mozilla Firefox

UHDAS ADCP web page x ADCP Figures (with frames) x +

localhost/adcp/index.html Search

**Web Browser**

## Kilo Moana

### UHDAS and ADCP

**Quick Links:**

- [Figures \(live\)](#)
- [Figures \(archive\)](#)
- [Data \(web\)](#)

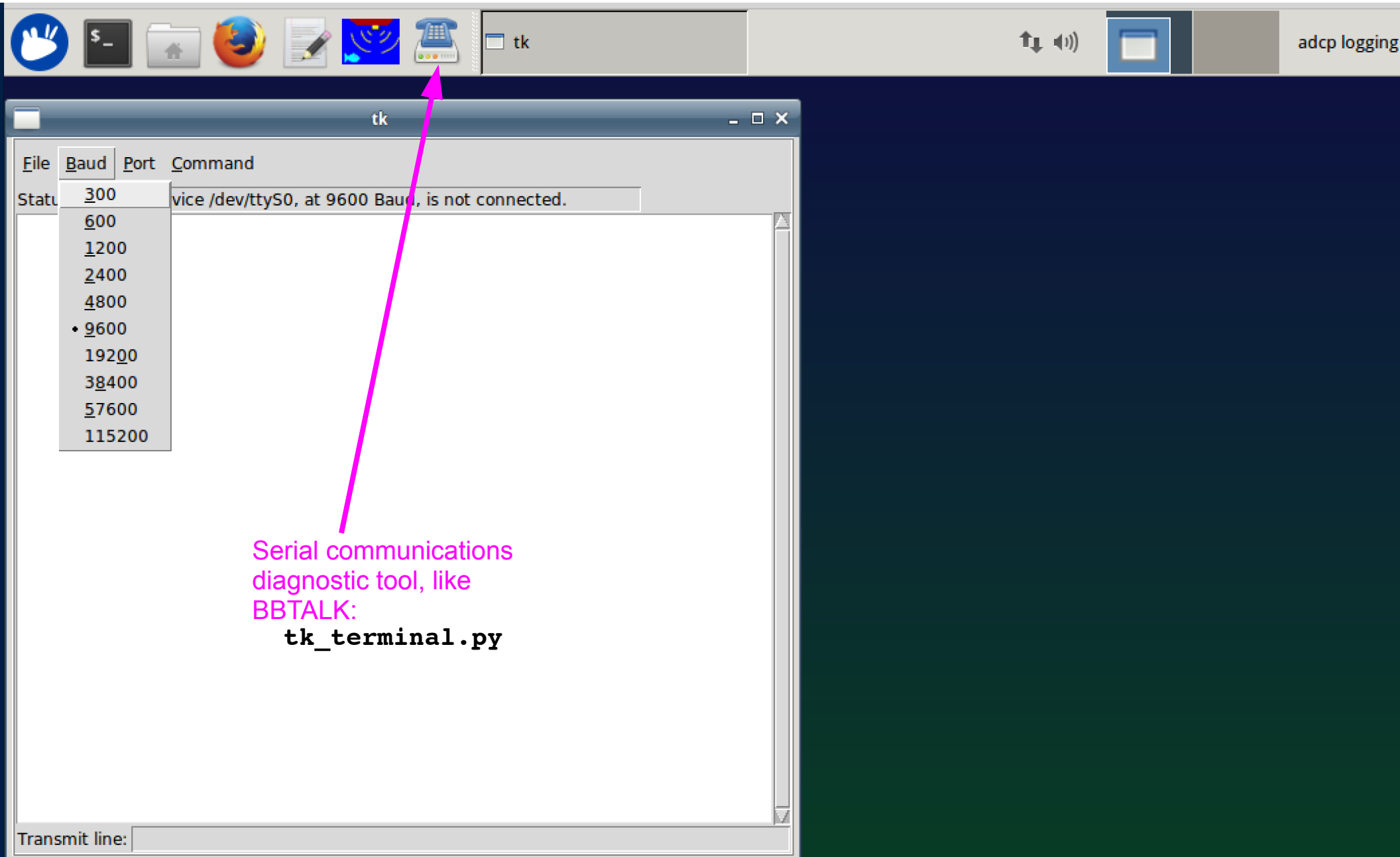
**Documentation:**

- [UHDAS at sea](#)
- [ADCP data tools](#)

The Kilo Moana has two Doppler current profilers, an RDI 38KHz "Ocean Surveyor" ADCP and a 300kHz "Workhorse Mariner". The 38kHz instrument can reach over 1400m in good weather in its deep-profiling mode. In bad weather or low scattering conditions, the range is less. The 300kHz instrument is a high-resolution sonar, with vertical resolution configured to 2m. It measures the upper ocean velocities to about 100m.

The purpose of this web site is to make the shipboard ADCP data easy to access via the KM network. Therefore we are working to provide a selection of automatically generated plots, their

# UHDAS computer intro: “Terminal emulator”



# UHDAS computer intro: UHDAS GUI

The screenshot shows the UHDAS GUI interface. The top bar includes system icons and the text 'UHDAS' and 'adcp logging'. The main window has a title bar 'UHDAS' and a menu bar with options: Control, Terminal, Monitor, 5-minPlot, ContourPlot, VectorPlot, BridgePlot, HeadingPlot, Log, and Errors. The 'Control' tab is selected. On the left, there are sections for 'Cruise Setup' (Cruise ID: None, Start Cruise, End Cruise) and 'Data Recording' (Start Recording, Stop Recording). A pink arrow points from the 'Data Recording' section to the 'UHDAS GUI TOOL' text. The main area is divided into two panels: 'RDI wh300 Data Collection Parameters' and 'RDI os38 Data Collection Parameters'. Each panel has a table of parameters with 'Command', 'Range', 'New', and 'Present' columns. Below each table are 'Restore Defaults', 'Load File', and 'Save File' buttons, and a 'Commands' list.

**UHDAS GUI TOOL**

Command	Range	New	Present
Water Profile	ON or OFF	ON	<input type="checkbox"/>
Number of Bins	5 to 128	70	<input type="checkbox"/>
Bin Length (m)	2 to 16	2.0	<input type="checkbox"/>
Blanking (m)	2 to 16	2.0	<input type="checkbox"/>
Bottom Track	ON or OFF	OFF	<input type="checkbox"/>
BT max depth (m)	10 to 200	200.0	<input type="checkbox"/>
Bandwidth	0 to 1	0	<input type="checkbox"/>
Ambiguity (cm/s)	100 to 700	550	<input type="checkbox"/>
TP min ping time (s)	0 to 6	00.80	<input type="checkbox"/>

**Commands**

- WP1
- WN70
- WS200
- WF200
- BP0
- BX2000
- WB0
- WV550
- TP00:00.80

Command	Range	New	Present
Narrowband Mode	ON or OFF	ON	<input type="checkbox"/>
NB Number of Bins	5 to 128	75	<input type="checkbox"/>
NB Bin Length (m)	16 to 64	24.0	<input type="checkbox"/>
NB Blanking (m)	4 to 90	16.0	<input type="checkbox"/>
Broadband Mode	ON or OFF	ON	<input type="checkbox"/>
BB Number of Bins	5 to 128	115	<input type="checkbox"/>
BB Bin Length (m)	8 to 64	12.0	<input type="checkbox"/>
BB Blanking (m)	4 to 90	16.0	<input type="checkbox"/>
Bottom Track	ON or OFF	OFF	<input type="checkbox"/>
BT max depth (m)	100 to 2000	1000.0	<input type="checkbox"/>
TP min ping time (s)	0 to 6	03.00	<input type="checkbox"/>
Trigger in,out[,timeout]	[timeout 120-43200]	0,0	<input type="checkbox"/>

**Commands**

- NP1
- NN75
- NS2400
- NF1600
- WP1
- WN115
- WS1200
- WF1600
- BP0
- BX10000
- TP00:03.00
- CX0,0

# Part II: UHDAS

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- (1) UHDAS: What it does
  - at-sea “CODAS” processing
  - overview
- (2) Operational Introduction
  - computer
  - UHDAS GUI (Graphical User Interface)
- (3) Monitoring
  - at sea
  - on land
- (4) What can be changed



# Running UHDAS GUI

The screenshot shows the UHDAS GUI interface. The 'Control' tab is selected. The 'Cruise ID' is 'None'. The 'Cruise actions' panel on the left contains buttons for 'Cruise Setup', 'Start Cruise', 'End Cruise', 'Data Recording', 'Start Recording', and 'Stop Recording'. The main area is divided into two instrument settings panels: 'RDI wh300 Data Collection Parameters' and 'RDI os38 Data Collection Parameters'. The WH300 panel has a pink border and is labeled 'Instrument settings: WH300'. The OS38 panel has a pink border and is labeled 'Instrument settings: OS38'. Both panels show a table of parameters with 'New' and 'Present' status indicators. The WH300 'Bottom Track' parameter is set to 'OFF' (red), while the OS38 'Bottom Track' parameter is also set to 'OFF' (red). A 'Commands' list is visible at the bottom of each panel.

Command	Range	New	Present
Water Profile	ON or OFF	ON	
Number of Bins	5 to 128	70	
Bin Length (m)	2 to 16	2.0	
Blanking (m)	2 to 16	2.0	
Bottom Track	ON or OFF	OFF	
BT max depth (m)	10 to 200	200.0	
Bandwidth	0 to 1	0	
Ambiguity (cm/s)	100 to 700	550	
TP min ping time (s)	0 to 6	00.80	

Command	Range	New	Present
Narrowband Mode	ON or OFF	ON	
NB Number of Bins	5 to 128	75	
NB Bin Length (m)	16 to 64	24.0	
NB Blanking (m)	4 to 90	16.0	
Broadband Mode	ON or OFF	ON	
BB Number of Bins	5 to 128	115	
BB Bin Length (m)	8 to 64	12.0	
BB Blanking (m)	4 to 90	16.0	
Bottom Track	ON or OFF	OFF	
BT max depth (m)	100 to 2000	1000.0	
TP min ping time (s)	0 to 6	03.00	
Trigger in,out[,timeout]	[timeout 120-43200]	0,0	

**Cruise actions**

**Instrument settings: WH300**

**Instrument settings: OS38**

# Cruise Sequence (for operator)

---

- Start UHDAS GUI
- Start cruise
- Start logging
  
- Cruise data goes in `/home/data/CRUISEID:`
  - **raw**
  - **rbin**
  - **gbin**
  - **proc**
  - **reports**

# UHDAS cruise directory structure

Data for scientists:

There are three categories of data, all located in the logging directory, `/home/data/[CRUISEID]`:  
ADCP logging directories

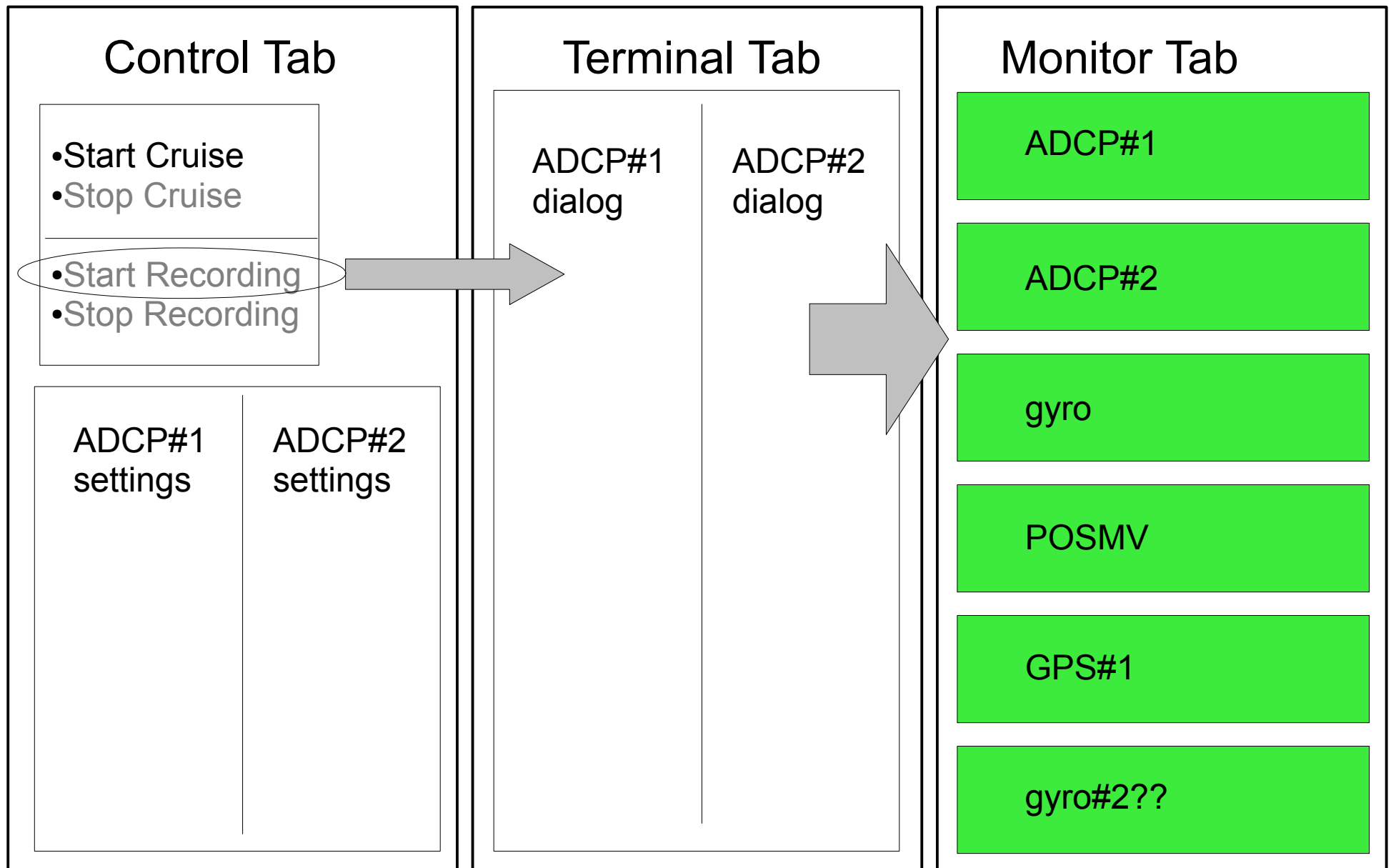
<b>subdirectory</b>	<b>contents</b>	<b>importance</b>	<b>back up for...</b>
<b>raw</b>	all raw data	critical	<ul style="list-style-type: none"><li>◦ archiving</li><li>◦ scientists who ask for it</li></ul>
<b>rbin</b>	intermediate files	nice to have	anyone who gets <b>raw</b>
<b>gbin</b>	intermediate files	nice to have	anyone who gets <b>raw</b>
<b>proc</b>	<ul style="list-style-type: none"><li>◦ final processing</li><li>◦ codas database</li><li>◦ underway figure archive</li><li>◦ matlab files</li></ul>	final product	science CDs after cruise

**reports**

collection of diagnostics

nice to have

# Running UHDAS (the UHDAS GUI tool)



# UHDAS data logging: Green is Good

Control Tab Terminal Tab Monitor Tab

The screenshot shows the UHDAS software interface with the following data:

Sensor	Serial Device	Status	Start	Good	Errors	Log
os38	ttyS0	Logging	2004/10/01 02:15:15	469	1	275 02:48:47 np2004_274_08144.raw 1238880 2670 275 02:48:51 np2004_274_08144.raw 1241550 2670 275 02:48:55 np2004_274_08144.raw 1244220 2670 275 02:48:59 np2004_274_08144.raw 1246890 2670
nb150	ttyn1g	Logging	2004/10/01 02:15:15	1979	0	275 02:48:57 np2004_274_08144.raw 1142946 579 275 02:48:58 np2004_274_08144.raw 1143525 579 275 02:48:59 np2004_274_08144.raw 1144104 579 275 02:49:00 np2004_274_08144.raw 1144683 579
Soundspeed	ttyn1e	Logging	2004/10/01 02:15:15	3179	0	1556.16 1555.31 1556.16 1555.31
Seapath	ttyn1c	Logging	2004/10/01 02:15:15	5991	0	\$PSXN,23,-1.58,-0.02,102.71,0.00*33 \$GPGGA,024900.40,3649.894951,S,17447.059253,E,1,10,1.0,30.85,M,,M,,*63 \$PSXN,20,1,0,0,0*3A \$PSXN,23,-1.57,-0.01,102.71,0.00*3F
GPS Tm			2004/10/01 02:15:15			\$GPGGA,024856.493,3649.8946,S,17447.0578,E,1,06,1.6,039.0,M,-026.4,M,,*54

# Cruise Sequence (for operator)

---

- ...[cruise occurs]
- may change settings:
  - Bottom track On/Off
  - Triggering On/Off

# Autonomous Pinging (no trigger)

- Stop Recording
- (change settings)
- Start Recording

No trigger in  
No trigger out

(0,0)

Command	Range	New	Present
Narrowband Mode	ON or OFF	ON	ON
NB Number of Bins	5 to 128	60	60
NB Bin Length (m)	4 to 16	8.0	8.0
NB Blanking (m)	2 to 90	4.0	4.0
Broadband Mode	ON or OFF	OFF	OFF
BB Number of Bins	5 to 128	80	80
BB Bin Length (m)	2 to 16	4.0	4.0
BB Blanking (m)	2 to 90	4.0	4.0
Bottom Track	ON or OFF	OFF	OFF
BT max depth (m)	50 to 700	500.0	500.0
TP min ping time (s)	0 to 6	01.10	01.10
Trigger in,out[,timeout]	[timeout 120-43200]	0,0	0,0

Commands

- NP1
- NN60
- NS800
- NF400
- WPO
- WN80
- WS400
- WF400
- BPO
- BX5000
- TP00:01.10
- CX0,0

# Trigger in, Trigger out (i.e. response)

Command	Range	New	Present
Narrowband Mode	ON or OFF	ON	ON
NB Number of Bins	5 to 128	60	60
NB Bin Length (m)	4 to 16	8.0	8.0
NB Blanking (m)	2 to 90	4.0	4.0
Broadband Mode	ON or OFF	OFF	OFF
BB Number of Bins	5 to 128	80	80
BB Bin Length (m)	2 to 16	4.0	4.0
BB Blanking (m)	2 to 90	4.0	4.0
Bottom Track	ON or OFF	OFF	OFF
BT max depth (m)	50 to 700	500.0	500.0
TP min ping time (s)	0 to 6	0.00	01.10
Trigger in,out[,timeout]	[timeout 120-43200]	1,1	0,0

Commands

- NP1
- NN60
- NS800
- NF400
- WPO
- WN80
- WS400
- WF400
- BPO
- BX5000
- TP00:00.00
- CX1,1

- Stop Recording
- (change settings)
- Start Recording

Yes trigger in  
Yes trigger out

(1,1)



# Other settings for ADCPs

- Stop Recording
- (change settings)
- Start Recording
  
- Toggle modes
  - broadband
  - narrowband
  - bottomtrack
  
- shorter bins = shallower range (increase #bins)

The screenshot displays the 'RDI os150 Data Collection Parameters' window. The interface includes tabs for Control, Terminal, Monitor, 5-minPlot, ContourPlot, VectorPlot, BridgePlot, and Head. The 'Control' tab is active, showing 'Cruise Setup' (Cruise ID: Suuuu) and 'Data Recording' (Start Recording, Stop Recording) buttons. The 'RDI os150 Data Collection Parameters' table is shown below, with a circled area highlighting the 'New' column settings.

Command	Range	New	Present
Narrowband Mode	ON or OFF	ON	ON
NB Number of Bins	5 to 128	60	60
NB Bin Length (m)	4 to 16	8.0	8.0
NB Blanking (m)	2 to 90	4.0	4.0
Broadband Mode	ON or OFF	OFF	OFF
BB Number of Bins	5 to 128	80	80
BB Bin Length (m)	2 to 16	4.0	4.0
BB Blanking (m)	2 to 90	4.0	4.0
Bottom Track	ON or OFF	OFF	OFF
BT max depth (m)	50 to 700	500.0	500.0
TP min ping time (s)	0 to 6	01.10	01.10
Trigger in,out[,timeout]	[timeout 120-43200]	0,0	0,0

Buttons: Restore Defaults, Load File, Save File

Commands list: NP, NN60, NS800, NF400, WPO, WN80, WS400, WF400, BPO, BX5000, TP00:01.10, CX0,0

# Cruise Sequence (for operator)

---

- ...[cruise occurs]
- Stop recording (logging)
- End Cruise
- Back up /home/data/CRUISEID

# Part II: UHDAS

---

- UHDAS: What it does
  - at-sea “CODAS” processing
  - overview
- Operational Introduction
  - computer
  - UHDAS GUI
- **Monitoring**
  - **at sea**
  - on land
- What can be changed

# UHDAS: Monitoring

---

## Monitoring...

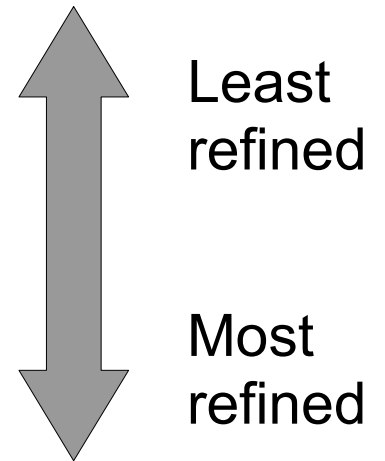
- **at sea:**
  - data acquisition (UHDAS tool)
  - health of accurate heading device (web plots)
  - processing (web plots)
- **from shore:**
  - sends daily email with attachment
  - diagnostic files
  - data snippet
  - shore-based figures generated from snippet

# Monitoring: At Sea

---

There are three categories of monitoring:

- (1) data acquisition
- (2) health of components (heading)
- (3) CODAS Processing



Example [at-sea web site](#)

# Monitoring: At Sea

---

There are three categories of monitoring:

- (1) data acquisition (UHDAS GUI only)
- (2) health of components (heading)
- (3) CODAS Processing

# UHDAS data logging: Green is Good

Control Tab Terminal Tab Monitor Tab

Device	Serial Device	Start	Good	Errors	Log
os38	ttyS0	2004/10/01 02:15:15	469	1	275 02:48:47 np2004_274_08144.raw 1238880 2670 275 02:48:51 np2004_274_08144.raw 1241550 2670 275 02:48:55 np2004_274_08144.raw 1244220 2670 275 02:48:59 np2004_274_08144.raw 1246890 2670
nb150	ttyn1g	2004/10/01 02:15:15	1979	0	275 02:48:57 np2004_274_08144.raw 1142946 579 275 02:48:58 np2004_274_08144.raw 1143525 579 275 02:48:59 np2004_274_08144.raw 1144104 579 275 02:49:00 np2004_274_08144.raw 1144683 579
Soundspeed	ttyn1e	2004/10/01 02:15:15	3179	0	1556.16 1555.31 1556.16 1555.31
Seapath	ttyn1c	2004/10/01 02:15:15	5991	0	\$PSXN,23,-1.58,-0.02,102.71,0.00*33 \$GPGGA,024900.40,3649.894951,S,17447.059253,E,1,10,1.0,30.85,M,,M,,*63 \$PSXN,20,1,0,0,0*3A \$PSXN,23,-1.57,-0.01,102.71,0.00*3F
GPS Tm		2004/10/01 02:15:15			\$GPGGA,024856.493,3649.8946,S,17447.0578,E,1,06,1.6,039.0,M,-026.4,M,,*54

Serial messages

# Monitoring At Sea: data Acquisition

Cruise ID: HLY10TC\_14

os150 os75 GP90 GPS MK39 gyro MK27 gyro Ashtech POSMV

Control	Terminal	Monitor	5-minPlot	ContourPlot	VectorPlot	BridgePlot	HeadingPlot	Log	Errors
os150 tty_dgnc_0_0 Logging	Start: 2010/06/08 03:27:41 Good: 29 Errors: 0	2010/06/08 03:27:41 2010/06/08 03:27:59	159 03:27:52 hly2010_158_07200.raw 5105610 2130 159 03:27:55 hly2010_158_07200.raw 5107740 2130 159 03:27:57 hly2010_158_07200.raw 5109870 2130 159 03:27:59 hly2010_158_07200.raw 5112000 2130						
os75 tty_dgnc_0_7 Logging	Start: 2010/06/08 03:27:41 Good: 19 Errors: 0	2010/06/08 03:27:41 2010/06/08 03:28:00	159 03:27:50 hly2010_158_07200.raw 2413950 1650 159 03:27:53 hly2010_158_07200.raw 2415600 1650 159 03:27:57 hly2010_158_07200.raw 2417250 1650 159 03:28:00 hly2010_158_07200.raw 2418900 1650						
GP90 GPS tty_dgnc_0_2 Logging	Start: 2010/06/08 03:27:41 Good: 66 Errors: 0	2010/06/08 03:27:41 2010/06/08 03:28:01	\$GPGGA,032757.565,4915.6323,N,16419.7563,W,1,06,1.3,018.2,M,-007.7,M,*,*5F \$GPGGA,032758.565,4915.6368,N,16419.7575,W,1,06,1.3,018.1,M,-007.7,M,*,*5B \$GPGGA,032759.565,4915.6415,N,16419.7586,W,1,06,1.3,018.4,M,-007.7,M,*,*5E \$GPGGA,032800.565,4915.6461,N,16419.7596,W,1,06,1.3,018.9,M,-007.7,M,*,*52						
MK39 gyro tty_dgnc_0_5 Logging	Start: 2010/06/08 03:27:41 Good: 1 Errors: 0	2010/06/08 03:27:41 2010/06/08 03:27:43	\$INHDT,347.67,T*14						
MK27 gyro tty_dgnc_0_6 Logging	Start: 2010/06/08 03:27:41 Good: 73 Errors: 0	2010/06/08 03:27:41 2010/06/08 03:28:01	\$HEHDT,349.79,T*1F \$HEHDT,349.75,T*13 \$HEHDT,349.77,T*11 \$HEHDT,349.79,T*1F						
Ashtech tty_dgnc_0_1 Logging	Start: 2010/06/08 03:27:41 Good: 132 Errors: 0	2010/06/08 03:27:41 2010/06/08 03:28:01	\$GPGGA,032800.00,4915.64252,N,16419.76000,W,1,12,0.8,18.56,M,7.95,M,*,*79 \$GPPAT,032800.00,4915.64252,N,16419.76000,W,00026.50,348.9006,000.11,000.48,0.0017,0.02 \$GPGGA,032801.00,4915.64714,N,16419.76129,W,1,12,0.8,18.62,M,7.95,M,*,*72 \$GPPAT,032801.00,4915.64714,N,16419.76129,W,00026.57,348.8898,-000.21,000.53,0.0021,0.02						
POSMV tty_dgnc_0_3 Logging	Start: 2010/06/08 03:27:41 Good: 131 Errors: 0	2010/06/08 03:27:41 2010/06/08 03:28:00	\$PASHR,032759.564,348.61,T,0.40,0.23,0.10,0.024,0.024,0.011,2,1*12 \$INGGA,032759.564,4915.66953,N,16419.76833,W,1,08,1.2,0.61,M,*,*38 \$PASHR,032800.564,348.65,T,0.50,-0.16,-0.04,0.024,0.024,0.011,2,1*17 \$INGGA,032800.564,4915.67409,N,16419.76958,W,1,08,1.2,0.41,M,*,*36						

Solution: Verify the source has the right messages and baud rate,  
Plug back into USB-serial box.

If it the ADCP, check that it has power, then **Stop recording,**  
**Start recording**



# UHDAS serial data flow

---

- Positions come in a serial port
- Positions are split via an internal data stream so we can monitor them continually
- The mechanism is called “ZMQ”
- It is newly-added and not well documented for UHDAS ... yet...

## Linux serial port names

- start with ZERO
- always start with letters "tty"
- always named `/dev/ttyXXX`
- named during the boot process or discovered on hot-plug
- find out if the serial ports are there:

```
ls -ltr /dev/ttyUSB*
```

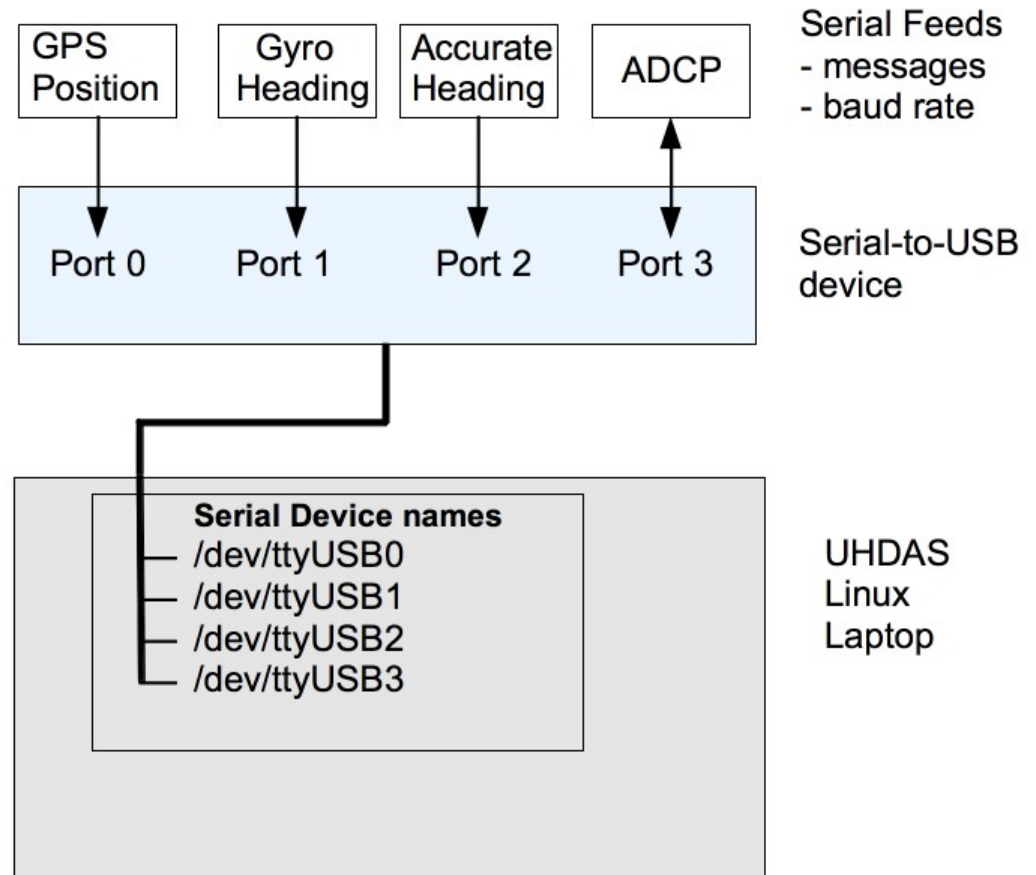
```
crw-rw---- 1 root dialout 188, 4 Nov 10 17:53 /dev/ttyUSB4
crw-rw---- 1 root dialout 188, 5 Nov 10 17:53 /dev/ttyUSB5
crw-rw---- 1 root dialout 188, 0 Nov 10 17:53 /dev/ttyUSB0
crw-rw---- 1 root dialout 188, 6 Nov 10 17:53 /dev/ttyUSB6
crw-rw---- 1 root dialout 188, 1 Nov 10 17:53 /dev/ttyUSB1
crw-rw---- 1 root dialout 188, 2 Nov 10 17:53 /dev/ttyUSB2
crw-rw---- 1 root dialout 188, 3 Nov 20 02:21 /dev/ttyUSB3
crw-rw---- 1 root dialout 188, 7 Nov 20 02:21 /dev/ttyUSB7
```

## UHDAS and serial data

Kill UHDAS GUI tool before:

- using another serial tool like  
`tk_terminal.py`
- unplugging the USB-serial device
- making any changes to  
`sensor_cfg.py`

## Serial logging: Physical layout and serial devices



- Serial device names are determined by the type of serial hardware
- Serial feed : Physically plugging a serial instrument into a plug
- Serial Logging: Software talking to the serial ports must know
  - device name
  - baud rate
  - messages to expect

Serial port setup for UHDAS is done in  
`/home/adcp/config/sensor_cfg.py`

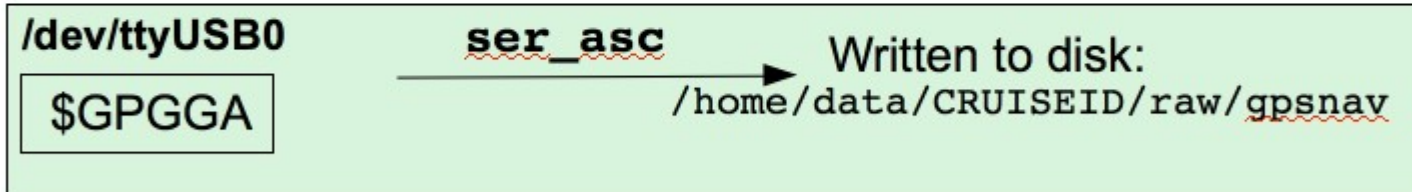
# Serial GPS data flow

---

## Monitoring GPS (without zmq)

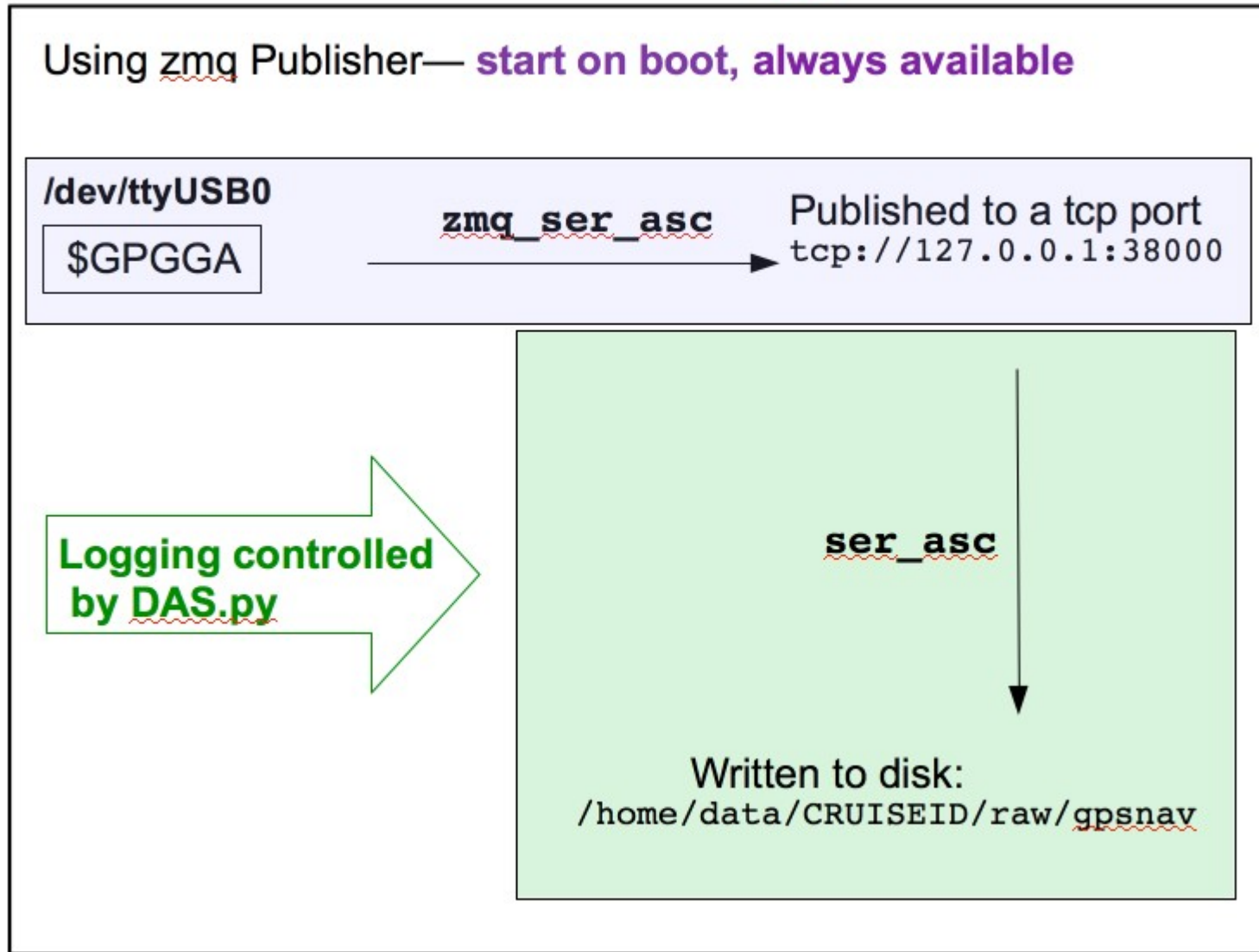
Without zmq Publisher—only accessible when DAS.py is logging

**Logging controlled by DAS.py**



# Serial GPS data flow

## Monitoring GPS with zmq



# Monitoring: At Sea

---

There are three categories of monitoring:

- (1) data acquisition
- (2) health of components (heading)
- (3) CODAS Processing

# Monitoring Heading Quality

---

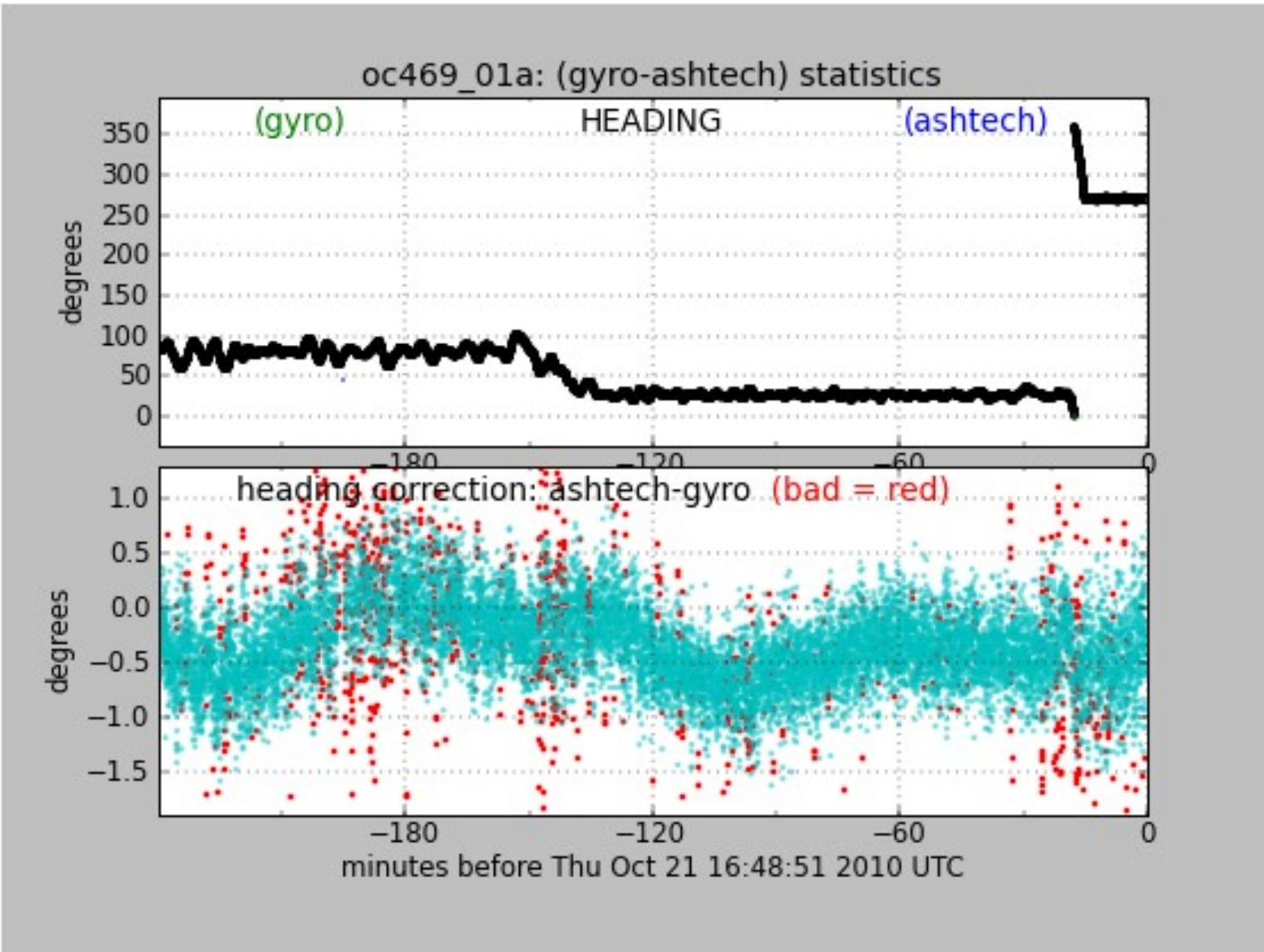
- Heading is required to convert beam to earth coordinates and get ocean velocity
- **A 1-degree error in heading is a 10cm/s error in ocean velocity (cross-track), which is about 1/2 the open ocean signal**
- Incorrect transducer angle must be fixed (ADCP calibrated) when re-installed
- heading or transducer angle errors will result in errors in ocean velocity, sometimes subtle

# Attitude Health

---

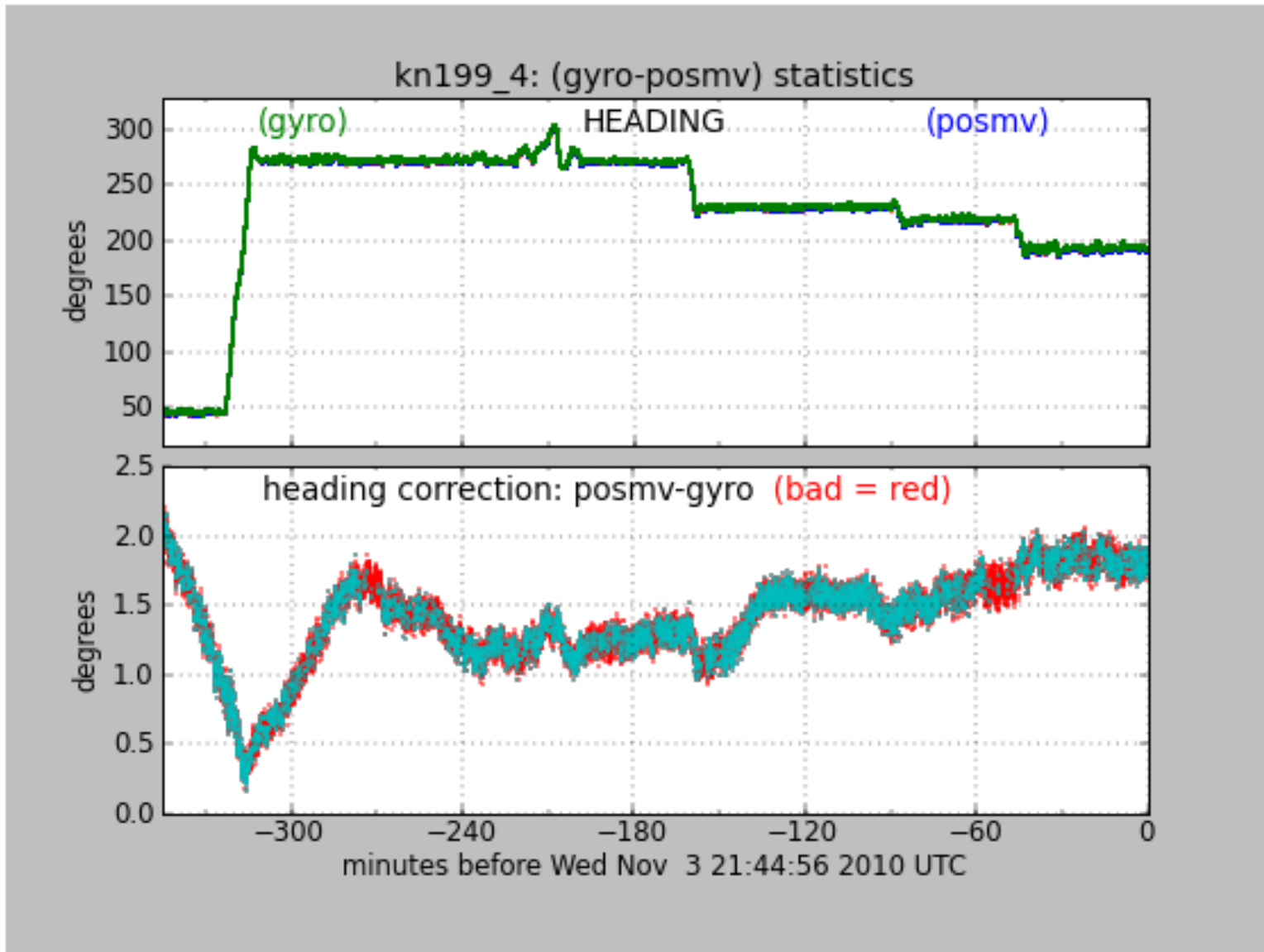
- Examples of
  - Ashtech
  - POSMV
  - Phins
- Statistics generated for all 3
- Example of POSMV in trouble

# Ashtech

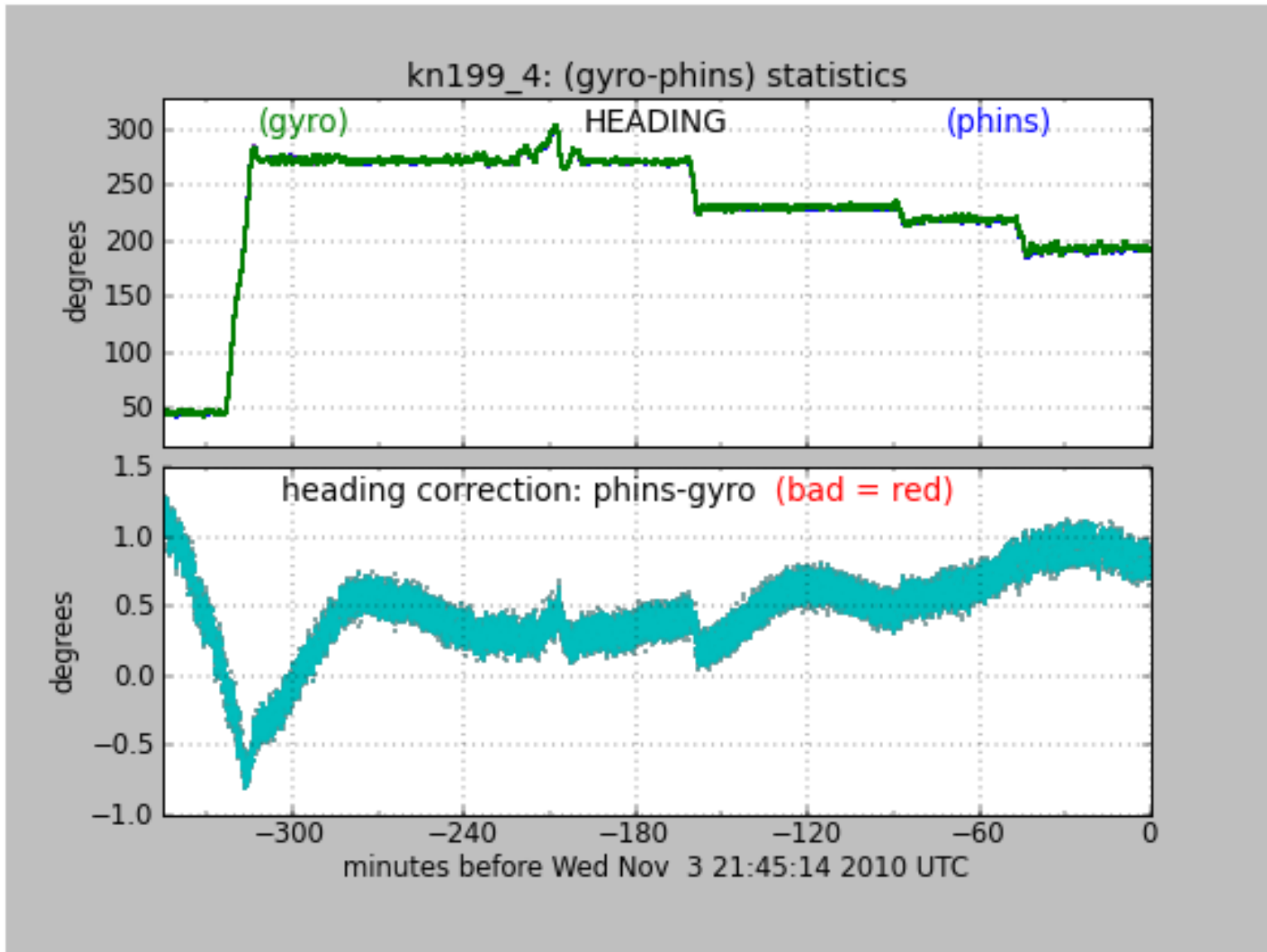




# POSMV

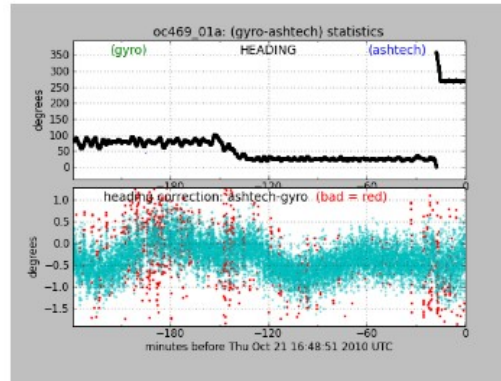


# Phins



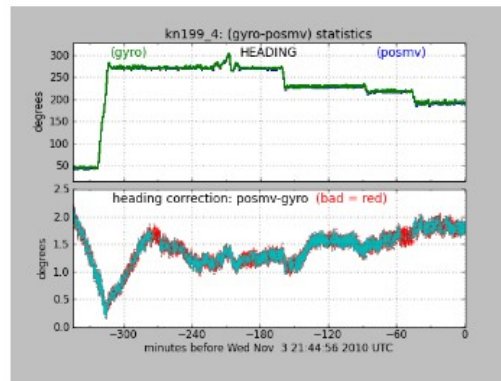
# Accurate heading device: examples

Statistics  
generated  
in daily email  
for three cases



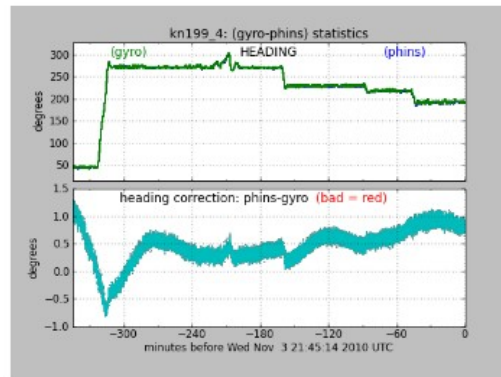
```

=====
----- ashtech statistics -----
=====
ashtech-gyro statistics )
ddrange: 304.7901512 to 305.7901506
(2010/11/01 18:57:49 to 2010/11/02 18:57:49)
all ashtech messages: (89%) were good
(300sec) ensemble heading corrections:
  288 out of 288 (100%) were good
statistics of good data:
  mean N = 270, stdev N = 27
  min = -0.25, max = 0.61
  mean = 0.15, stdev = 0.22
    
```



```

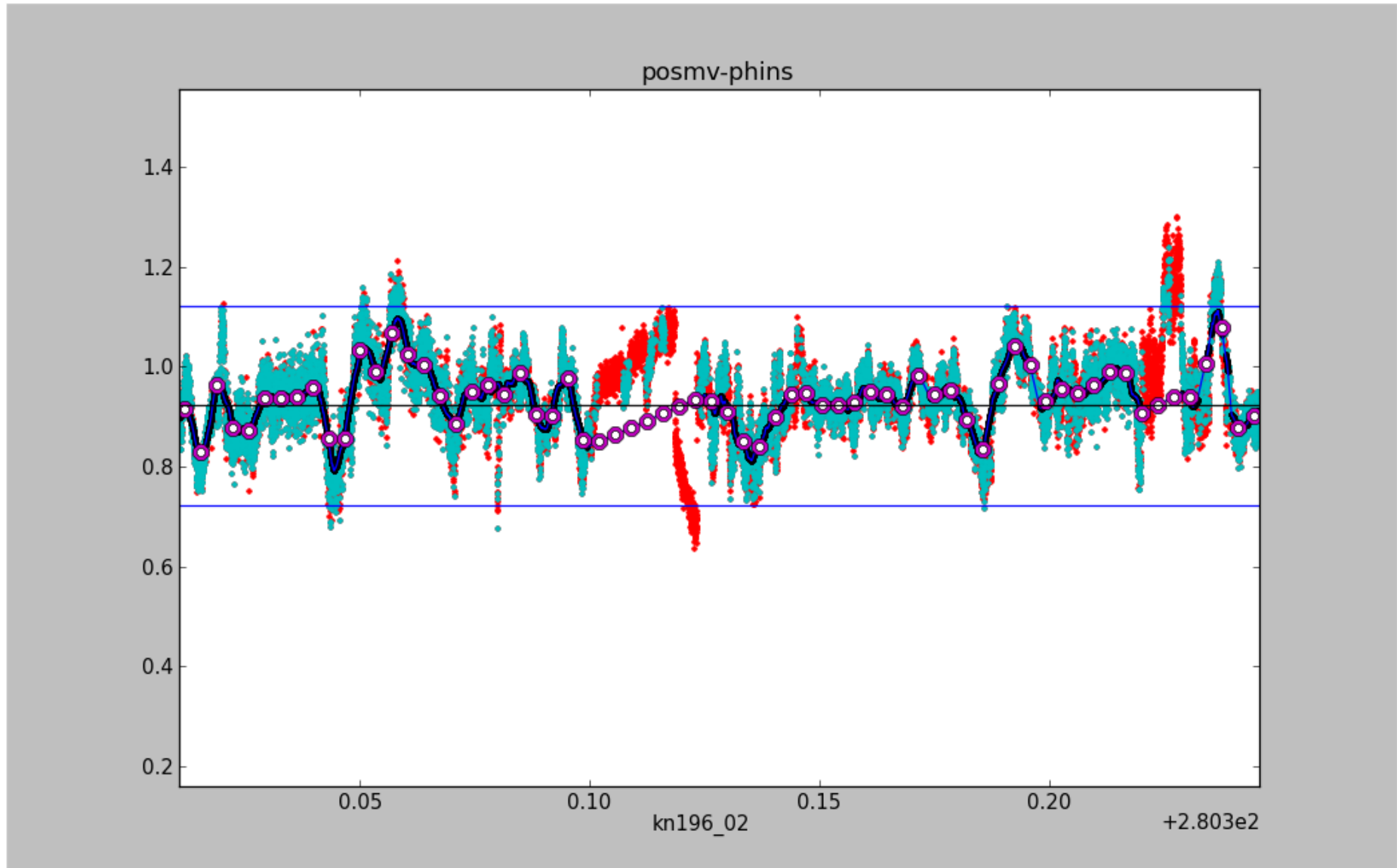
=====
----- posmv statistics -----
=====
posmv-gyro statistics (pycurrents)
ddrange: 305.8333642 to 306.8577969
(2010/11/02 20:00:03 to 2010/11/03 20:35:14)
number of good points: 182 out of 294 (62%)
min dh = 0.37, max dh = 1.85
mean dh = 0.80
stdev dh = 0.35
heading correction quality:
mean N in ensemble = 120
stdev N in ensemble = 40
(one ensemble looks like 300 seconds)
    
```



```

=====
----- phins statistics -----
=====
phins-gyro statistics (pycurrents)
ddrange: 305.8333642 to 306.8579936
(2010/11/02 20:00:03 to 2010/11/03 20:35:31)
number of good points: 295 out of 295 (100%)
min dh = -0.63, max dh = 1.07
mean dh = -0.12
stdev dh = 0.38
heading correction quality:
mean N in ensemble = 301
stdev N in ensemble = 0
(one ensemble looks like 300 seconds)
    
```

# POSMV in trouble



# Monitoring: At Sea

---

There are three categories of monitoring:

- (1) data acquisition
- (2) health of components (heading)
- (3) CODAS Processing

# Monitoring At Sea: UHDAS web site

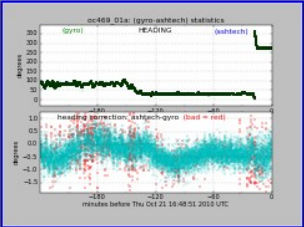
ADCP Figures (with frames)

[HOME](#)

Monitoring: click opens a new figure

**Attitude Devices**

- ashtech [heading correction](#)



**Beam Diagnostics (OS only):**

- [last 30 min](#)
- [last 24 files \(stats\)](#)

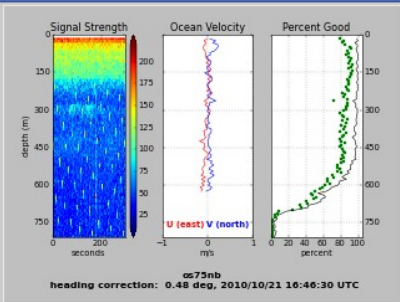
**Bridge plots:**

- surface vector :
  - [day](#)
  - [night](#)
- kts and direction profile:
  - [day](#)
  - [night](#)
- kts E/N + scattering [profile](#)

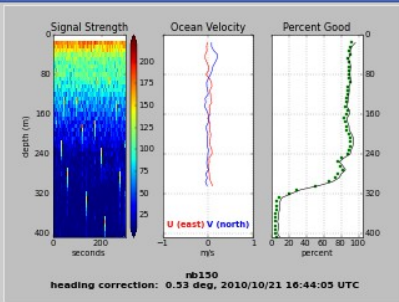
Click shows figures on the right:

[all thumbnails](#)

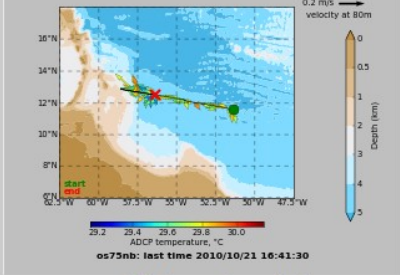
[HOME](#)



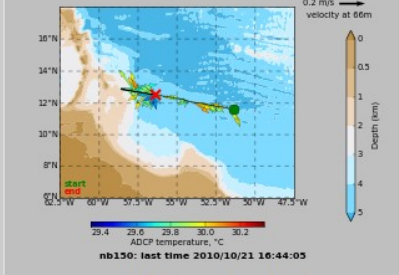
**os75nb 5-minute profile**



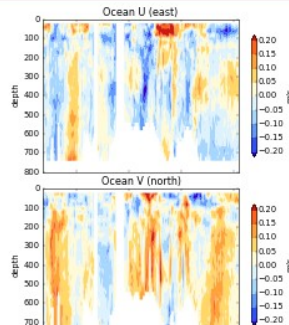
**nb150 5-minute profile**

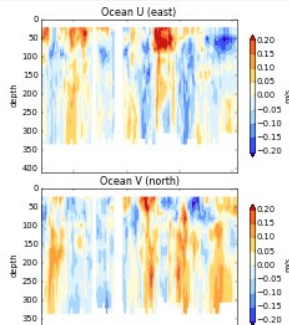


**os75nb vector plot**



**nb150 vector plot**





Example at-sea web site

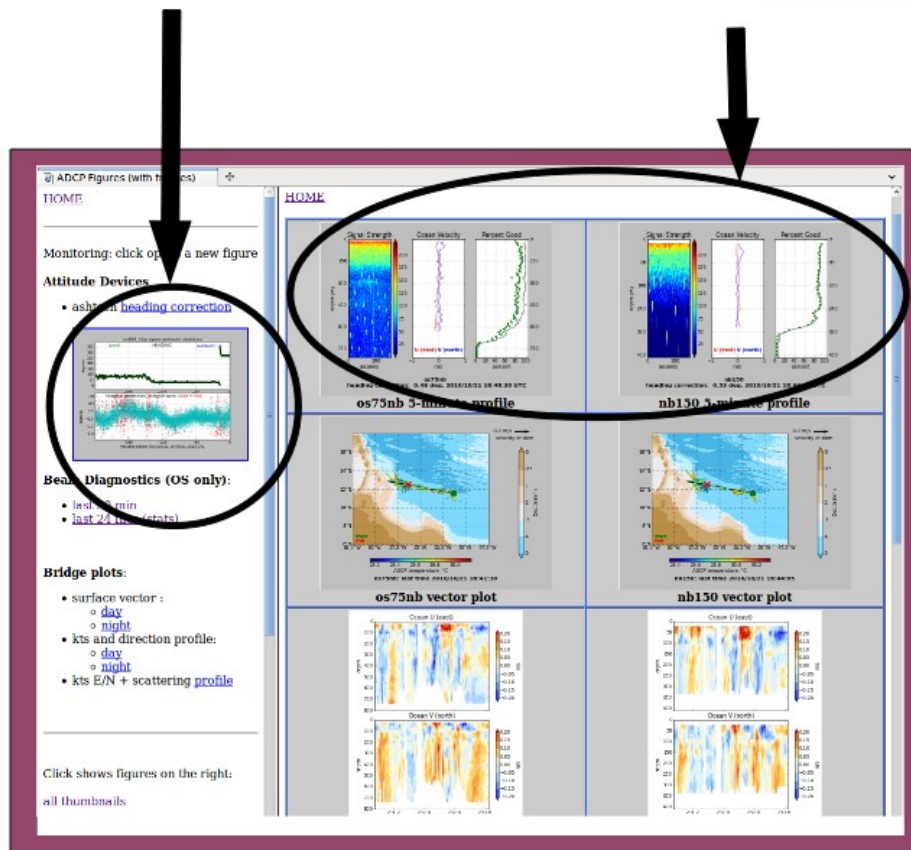


# Monitoring the 5-minute timer: Check: less than 10 minutes old?

## Accurate Heading Device

Ashtech, POSMV, Seapath  
Phins, Mahrs

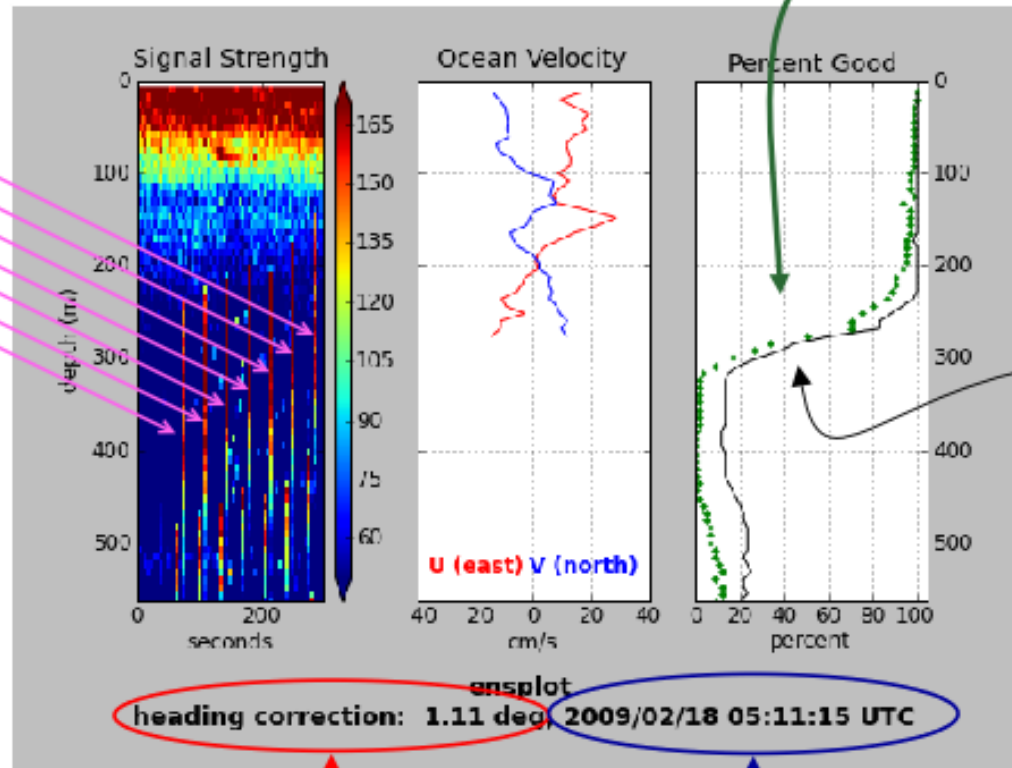
5-minute profile  
of each  
ADCP+Pingtype



# UHDAS average (5-minute) profile plot

Acoustic interference (edited out; decreases percent good)

percent good in this 5-minute average, after UHDAS editing



percent good before UHDAS editing

ansplot  
heading correction: 1.11 deg 2009/02/18 05:11:15 UTC

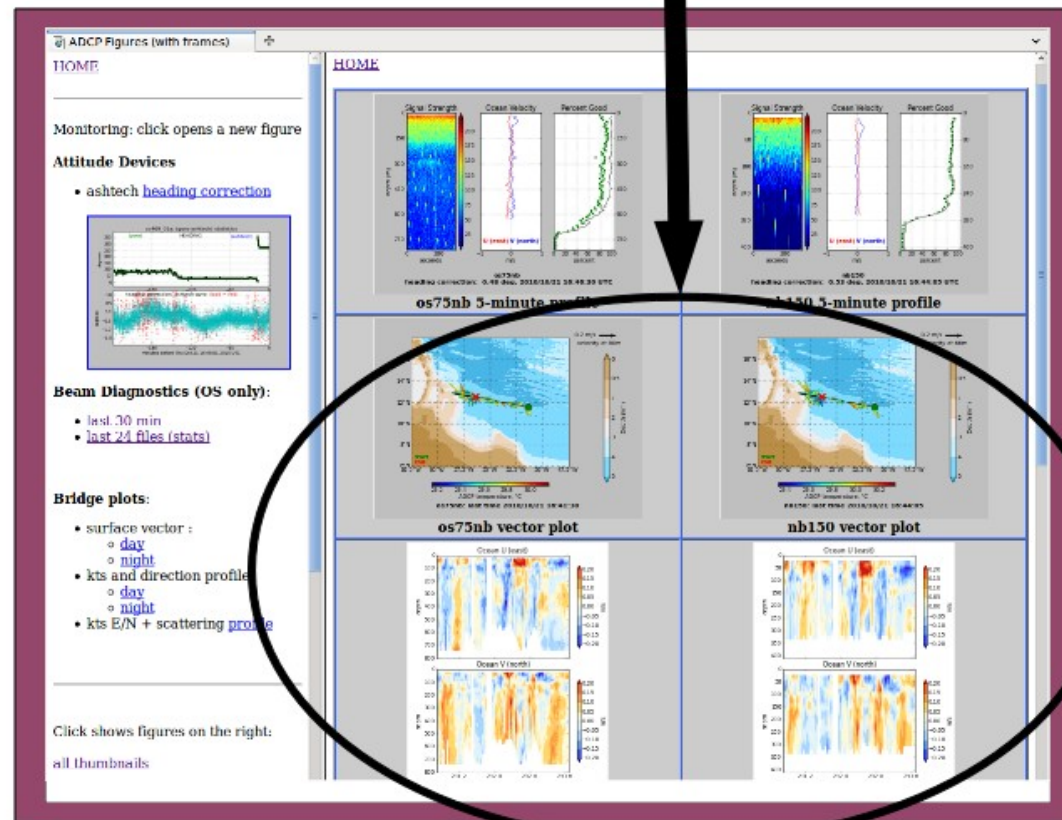
heading correction (ashtech - gyro)

UTC time of last sample



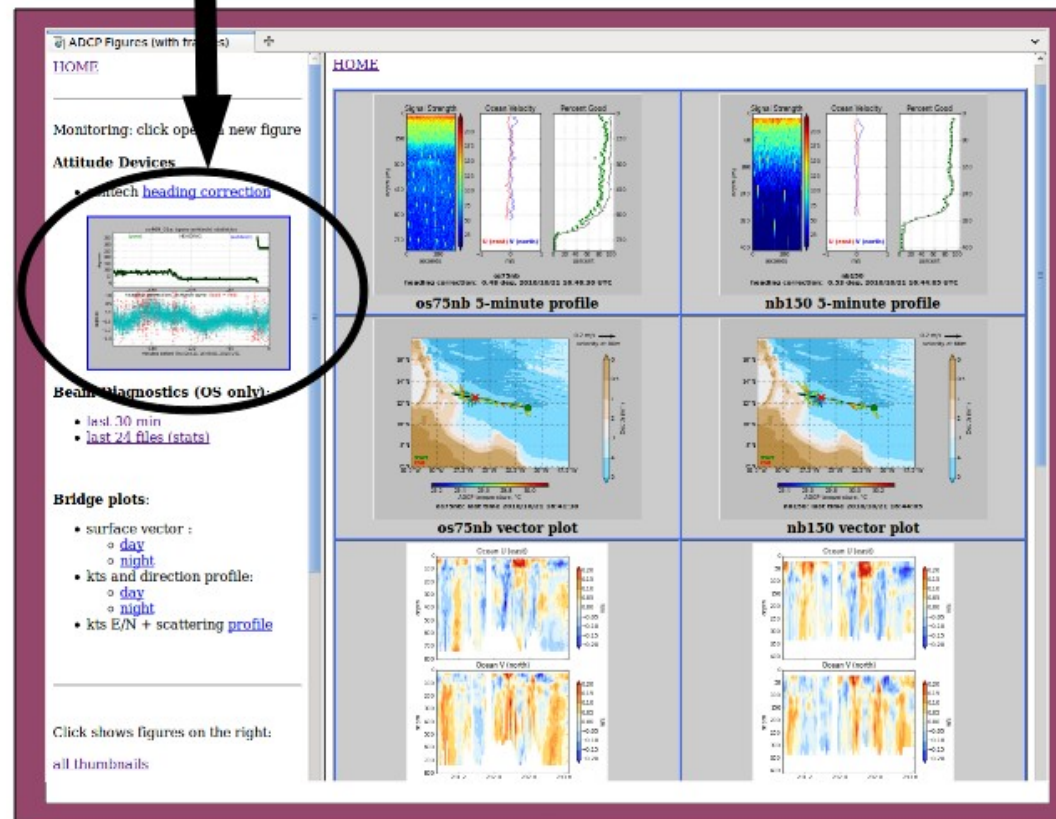
# Monitoring the 30-minute timer: Check: less than 1 hour old?

plot of last 3 days of data  
generated every 30 minutes  
one for each ADCP+Pingtype



# Monitoring the accurate heading device: Is it working?

Accurate but possibly intermittent attitude device: figure updates every 5 minutes.



# Part II: UHDAS

---

- UHDAS: What it does
  - at-sea “CODAS” processing
  - overview
- Operational Introduction
  - computer
  - UHDAS GUI
- **Monitoring**
  - at sea
  - on land
- What can be changed

# UHDAS: What it does

---

## Monitoring...

- **at sea:**
  - processing (web plots)
  - health of accurate heading device (web plots)
  - data acquisition (UHDAS tool)
- **from shore:**
  - sends daily email with attachment
  - diagnostic files
  - data snippet
  - shore-based figures generated from snippet

# UHDAS: Monitoring from shore

---

Link to on-shore monitoring: [UHDAS ships](#)

- daily email with attachment
- figures from data snippet (3 days)
- diagnostic files
  - 10 single pings from each instrument
  - calibration information
  - configuration files

[http://currents.soest.hawaii.edu/uhdas\\_fromships.html](http://currents.soest.hawaii.edu/uhdas_fromships.html)



Actual link

# UHDAS monitoring



screenshot

letters	ship name	figures	last email	cruise name	status	daily report	daily email
ae	Atlantic Explorer	<a href="#">figs</a>	9hr	AE1531_A	logging	<a href="#">dir</a>	<a href="#">email</a>
ar	Neil Armstrong	<a href="#">figs</a>	NA	NA	NA	<a href="#">dir</a>	<a href="#">email</a>
at	Atlantis	<a href="#">figs</a>	5d	(not set)		<a href="#">dir</a>	<a href="#">email</a>
en	Endeavor	<a href="#">figs</a>	9hr	SerialGearTest2	logging	<a href="#">dir</a>	<a href="#">email</a>
ex	Okeanos Explorer	<a href="#">figs</a>	73d	(not set)		<a href="#">dir</a>	<a href="#">email</a>
fh	Ferdinand Hassler	<a href="#">figs</a>	NA	NA	NA	<a href="#">dir</a>	<a href="#">email</a>
fk	Falkor	<a href="#">figs</a>	9hr	FK151121	logging	<a href="#">dir</a>	<a href="#">email</a>
gu	Gordon Gunter	<a href="#">figs</a>	NA	NA	NA	<a href="#">dir</a>	<a href="#">email</a>
hb	Henry Bigelow	<a href="#">figs</a>	NA	NA	NA	<a href="#">dir</a>	<a href="#">email</a>
hi	Hi`ialakai	<a href="#">figs</a>	9hr	(not set)		<a href="#">dir</a>	<a href="#">email</a>
hly	Healy	<a href="#">figs</a>	25d	(not set)		<a href="#">dir</a>	<a href="#">email</a>
kk	Ka`imikai O Kanaloa	<a href="#">figs</a>	9hr	Post_kok1516	logging	<a href="#">dir</a>	<a href="#">email</a>
km	Kilo Moana	<a href="#">figs</a>	9hr	km1520	logging	<a href="#">dir</a>	<a href="#">email</a>
lg	L.M.Gould	<a href="#">figs</a>	9hr	LMG1510	logging	<a href="#">dir</a>	<a href="#">email</a>
mgl	M.G.Langseth	<a href="#">figs</a>	301d	MGL1405	(not logging)	<a href="#">dir</a>	<a href="#">email</a>
nf	Nancy Foster	<a href="#">figs</a>	9hr	(not set)		<a href="#">dir</a>	<a href="#">email</a>
nh	New Horizon	<a href="#">figs</a>	223d	(not set)		<a href="#">dir</a>	<a href="#">email</a>
np	N.B.Palmer	<a href="#">figs</a>	9hr	nbp1511	logging	<a href="#">dir</a>	<a href="#">email</a>
oc	Oceanus	<a href="#">figs</a>	9hr	(not set)		<a href="#">dir</a>	<a href="#">email</a>
olr	Oleander	<a href="#">figs</a>	3d	(not set)		<a href="#">dir</a>	<a href="#">email</a>
pc	Pisces	<a href="#">figs</a>	NA	NA	NA	<a href="#">dir</a>	<a href="#">email</a>
pe	Pelican	<a href="#">figs</a>	9hr	PE16_Trimm	logging	<a href="#">dir</a>	<a href="#">email</a>
ps	Point Sur	<a href="#">figs</a>	8d	(not set)		<a href="#">dir</a>	<a href="#">email</a>
rb	Ron Brown	<a href="#">figs</a>	9hr	RB1507_TAO	logging	<a href="#">dir</a>	<a href="#">email</a>
rr	Roger Revelle	<a href="#">figs</a>	27d	(not set)		<a href="#">dir</a>	<a href="#">email</a>
se	Sette	<a href="#">figs</a>	61d	(not set)		<a href="#">dir</a>	<a href="#">email</a>
sh	Bell Shimada	<a href="#">figs</a>	9hr	(not set)		<a href="#">dir</a>	<a href="#">email</a>
skq	Sikuliaq	<a href="#">figs</a>	10d	(not set)		<a href="#">dir</a>	<a href="#">email</a>
sp	R.G.Sproul	<a href="#">figs</a>	6hr	SP1532	(not logging)	<a href="#">dir</a>	<a href="#">email</a>
tt	Thomas G. Thompson	<a href="#">figs</a>	9hr	TN334	logging	<a href="#">dir</a>	<a href="#">email</a>
ws	Walton Smith	<a href="#">figs</a>	9hr	(not set)		<a href="#">dir</a>	<a href="#">email</a>

# Monitoring: From Shore

---

- **from the text email:**
  - CODAS Processing
  - health of heading device (eg. Ashtech)
  - computer clock
  - Bottom track (on/off), ping rate (is it triggered?)
- **from the diagnostic files:**
  - data acquisition
  - processing
  - troubleshooting

# Monitoring: From Shore

---

- **from the text email:**
  - CODAS Processing
  - health of heading device (eg. Ashtech)
  - PC clock
  - Bottom track (on/off), ping rate (triggered)

Description follows...



**(1) Time**

2015/12/16 14:30:01

currents01en 3.13.0-24-generic

**(2) logging status**

Current cruise: SerialGearTest3      \*\* is logging \*\*

Database time ranges:

wh300 2015/12/15 20:43:14 to 2015/12/16 14:25:13 (4 min. ago)

**(3) position**

approximate lat, lon, depth: 41 35.22200 N 71 24.66500 W depth=4  
position from zmq

**(4) heading quality**

---- heading correction ----  
(heading correction from "ashpaq2")  
=====

----- ashpaq2 statistics -----  
=====

ashpaq2-gyro statistics (comment=rangeslice, dday)

ddrange: 348.8619676 to 349.6017593  
(2015/12/15 20:41:14 to 2015/12/16 14:26:32)  
all ashpaq2 messages: (99%) were good

(300sec) ensemble heading corrections:  
212 out of 213 (100%) were good  
statistics of good data:  
mean N = 297, stddev N = 18.8  
min = -0.47, max = 0.95  
mean = 0.27, stddev = 0.26

**(5) bottom track**

---bottom track status-----  
wh300: BT is off

**(6) timeserver**

remote	refid	st	t	when poll reach	delay	offset	jitter
192.168.1.2	.INIT.	16	u	- 1024	0	0.000	0.000

**(7) ping rate**

----- pings per ensemble -----  
wh300 recent ping statistics  
  
(2015/12/16 14:23:14) ens = 120 sec, 93 pings, (1.29 sec/ping)

2010/11/03 20:40:01

(1) Check the time of the email (this is UTC time)

This email was generated on the ship at 20:40 and mailed out shortly after that.

Expect: email is generated daily, sent shortly after creation

Indicator of a problem	How to proceed
email is over 24hrs old	check ship schedule: - are they in port for a long time? (computer may be off) - are they at sea? check with techs: is email and networking up?

2010/11/03 20:40:01  
currents 2.6.24-25-generic

Current cruise: TN256    \*\* is logging \*\*

Expect one of these

(1) \*\* is logging \*\*

(2) \*\* not logging \*\*

(3) no cruise set

serial acquisition is active

cruise started but not logging

no cruise set

Indicator of a problem

How to proceed

Current cruise: LMG1007    \*\* is logging \*\*  
DAS\_while\_logging.py is \*not\* running.

Tech at sea  
should:  
- stop logging  
- start logging  
- make sure  
  figures  
  start  
  updating

2010/11/03 20:40:01  
currents 2.6.24-25-generic

Current cruise: TN256    \*\* is logging \*\*

Database time ranges:

os75bb 2010/10/23 18:14:25 to 2010/11/03 20:17:14 (22 min. ago)

Expect: all database times should be under 30min old

Indicator of a problem	How to proceed
data are much older than 30min and <u>DAS_while_logging.log</u> is **not** running	Tech at sea should restart logging
data are much older than 30 min and no other clue is given	look in daily_report directory for clues;

# Cruise status: when to be worried

2015/12/15 14:30:01  
currents1673 3.13.0-32-generic

no cruise set ←

approximate lat, lon, depth: 44 37.58190 N 124 2.83080 W depth=-2  
position from zmq

**No active cruise**  
**Position from zmq**

2015/12/15 14:30:02  
currents01en 3.13.0-24-generic

Current cruise: SerialGearTest2 ← **\*\* is logging \*\***

Database time ranges:

wh300 2015/12/14 18:05:21 to 2015/12/15 14:17:21 (12 min. ago)

approximate lat, lon, depth: 41 35.22500 N 71 24.66300 W depth=4  
position from zmq

**Active cruise**  
**Position from zmq**  
**Recent database**

2015/12/15 14:30:01  
currents 3.13.0-24-generic

Current cruise: Post\_kok1516 ← **\*\* is logging \*\***

Database time ranges:

wh300 2015/12/11 19:46:24 to 2015/12/11 23:54:24 (5195 min. ago)

approximate lat, lon, depth: 21 18.97391 N 157 53.17322 W depth=-2  
position from zmq

**Active cruise**  
**Position from zmq**  
**OLD database**

```
2010/11/03 20:40:01
currents 2.6.24-25-generic
```

```
Current cruise: TN256    ** is logging **
```

```
Database time ranges:
```

```
    os75bb 2010/10/23  18:14:25 to 2010/11/03  20:17:14  (22 min. ago)
```

```
---- heading correction ----
```

```
(heading correction from "posmv")
```

```
----- posmv -----
```

```
posmv_gyrodh.asc
```

```
ddrange: 305.8656494 to 306.8552328
```

```
(2010/11/02 20:46:32 to 2010/11/03 20:31:32)
```

```
number of good points: 286 out of 286 (100%)
```

```
heading correction statistics:
```

```
min dh = -2.17,  max dh = -0.41
```

```
mean dh  = -1.14
```

```
stddev dh = 0.08
```

Check the percentage of good points.  
If less than 80, tech at sea should check the device



```

2010/11/03 20:40:01
currents 2.6.24-25-generic

Current cruise: TN256    ** is logging **
Database time ranges:
    os75bb 2010/10/23  18:14:25 to 2010/11/03  20:17:14  (22 min. ago)

---- heading correction ----
(heading correction from "posmv")
----- posmv -----
posmv_gyrodh.asc

ddrange: 305.8656494 to 306.8552328
(2010/11/02 20:46:32 to 2010/11/03 20:31:32)

number of good points: 286 out of 286 (100%)
heading correction statistics:
min dh = -2.17, max dh = -0.41
mean dh = -1.14
stddev dh = 0.08

----- uptime -----
20:40:02 up 184 days, 22:13,  3 users,  load average: 0.03, 0.22, 0.24
----- ntpq -p -----
      remote           refid       st t when poll reach  delay  offset  jitter
=====
*ntpserver.thomp .GPS.           1 u  862 1024  377   0.427  -2.542  2.255

```

Expect

- (1) floating point numbers
- (2) ntp not active

Problem: if numbers are all 0.000

```

2010/11/03 20:40:01
currents 2.6.24-25-generic

Current cruise: TN256    ** is logging **
Database time ranges:
    os75bb 2010/10/23  18:14:25 to 2010/11/03  20:17:14  (22 min. ago)

---- heading correction ----
(heading correction from "posmv")
----- posmv -----
posmv_gyrodh.asc

ddrange: 305.8656494 to 306.8552328
(2010/11/02 20:46:32 to 2010/11/03 20:31:32)

number of good points: 286 out of 286 (100%)
heading correction statistics:
min dh = -2.17, max dh = -0.41
mean dh = -1.14
stddev dh = 0.08

----- uptime -----
20:40:02 up 184 days, 22:13, 3 users, load average: 0.03, 0.22, 0.24
----- ntpq -p -----
      remote          refid      st t when poll reach  delay  offset jitter
=====
*ntpserver.thomp .GPS.          1 u 862 1024 377   0.427  -2.542  2.255
-----

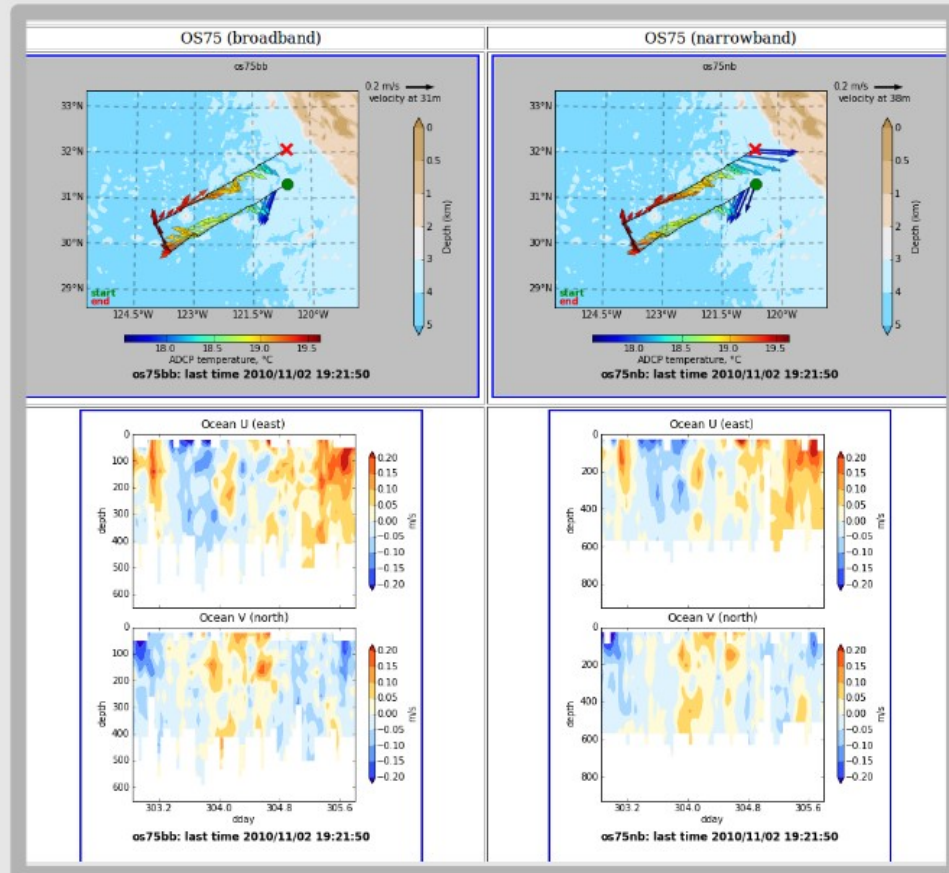
```

figures are at [http://currents.soest.hawaii.edu/uhdas\\_fromships/thompson/figs/](http://currents.soest.hawaii.edu/uhdas_fromships/thompson/figs/)

check the figures in the link



# Steps to check daily email:



## Observations:

- (1) two ping types (OS75 interleaved mode)
- (2) data from different types are consistent
- (3) data are physically reasonable
  - no big gaps
  - no big outliers
  - no deep strong currents
  - depth ranges are reasonable

Check: (text email)

BOTTOM TRACK should be **OFF**

# Monitoring: From Shore

---

- **from the diagnostic files:**

- **“tails.txt”**

- data acquisition
- processing
- troubleshooting

- **“cals.txt”**

- calibration

# Diagnostics reminder: UHDAS cruise directory structure

Data for scientists:

There are three categories of data, all located in the logging directory, `/home/data/[CRUISEID]`:  
ADCP logging directories

<b>subdirectory</b>	<b>contents</b>	<b>importance</b>	<b>back up for...</b>
<b>raw</b>	all raw data	critical	<ul style="list-style-type: none"><li>◦ archiving</li><li>◦ scientists who ask for it</li></ul>
<b>rbin</b>	intermediate files	nice to have	anyone who gets <b>raw</b>
<b>gbin</b>	intermediate files	nice to have	anyone who gets <b>raw</b>
<b>proc</b>	<ul style="list-style-type: none"><li>◦ final processing</li><li>◦ codas database</li><li>◦ underway figure archive</li><li>◦ matlab files</li></ul>	final product	science CDs after cruise

File **tails.txt** shows recent contents of raw, rbin, gbin

# UHDAS diagnostic file: **tails.txt**

---

- last 12 lines of each NMEA (or log) file
- last 12 raw files (each kind)
- last 12 rbin files (each kind)
- last 12 gbin files (each kind)

# Example using tails.txt

---

## Email shows a problem:

(1) cruise is named

(2) UHDAS is logging

(3) **database is old!**

---

```
2015/12/15 14:30:01
currents 3.13.0-24-generic
```

```
Current cruise: Post_kok1516
```

```
** is logging **
```

```
Database time ranges:
```

```
wh300 2015/12/11 19:46:24 to 2015/12/11 23:54:24 (5195 min. ago)
```

```
approximate lat, lon, depth: 21 18.97391 N 157 53.17322 W depth=-2
position from zmq
```

# Example using tails.txt

---



## Follow the link in the email:

```
----- uptime -----  
14:30:02 up 7 days, 20:10, 1 user, load average: 0.14, 0.13, 0.14  
=====
```

figures: [http://currents.soest.hawaii.edu/uhdas\\_fromships/kok/figs/](http://currents.soest.hawaii.edu/uhdas_fromships/kok/figs/)  
daily report: [http://currents.soest.hawaii.edu/uhdas\\_fromships/kok/daily\\_report/](http://currents.soest.hawaii.edu/uhdas_fromships/kok/daily_report/)

Click  
Opens directory  
Click on **tails.txt**



 <a href="#">sonar_summary.txt</a>	2015-12-15 04:30	154
 <a href="#">status_str.txt</a>	2015-12-15 04:30	2.8K
 <a href="#">stderr.txt</a>	2015-12-15 04:30	1.5K
 <a href="#">tails.txt</a>	2015-12-15 04:30	14K
 <a href="#">wh300_pingstats.txt</a>	2015-12-15 04:18	797
 <a href="#">wh300_tsstats.txt</a>	2015-12-15 04:18	368
 <a href="#">zmq_tails.txt</a>	2015-12-15 04:30	2.0K

# Example using tails.txt

---

\$UNIXD timestamp does not match:  
The GPS used for processing is out of date

----- gpsnav2: -----

```
$UNIXD,348.6041314,7.8406799  
$GPGGA,142605,2118.969,N,15753.174,W,1,9,1.7,27,M,,M,,*55  
$UNIXD,348.6041546,7.8407031  
$GPGGA,142607,2118.969,N,15753.174,W,1,9,1.7,27,M,,M,,*57  
$UNIXD,348.6041777,7.8407262  
$GPGGA,142609,2118.968,N,15753.173,W,1,9,1.7,27,M,,M,,*5F  
$UNIXD,348.6042009,7.8407494
```

This is new  
348.60....

----- gpsnav: -----

```
$UNIXD,344.9779365,4.2144850  
$GPGGA,232426.00,2118.97390478,N,15753.17321184,W,2,08,1.7,26.076,M,4.715,M,4.0,0138*59  
$UNIXD,344.9779596,4.2145081  
$GPGGA,232428.00,2118.97390454,N,15753.17321153,W,2,08,1.7,26.075,M,4.715,M,6.0,0138*52  
$UNIXD,344.9779712,4.2145197  
$GPGGA,232429.00,2118.97390442,N,15753.17321137,W,2,08,1.7,26.074,M,4.715,M,7.0,0138*56
```

This is old:  
344.977....

# Example using tails.txt

---

Serial feed “gpsnav” failed 4 days ago (!).

- Restore it; perhaps start a new cruise segment.
- Keep a close eye out when the next email comes.

----- gpsnav2: -----

```
-rw-r--r-- 1 adcp efiring 315903 Dec 14 17:59 kk2015_347_57600.gps
-rw-r--r-- 1 adcp efiring 315959 Dec 14 19:59 kk2015_347_64800.gps
-rw-r--r-- 1 adcp efiring 316409 Dec 14 21:59 kk2015_347_72000.gps
-rw-r--r-- 1 adcp efiring 315415 Dec 14 23:59 kk2015_347_79200.gps
-rw-r--r-- 1 adcp efiring 315952 Dec 15 01:59 kk2015_348_00000.gps
-rw-r--r-- 1 adcp efiring 313793 Dec 15 03:59 kk2015_348_07200.gps
-rw-r--r-- 1 adcp efiring 314772 Dec 15 05:59 kk2015_348_14400.gps
-rw-r--r-- 1 adcp efiring 314820 Dec 15 07:59 kk2015_348_21600.gps
-rw-r--r-- 1 adcp efiring 315258 Dec 15 09:59 kk2015_348_28800.gps
-rw-r--r-- 1 adcp efiring 313243 Dec 15 11:59 kk2015_348_36000.gps
-rw-r--r-- 1 adcp efiring 314837 Dec 15 13:59 kk2015_348_43200.gps
-rw-r--r-- 1 adcp efiring 79531 Dec 15 14:30 kk2015_348_50400.gps
```

Last file

Dec 15 14:40

----- gpsnav: -----

```
-rw-r--r-- 1 adcp efiring 82836 Dec 11 19:59 kk2015_344_71290.gps
-rw-r--r-- 1 adcp efiring 755865 Dec 11 21:59 kk2015_344_72000.gps
-rw-r--r-- 1 adcp efiring 514569 Dec 11 23:28 kk2015_344_79200.gps
```

Last file

Dec 11 23:28

----- mahrs: -----

```
-rw-r--r-- 1 adcp efiring 314562 Dec 14 17:59 kk2015_347_57600.tss
-rw-r--r-- 1 adcp efiring 314665 Dec 14 19:59 kk2015_347_64800.tss
-rw-r--r-- 1 adcp efiring 314665 Dec 14 21:59 kk2015_347_72000.tss
```



# Transducer alignment

---

- Transducer angle is used in two places
  - processing angle: “**h\_align**” in **proc\_cfg.py**
  - EA command in “**sensor\_cfg.py**” (Ocean Surveyor)
- Processing angle should be within 0.1deg relative to accurate heading device (POS MV)
- BUILD IN TIME after a new install or re-install
- Procedure is documented ([here](#)), but  
**Consult UH personnel first!!**

## Good ADCP Calibration numbers

UHDAS  
diagnostic file:  
**cals.txt**

keep an eye  
on calibration

2010/11/05 20:40:02

----- BOTTOM TRACK -----

unedited: 310 points

edited: 214 points, 2.0 min speed, 2.5 max dev

	median	mean	std
amplitude	1.0020	1.0033	0.0118
phase	0.0358	0.0679	0.3278

----- WATER TRACK -----

Number of edited points: 85 out of 90

	median	mean	std
amplitude	0.9990	1.0004	0.0116
phase	-0.0200	-0.0989	0.7160

Phase (angle misalignment)  
should be between  
-0.5 and +0.5 degrees

# Part II: UHDAS

---

- UHDAS: What it does
  - at-sea “CODAS” processing
  - overview
- Operational Introduction
  - computer
  - UHDAS GUI
- Monitoring
  - at sea
  - on land
- What can be changed

# UHDAS: what can be changed (not much, and only with care)

with the UHDAS tool:

- bb, nb mode (OS75, OS150)

- bottom tracking on/off

- bin size, number of bins

If using smaller bin size  
don't forget to increase  
the number of bins  
(to keep the range the same)

if required (carefully edit `sensor_cfg.py`)

- serial port, baud rate

# UHDAS: behind the scenes

---

## Consult UH personnel first!!

- If required, changes might be made to **sensor\_cfg.py**
  - serial port, baud rate
  - new serial feed
  - temporarily disable one ADCP
- **proc\_cfg.py**
  - change transducer angle
  - add a different heading device

# UHDAS: what they'll ask for

“It's up to you but I don't recommend it”

- smaller bins than the default
- bottom tracking on
  - Does not solve anything
  - Most useful for troubleshooting

# UHDAS: what they'll ask for


“I think the answer is 'no' but ask Toby/Jules”

- more rapid updating of the database
- finer grain than 5min averages

The answer is '**no**', in order to preserve the reliability of the UHDAS installation

# Configuration Files (expert)

---

- **proc\_cfg.py**
    - transducer angle
    - GPS-ADCP offset
    - specify serial inputs (position, heading, accurate heading) used for transformations
  - **uhdas\_cfg.py**
    - averaging interval
    - timers (5min, 30min)
    - bin range for bridge plots and vector plot
    - email
  - **sensor\_cfg.py**
    - serial setup: ports, baud rates, messages
    - speedlog configuration
    - zmq publisher
- calibration after (new) or re-install of ADCP
  - requires some bottom track or some reciprocal tracks
- 



# NOAA 2015 ADCP

---

Part I: ADCP...

Part II: UHDAS...

Part III: Signatures of problems:

- (1) ADCP systems (components)
- (2) Data flow (where is the problem)
- (3) Ocean Velocity signatures

# (III) ADCP System: what can go wrong

---

Viewed from the Perspective of:

- ADCP systems (components)
  - Computer
  - ADCP
  - Ancillary: GPS, Heading
- Data flow (where does the problem occur)
- Manifestation in ocean velocities – examples
  - Cross-track error (transducer angle)
  - Along-track error (scale factor)
  - Transition/maneuvering errors (lags in time or space)
  - depth-dependent bias (electrical noise)
  - surface bias (ringing)

# (III) ADCP System: what can go wrong

---

Viewed from the Perspective of:

- ADCP systems (components)
  - Computer
  - ADCP
  - Ancillary: GPS, Heading
- Data flow (where does the problem occur)
- Manifestation in ocean velocities – examples
  - Cross-track error (transducer angle)
  - Along-track error (scale factor)
  - Transition/maneuvering errors (lags in time or space)
  - depth-dependent bias (electrical noise)
  - surface bias (ringing)

# What can go wrong: system=acquisition

---

- PC clock is erratic
  - PC clock is set to local time
  - Poor quality serial feed
    - Too many messages
    - Low baud rate
    - Multiple unbuffered devices
- Partial loss,  
Garbled messages**
- 

## Solution: FIX IT

- Clock set to UTC, do not use bad timeserver
- **ONLY** send serial data from the original instrument

## Compromised serial data

- multiple feeds
- messages with no checksum
- low baud rate
- coming from a computer (SCS)

```
$GTG,A,054,35,27209.679,N7.5500.C  
8,01HDT,354.5,-2.4,M8685.4,8507.0,03,W*6D  
$GPM,0,356,13358,M  
$H.4,N,3543,K*  
$  
$GPG,3505453572727..5,5,N,.6,00.45  
$GW,2,,0501.0,272$PADCP,4910,20110507,054659.19,70.00  
5,M,94,.4,M,00.0,01,W,65  
,01HDT,354.3,-2  
$GPM,0,355,13358,M  
$H.3,N,3542,K*  
$  
$GPG,3505453582727..4,1,N,.5,00.45  
$GW,2,,0501.0,2726,M,20,.4,M,00.0,01,W,64  
,01HDT,354,M,T  
$GPVTG,354,T,356,M,09.3,N,17.2,KT
```

Partial \$GPGGA position messages

Partial \$HEHDT heading messages

## Serial Data Logging Rules

---

(1) DO NOT

push multiple sources into one port  
use long RS232 cables  
send too many extra messages

(2) DO

get data directly from the instrument  
- NOT a computer-generated message  
- NOT a switched feed (eg. Various GPS)

(3) IF POSSIBLE

avoid unnecessarily high repetition rate  
choose a higher baud rate  
use feeds with a checksum

3022.078N ?  
08833.792W ?  
014.7 ?

**BAD**

Checksum: helps Q/C

\$GPVTG,082,T,084,M,00.1,N,00.1,K\*48

# What can go wrong: system=ADCP

---

- ADCP loss or degradation
  - Loss of range (loud while underway, weak beam)
  - Loss of one beam (not good)
  - Loss of multiple beams (repair/replace)
  - Acoustic interference (another pinger)
  - Triggering (reduced ping rate, damage to pings)
  - Ice
  - Bubbles
  - Electrical noise

multiple examples  
of problematic data  
([link](#)) ←

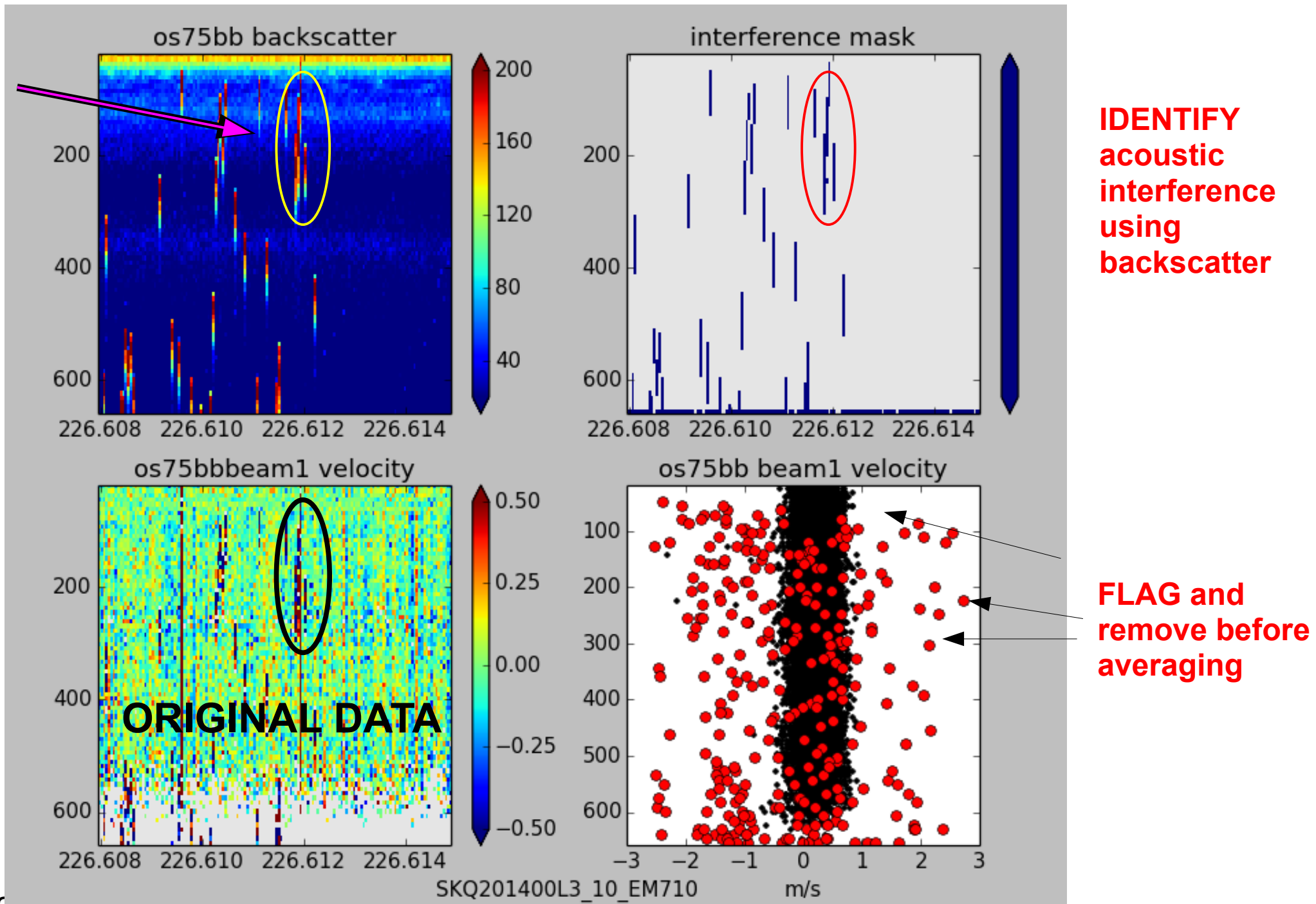
# What can go wrong: system=ADCP

---

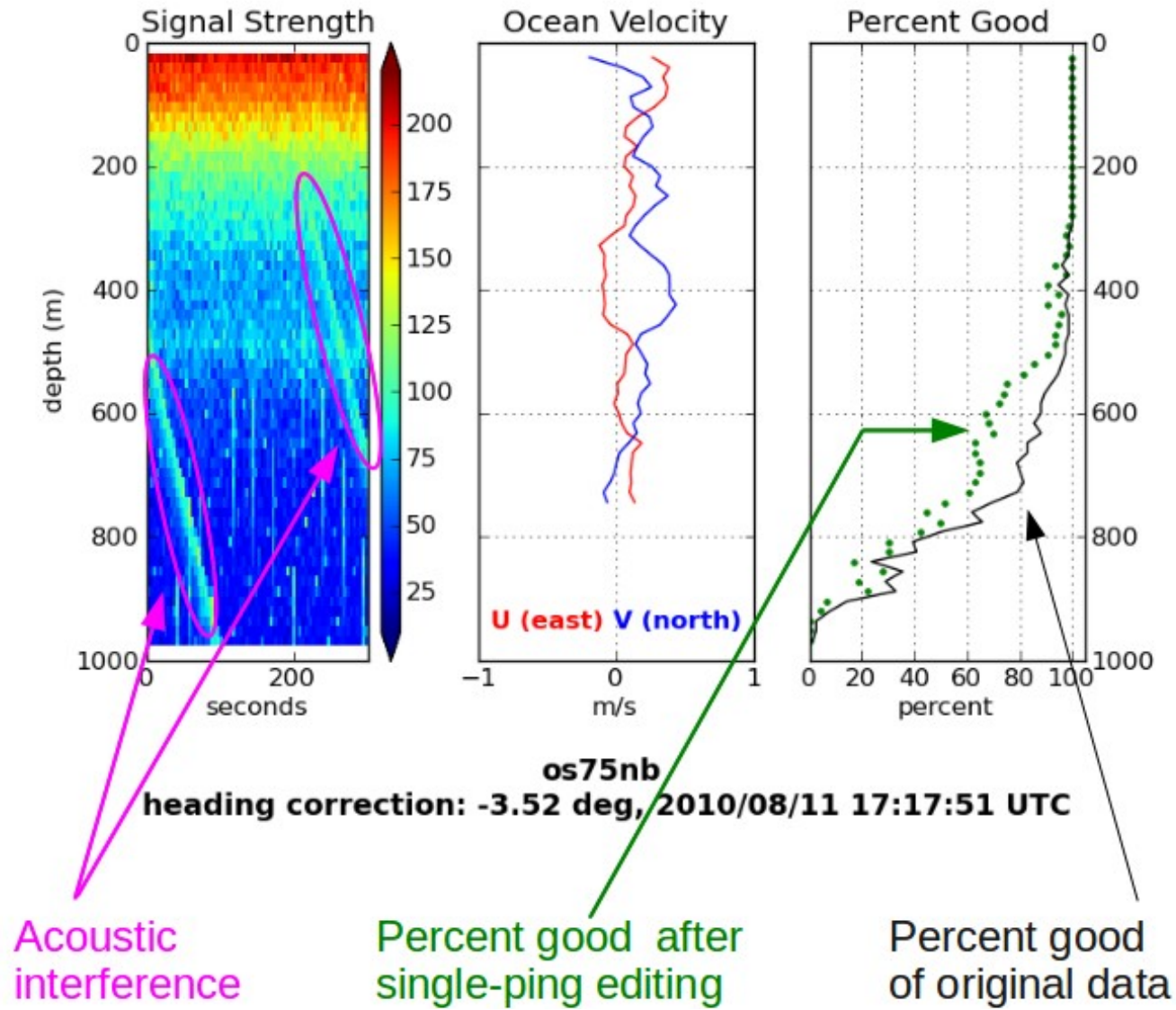
- ADCP loss or degradation
  - Loss of range (loud while underway, weak beam)
  - Loss of one beam (not good)
  - Loss of multiple beams (repair/replace)
  - Acoustic interference (another pinger)
  - Triggering (reduced ping rate, damage to pings)
  - Ice
  - Bubbles
  - Electrical noise



# Acoustic interference (single-ping editing)



# Acoustic interference after editing



# What can go wrong: system=ADCP

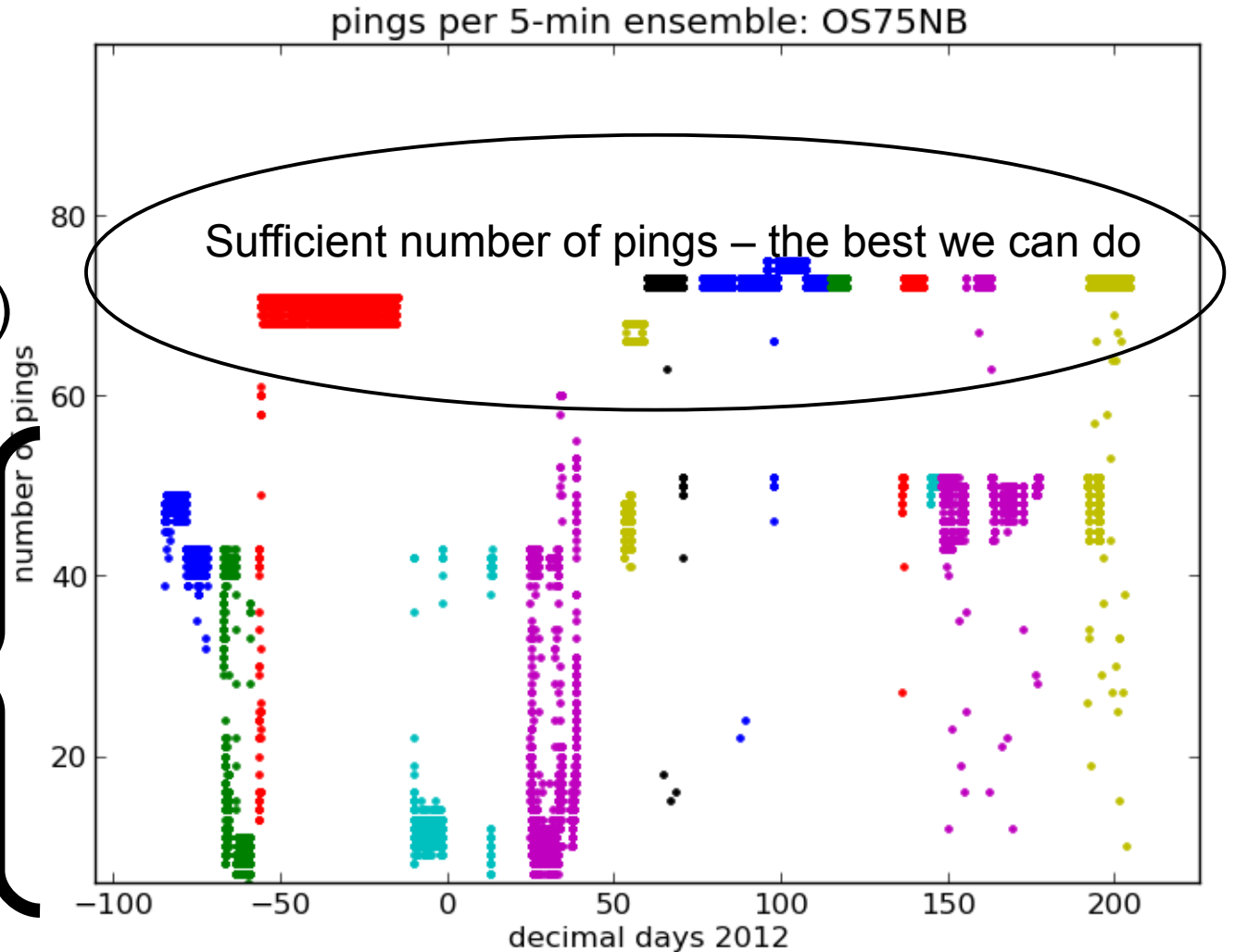
---

- ADCP loss or degradation
  - Loss of range (loud while underway, weak beam)
  - Loss of one beam (not good)
  - Loss of multiple beams (repair/replace)
  - Acoustic interference (another pinger)
  - Triggering (reduced ping rate, damage to pings)
  - Ice
  - Bubbles
  - Electrical noise

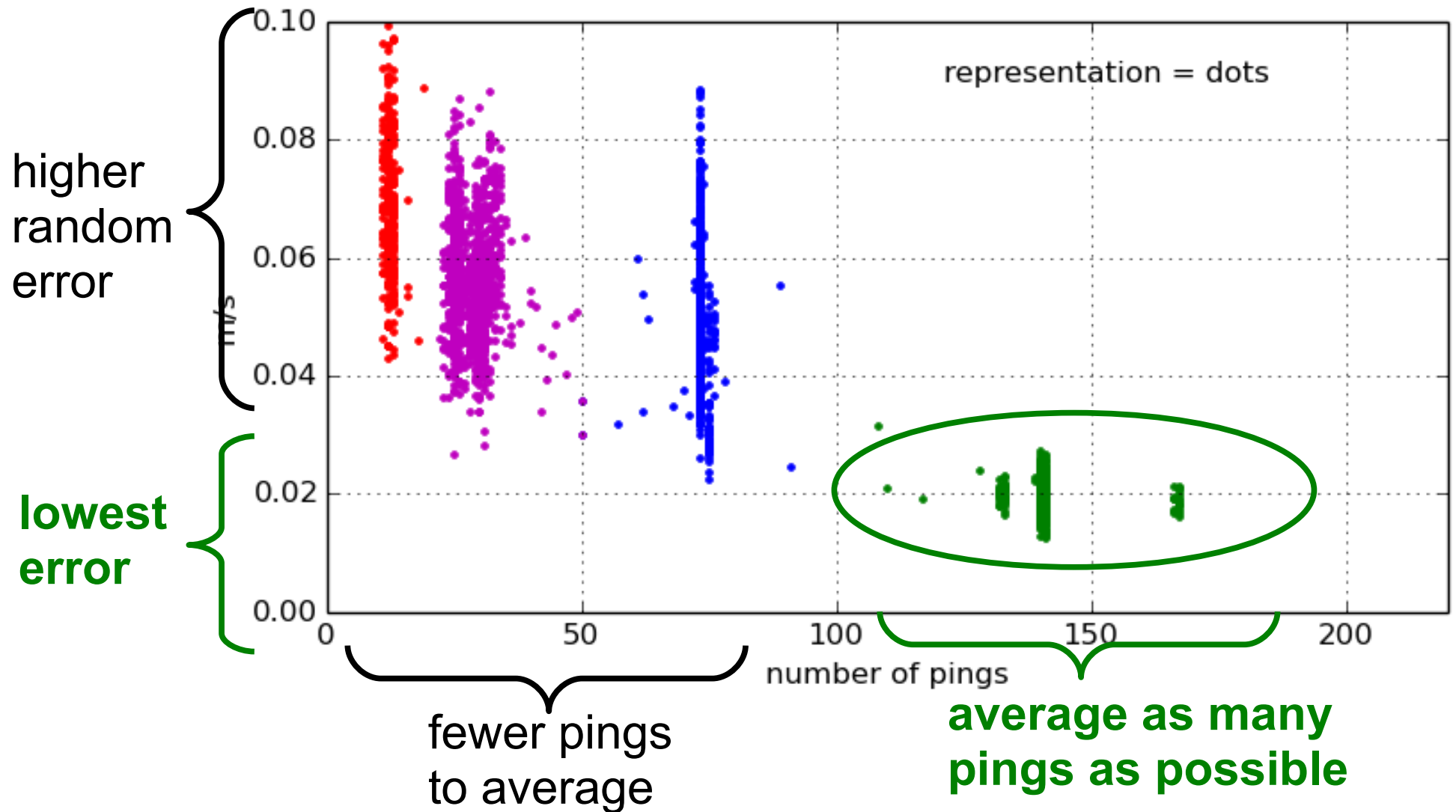
# Triggering: reduced ping rate

- 300-sec averages
- 2-second ping rate
- interleaved (BB+NB)
- expecting 70 pings

REDUCED number  
of pings due to  
triggering

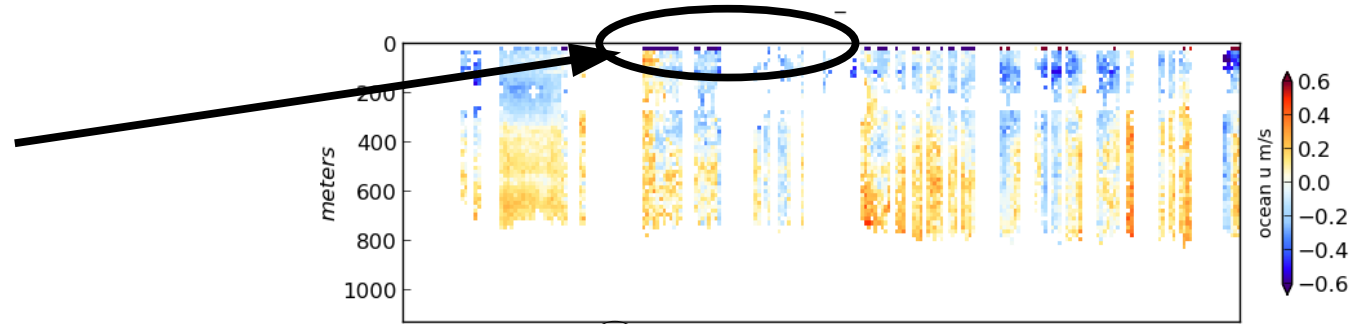


# Triggering: reduced ping rate (increased errors)

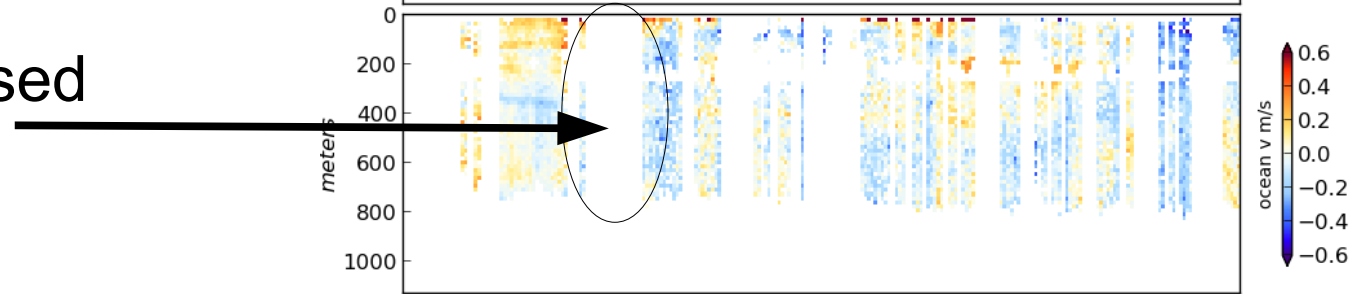


# Triggering: damage to pings

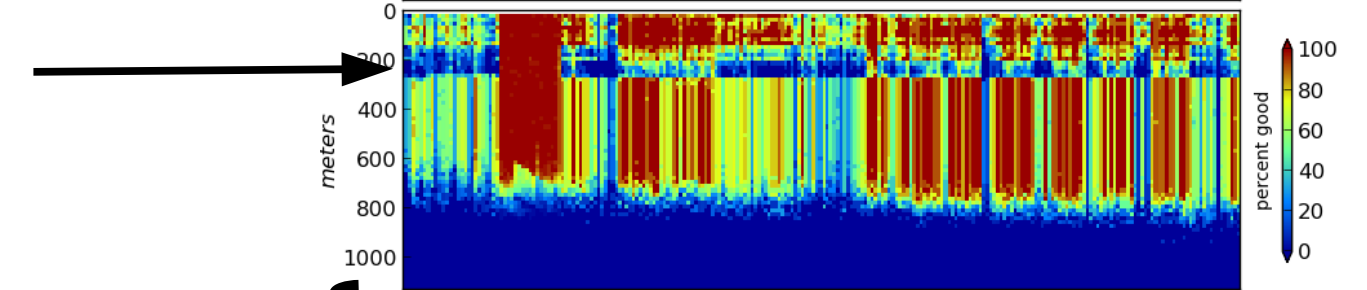
- bias in top bin(s)



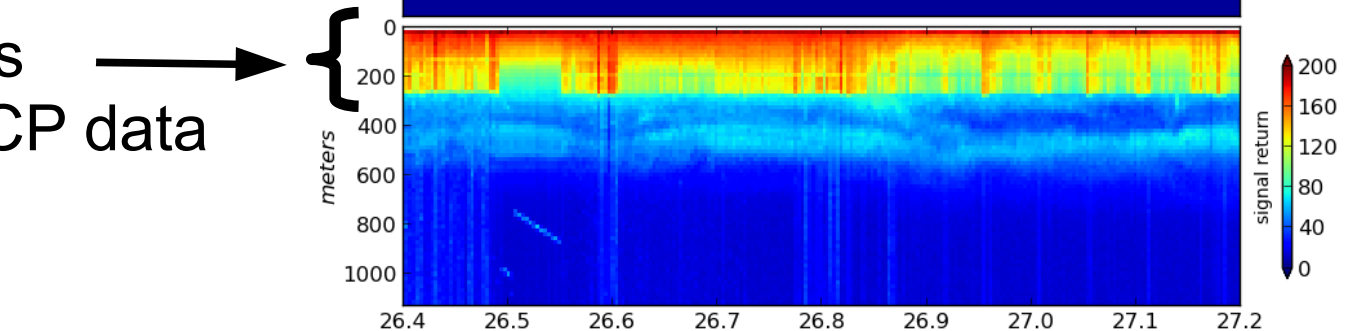
- gaps due to decreased ping rate



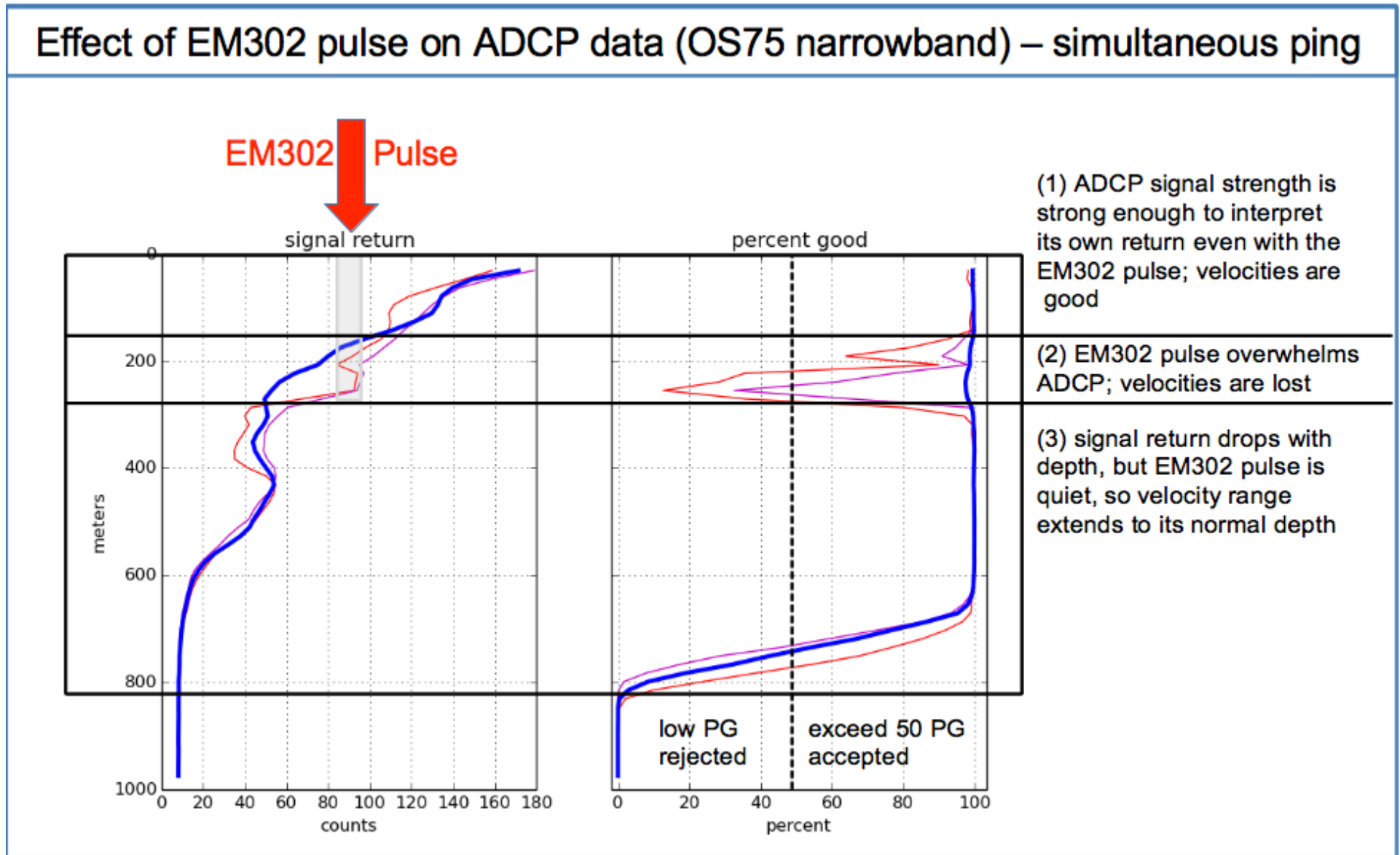
- Scarring where the master's pulse kills the ADCP signal



- Long pulse damages the top 250m of ADCP data



# Triggering: damage to data



# What can go wrong: system=ancillary

- Heading
  - Heading device fails
  - Inaccurate heading device (old mechanical gyro)
- Position
  - Position device fails; gappy
- Any: serial feed problems
  - Cable falls out
  - Instrument fails



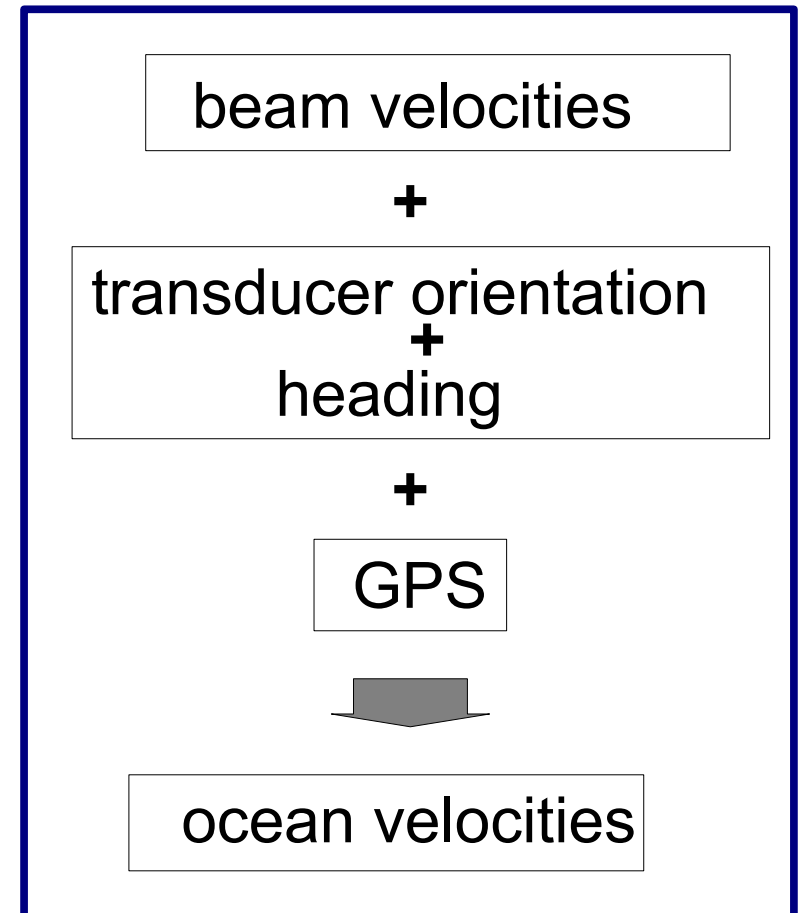
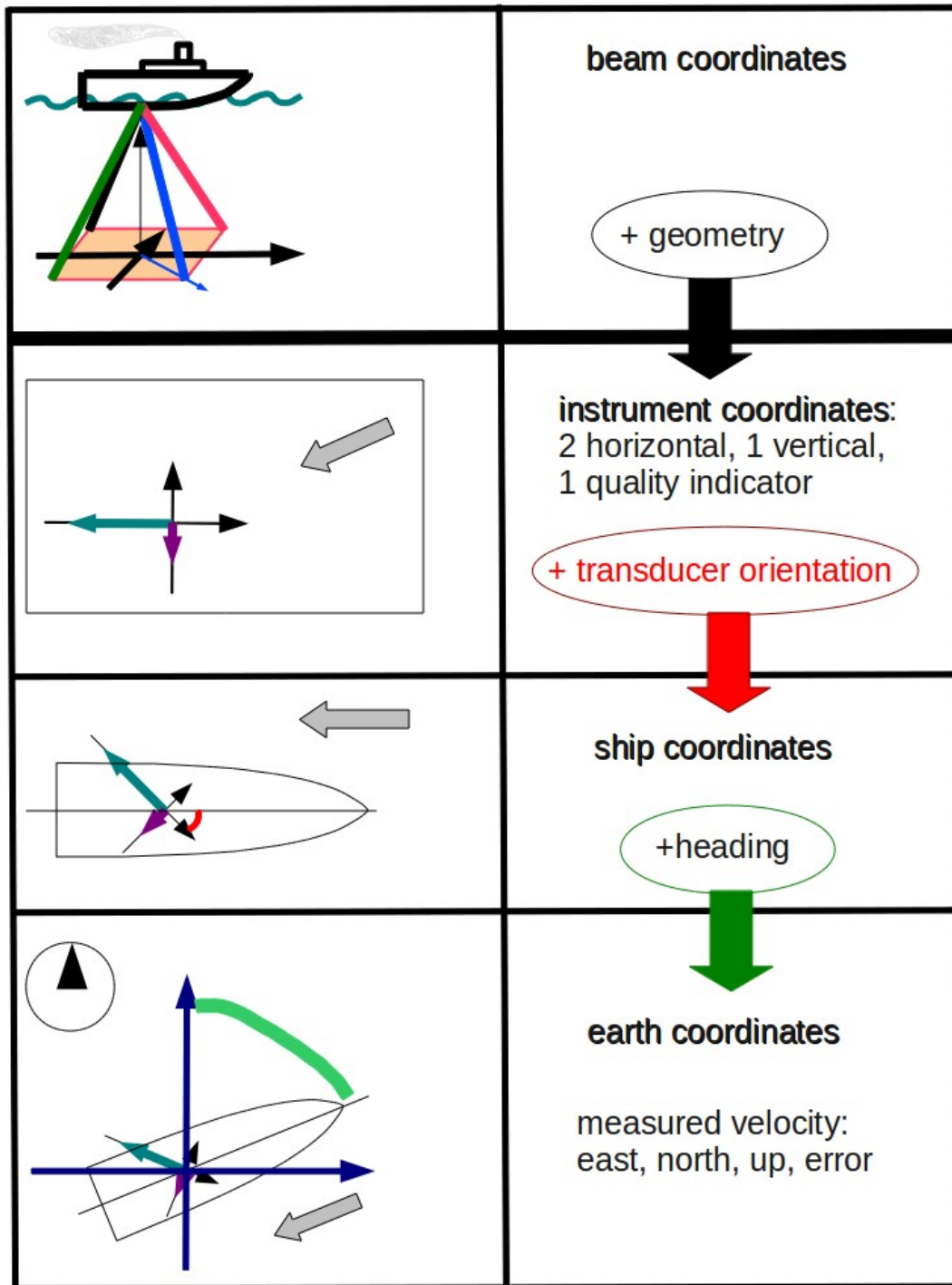
# ADCP: what can go wrong

---

## Viewed from the Perspective of:

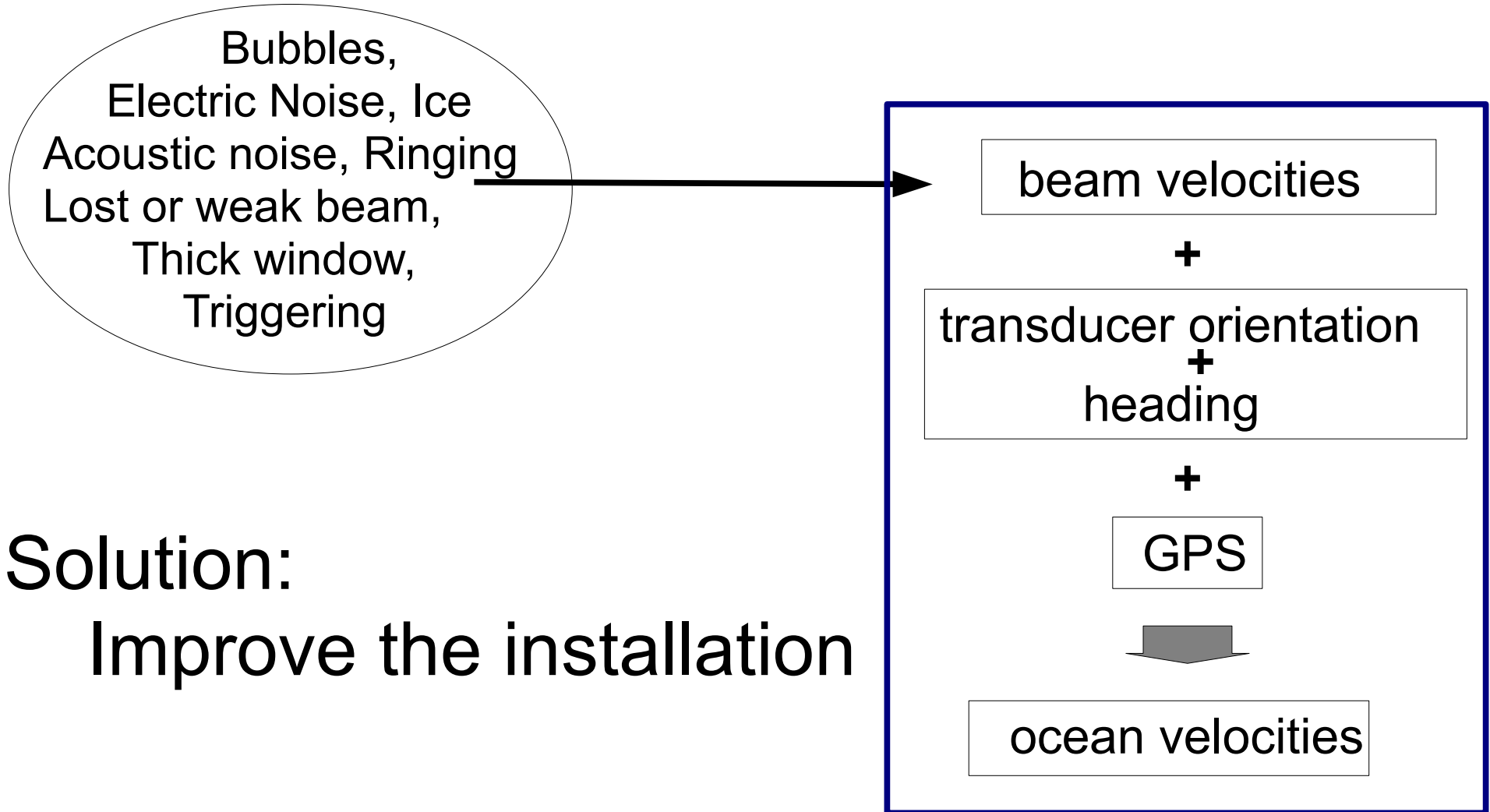
- ADCP systems (components)
  - Computer
  - ADCP
  - Ancillary: GPS, Heading
- Data flow (where does the problem occur)
- Manifestation in ocean velocities – examples
  - Cross-track error (transducer angle)
  - Along-track error (scale factor)
  - Transition/maneuvering errors (lags in time or space)
  - depth-dependent bias (electrical noise)
  - surface bias (ringing)

# ADCP: Getting Ocean Currents



# ADCP: data loss, degradation degraded range and coverage....

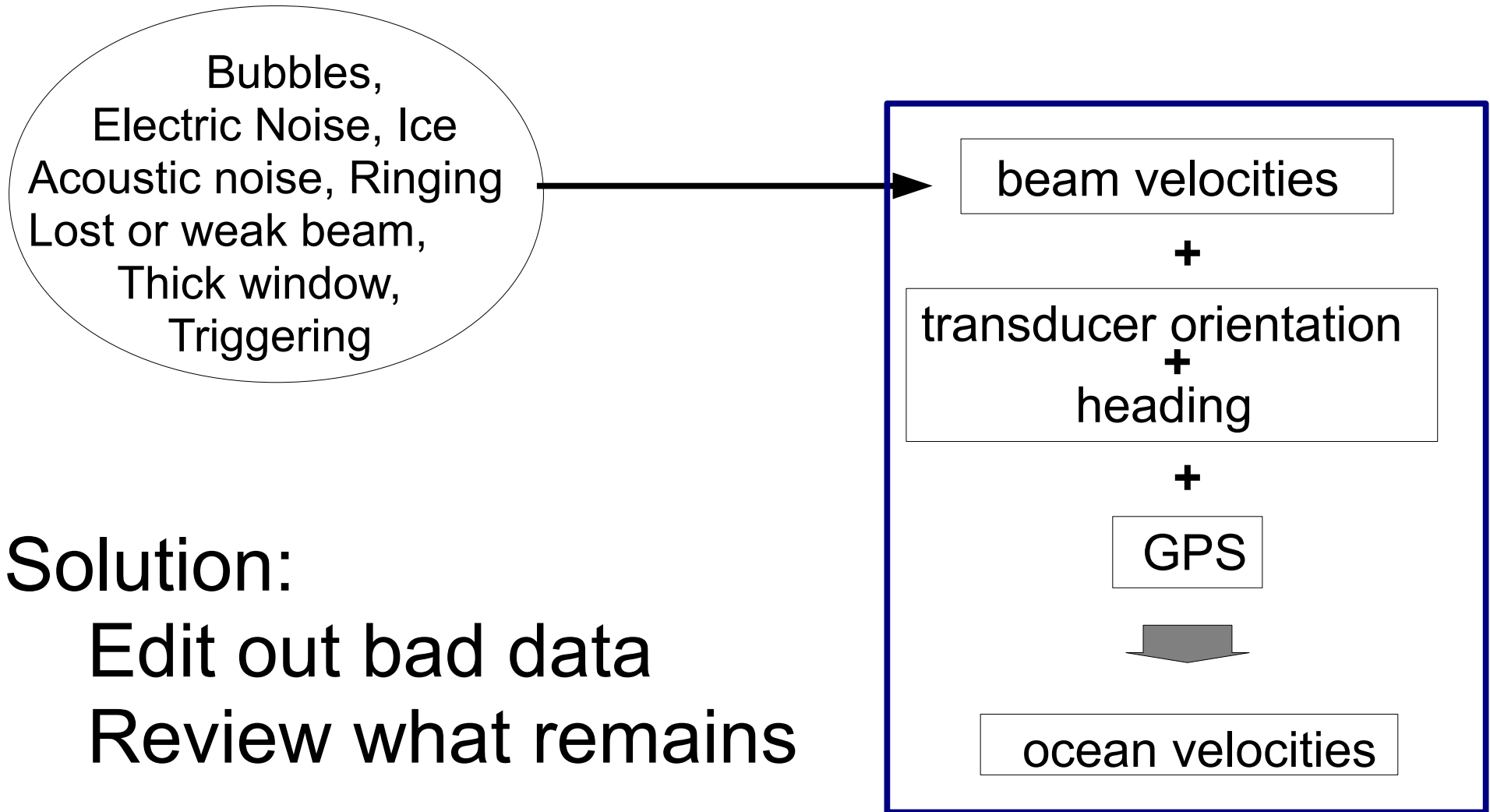
---



# ADCP: data loss, degradation

.... remaining data compromised

---



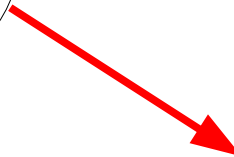
# Transducer misalignment angle off by <10deg ....

---

1deg error in heading

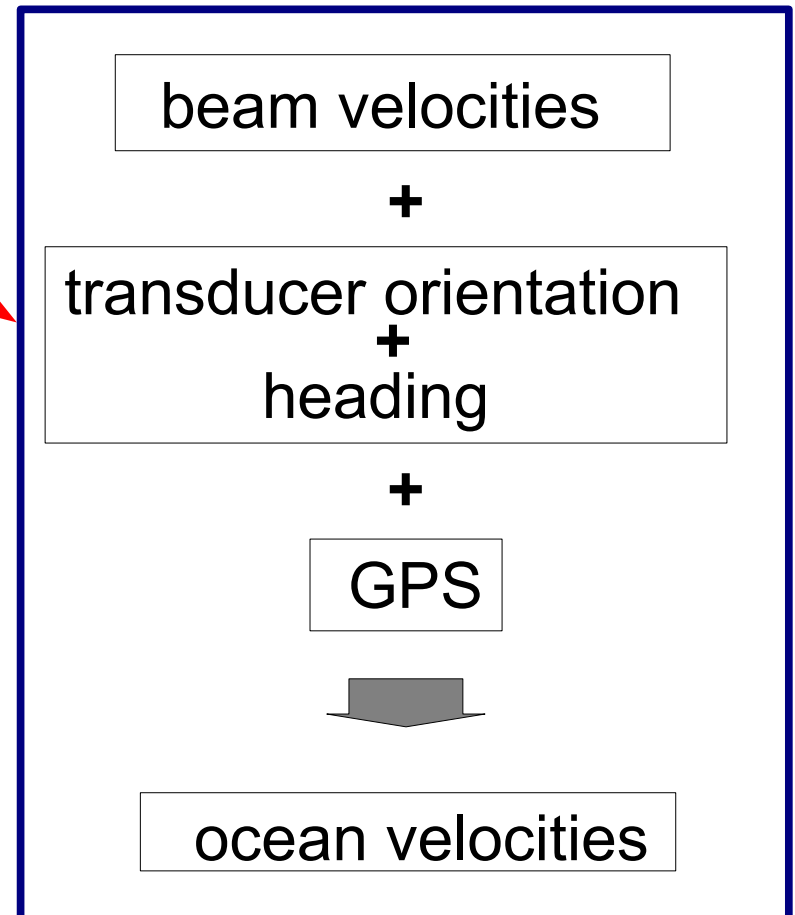


10cm/s error in ocean velocity



**Diagnostic:**

Cross-track error looks  
different on-station vs/  
underway

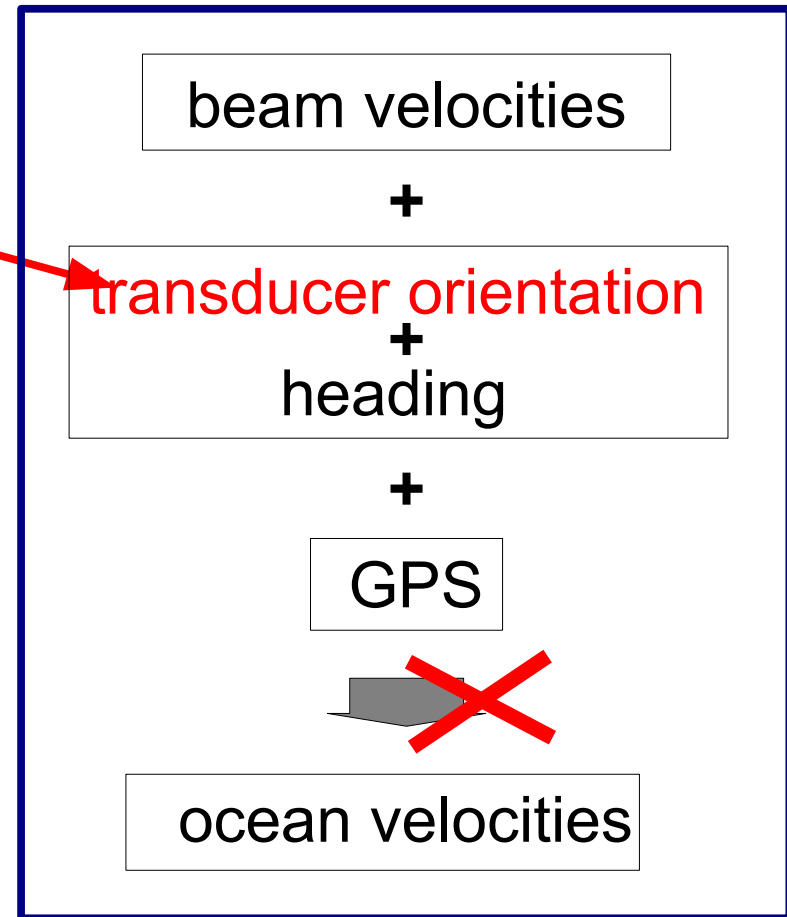


# Transducer misalignment

..... angle off by >90deg (\*)

Ocean Surveyor acquires data using **EA** in the calculation of BEAM VELOCITIES. Gross error could irrevocably ruin the data

Diagnostic:  
beam velocities  
corrupted (wrap)



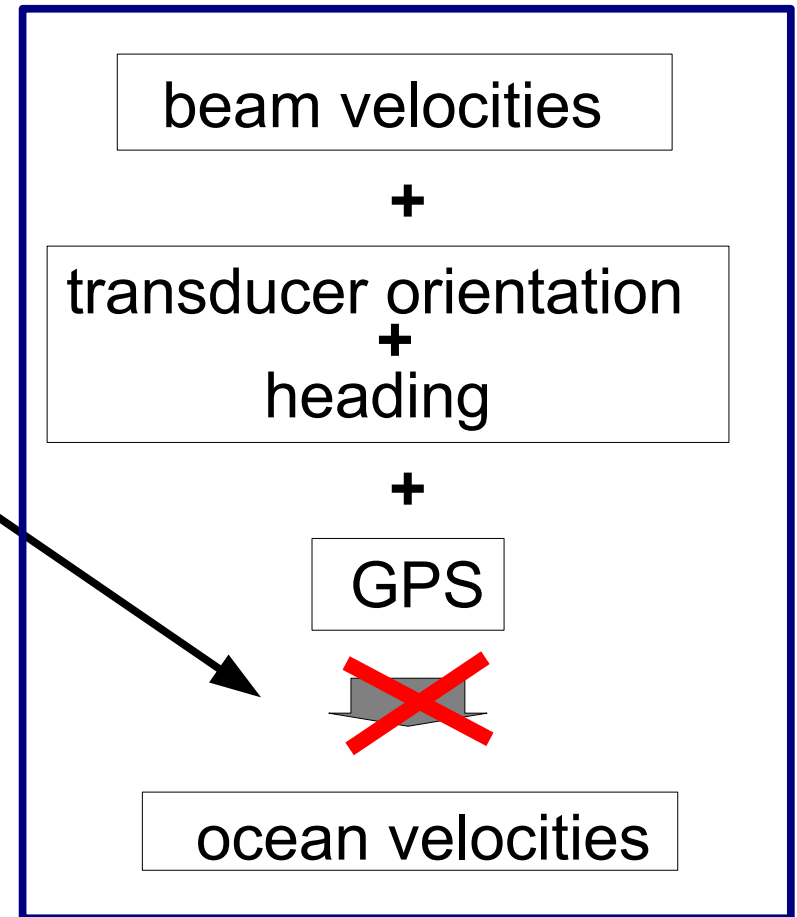
# Failure of ancillary (heading, gps)

---

Instrument failure  
Communications failure

Solution:

- Record multiple sources
- Switch to 2<sup>nd</sup> source
- Reprocess later with 1<sup>st</sup>

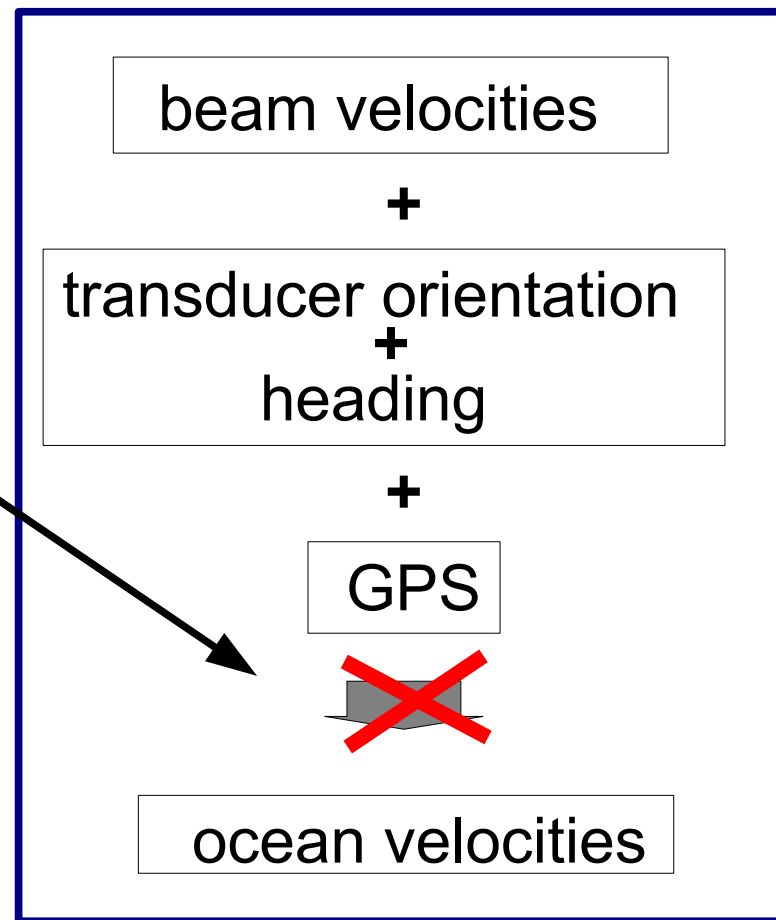


# Intermittent loss or corruption of ancillary data

---

poor serial feeds

Solution:  
Record multiple sources  
Switch to 2<sup>nd</sup> source  
Reprocess with 1<sup>st</sup>





# ADCP: what can go wrong

---

Viewed from the Perspective of:

- ADCP systems (components)
  - Computer
  - ADCP
  - Ancillary: GPS, Heading
- Data flow (where does the problem occur)
- Manifestation in ocean velocities – examples
  - Cross-track error (transducer angle)
  - Along-track error (scale factor)
  - Transition/maneuvering errors (lags in time or space)
  - Depth-dependent bias (electrical noise or ringing)

# What can go wrong: in the ocean velocities

---

## (1) Cross-track error:

- recovery requires accurate heading
- could be related to bad transducer angle

## (2) Along-track error:

- may indicate a serious problem
- recovery may be possible, incomplete or ambiguous

## (3) Transition/maneuvering error

- Lag or offset in time or space.
- might need to input the GPS-ADCP offset

## (4) Depth-dependent bias

- Surface along-track bias: ringing
- Surface? Deep? Could be electrical noise, could be acoustic

# What can go wrong: in the ocean velocities

---

## (1) Cross-track error:

- recovery requires accurate heading
- could be related to bad transducer angle

## (2) Along-track error:

- may indicate a serious problem
- recovery may be possible, incomplete or ambiguous

## (3) Transition/maneuvering error

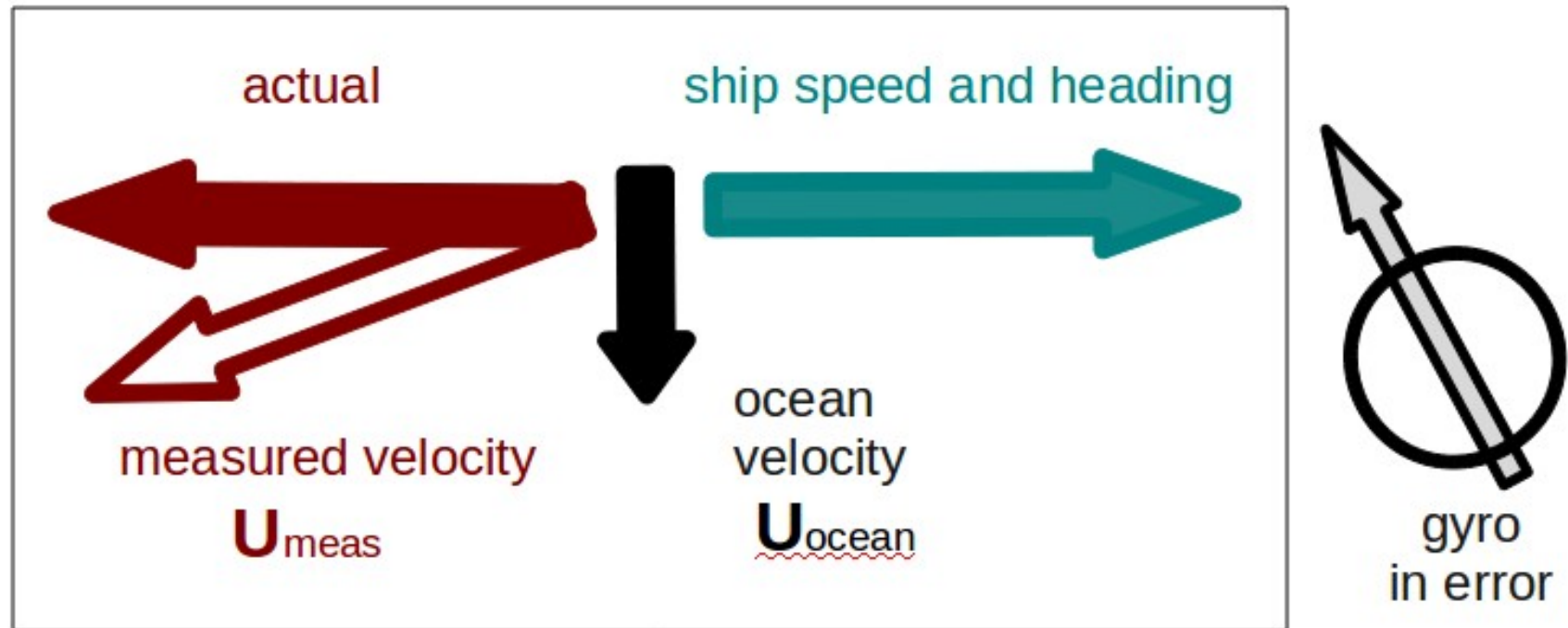
- Lag or offset in time or space.
- might need to input the GPS-ADCP offset

## (4) Depth-dependent bias

- Surface along-track bias: ringing
- Surface? Deep? Could be electrical noise, could be acoustic

Symptom = Cross-Track Error  
Cause = incorrect angle applied

Cross-track bias in ocean velocity from angle error:  
(heading + transducer angle)



# Symptom = Cross-Track Error

## Cause = incorrect **angle applied**

---

### **Angle applied** comes from

- Transducer angle (beam “3” clockwise from bow)
- Heading of ship
- If UHDAS,
  - Reliable heading for each ping (eg gyro)
  - Heading correction for each averaging period
  - Calculated relative to devices such as Ashtech, POSMV, Seapath, Mahrs, Phins

# Symptom = Cross-Track Error

## Cause = incorrect **angle applied**

---

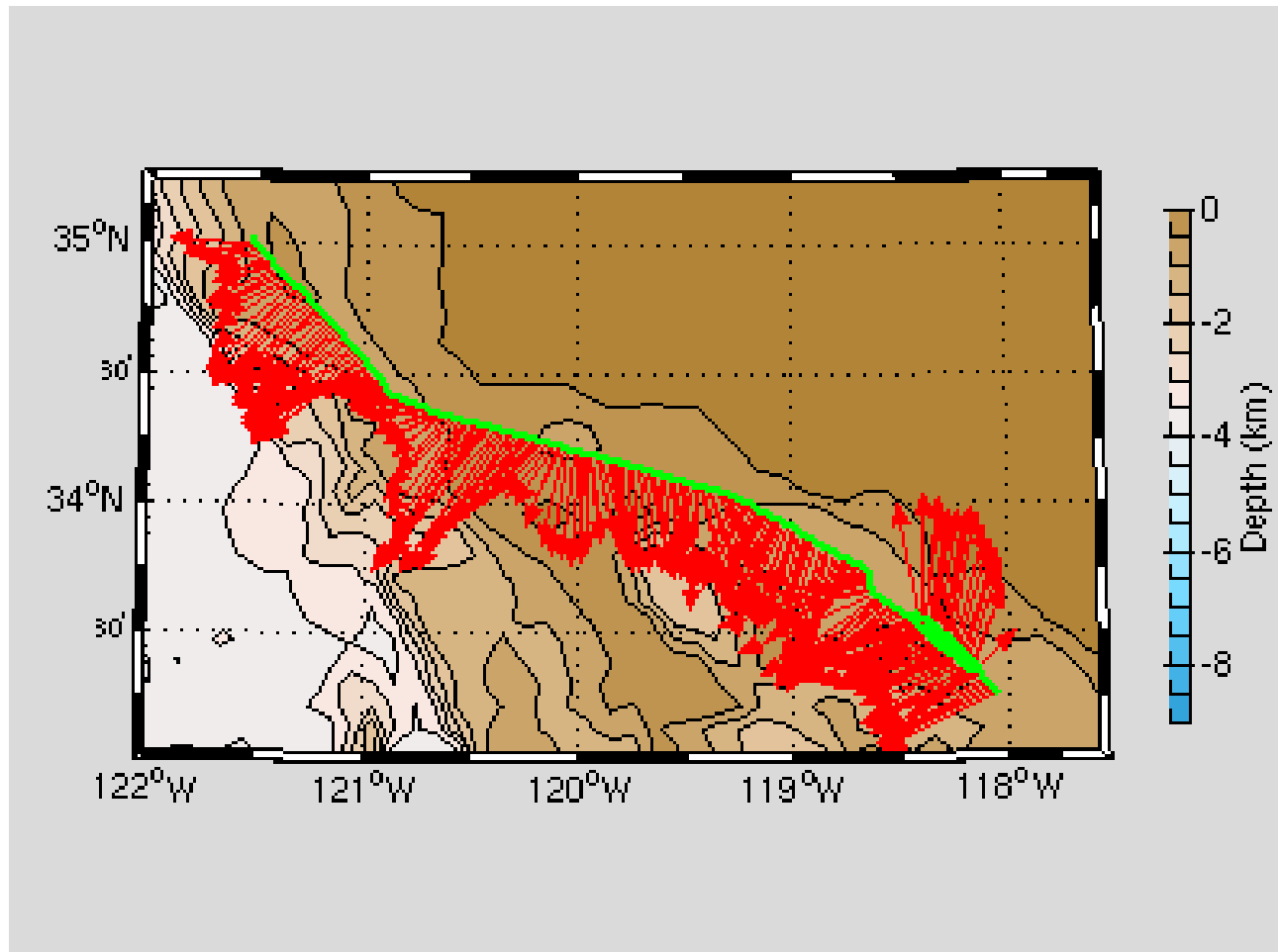
Angle applied comes from

- Transducer angle (beam “3” clockwise from bow)

This is a **constant value** for the whole cruise

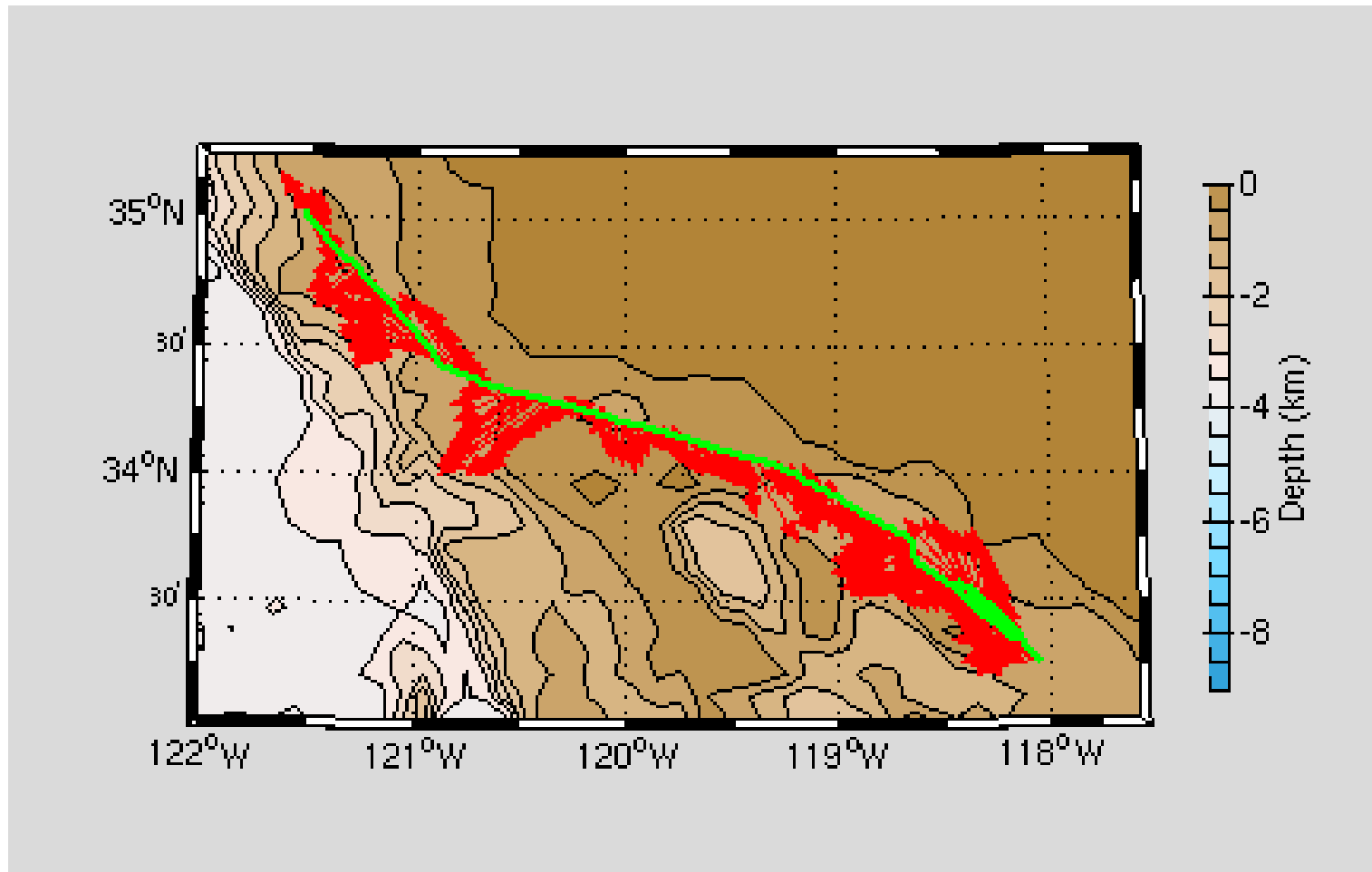
Examples of error in transducer angle follow...

# Calibration: angle error -3.6deg



151: Things go wrong (angle, constant error)

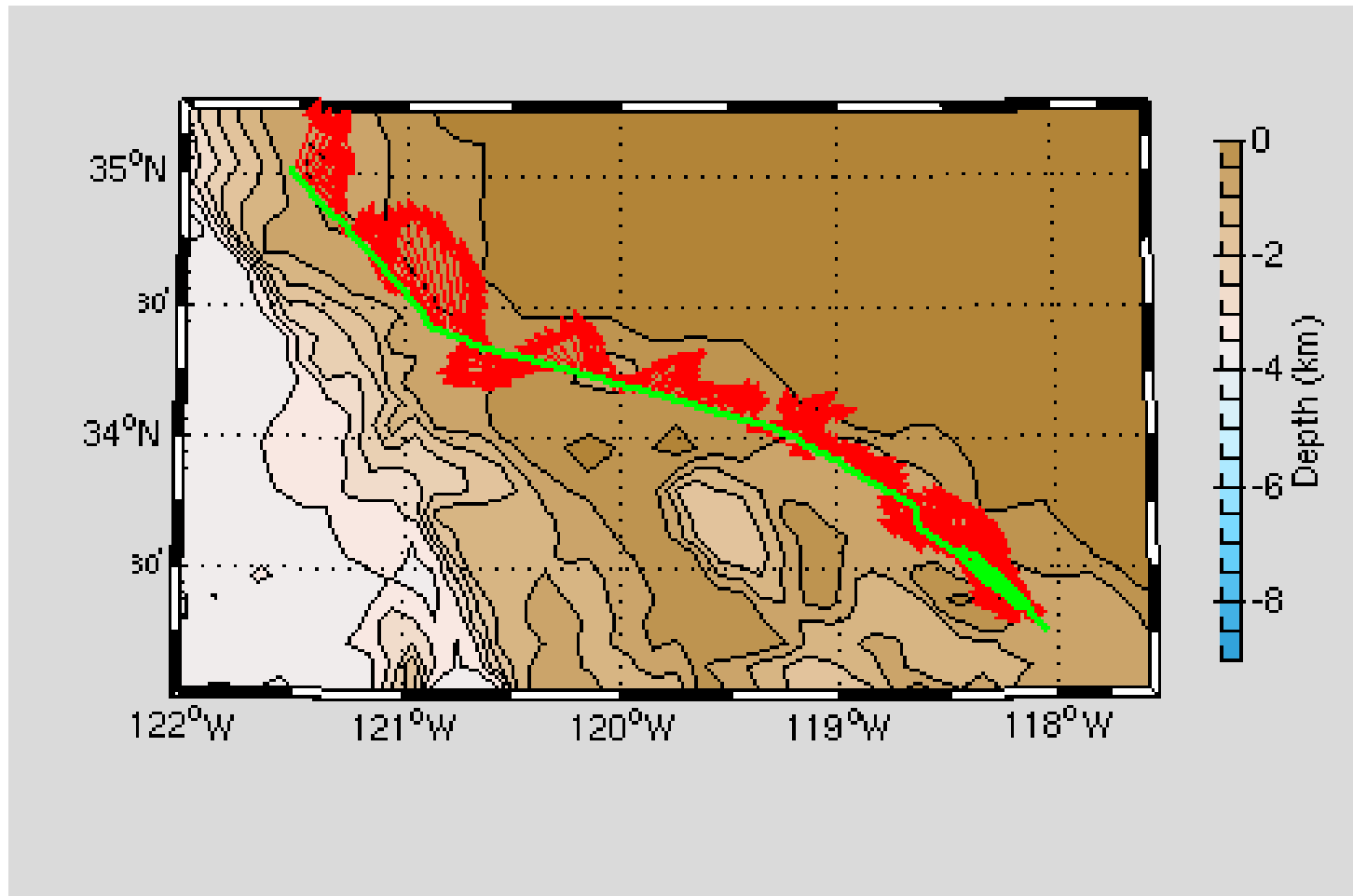
# Calibration: angle error -1.6



152: Things go wrong (angle, constant error)



# Calibration: angle error 0.4



153: Things go wrong (angle, constant error)

Symptom = Cross-Track Error  
Cause = incorrect **angle applied**

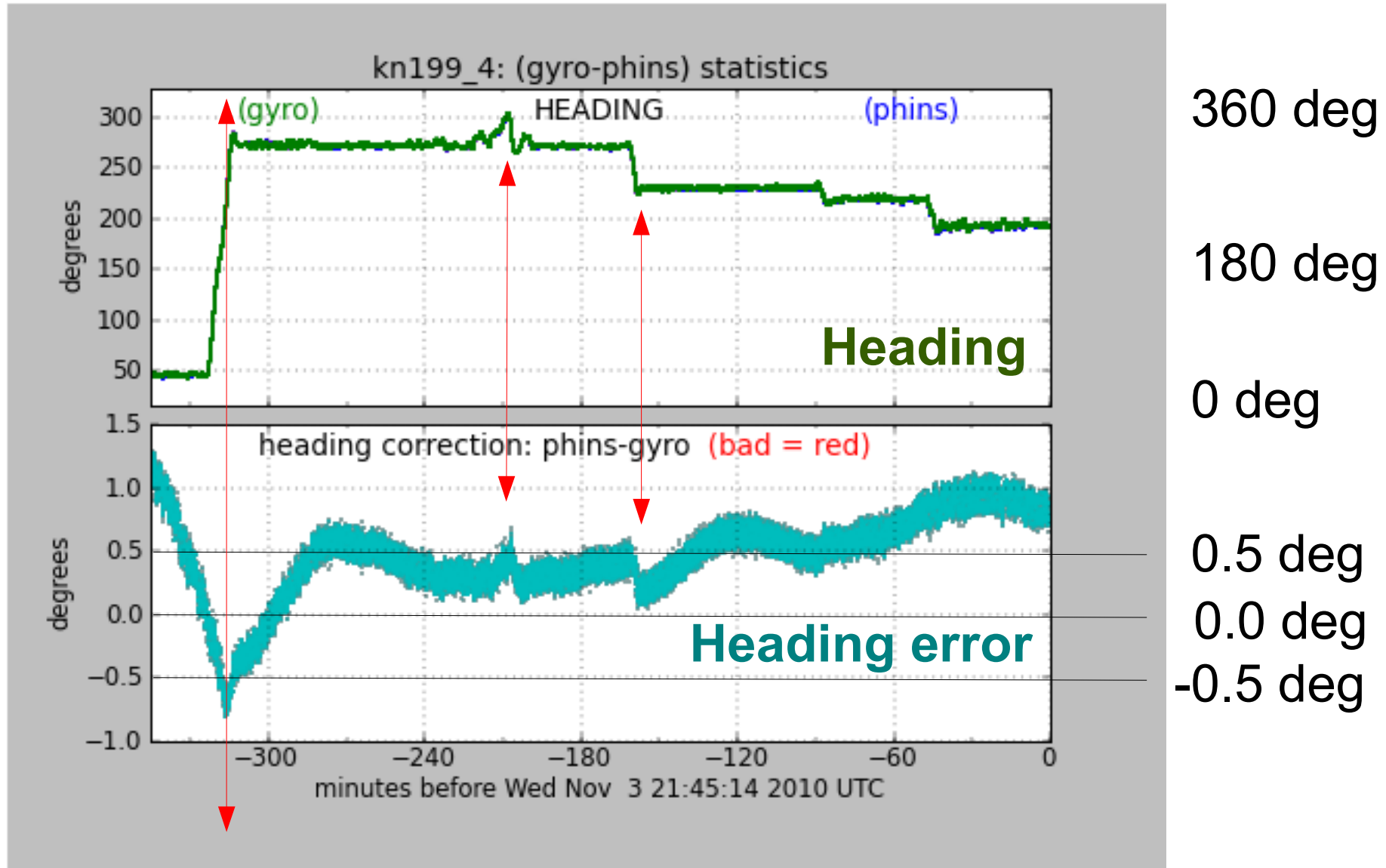
Angle applied comes from

Heading, which may be in error by

- A constant offset
- A **time-dependent offset**

Example follows ...

# Phins-Gyro difference varies with time



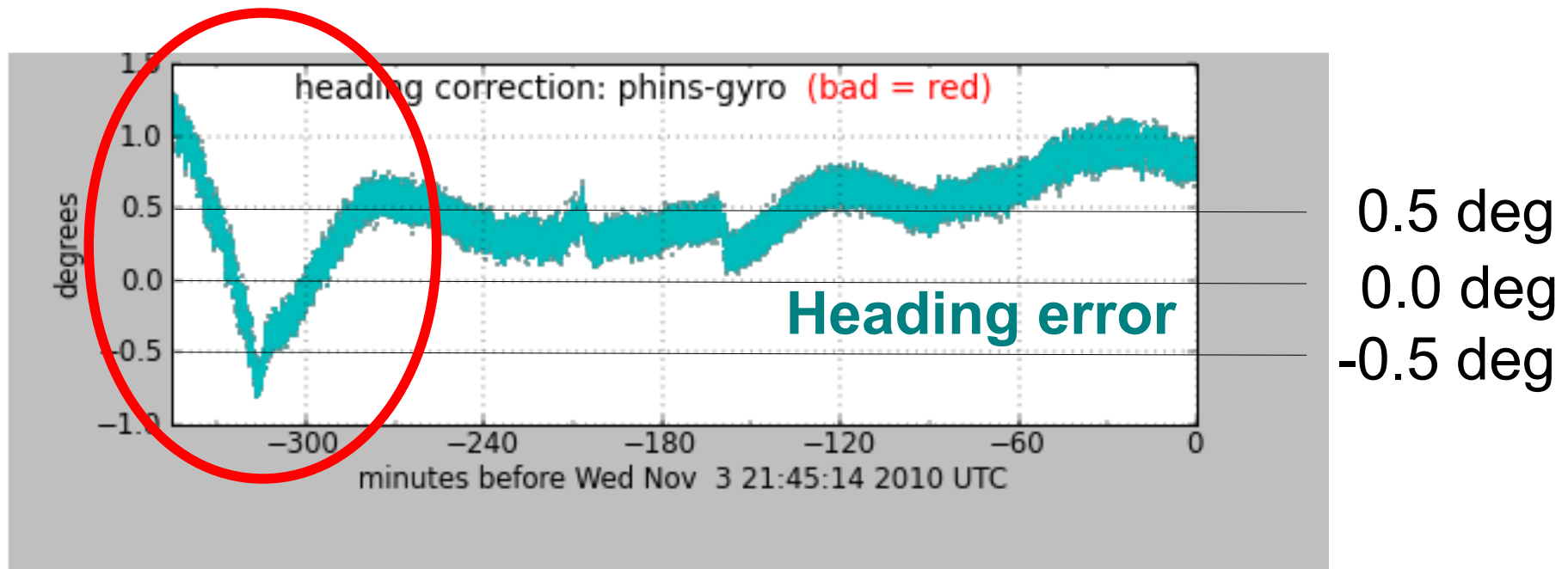
Changes in ship's heading affect heading error

155: Things go wrong (angle, variable)

# Effect of Time-Dependent Heading Error on Ocean Velocities

1 degree error in heading means:

- 0.1m/s error in ocean velocity
- in the cross-track direction



Changes in ship's heading affect heading error

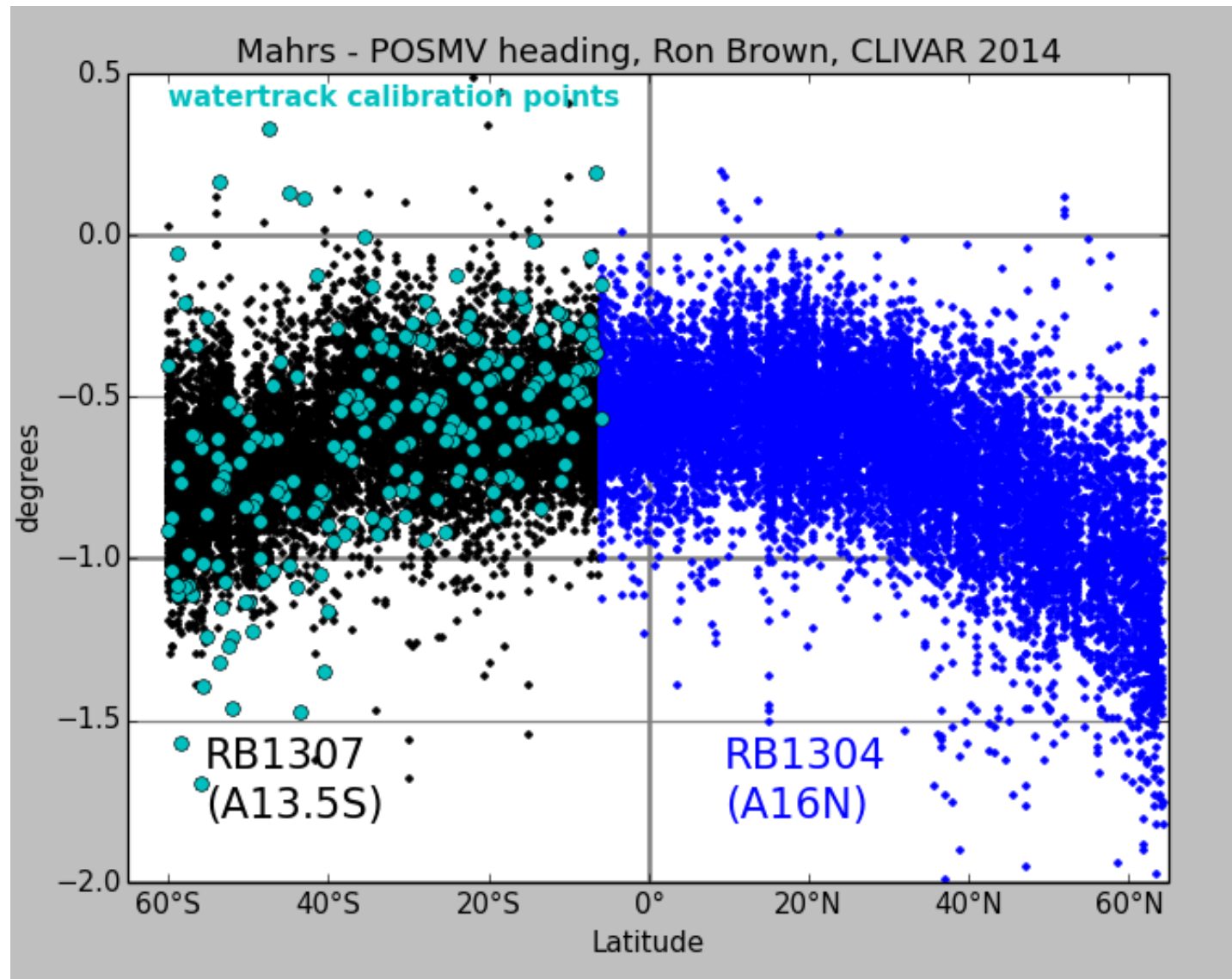
# Heading error with latitude

## MAHRS

- reliable
- not accurate

## POSMV

- should be accurate
- but has glitches
- still good enough to show the error in MAHRS over latitude



# What can go wrong in the ocean velocities

---

## (1) Cross-track error:

- recovery requires accurate heading
- could be related to bad transducer angle

## (2) Along-track error:

- may indicate a serious problem
- recovery may be possible, incomplete or ambiguous

## (3) Transition/maneuvering error

- Lag or offset in time or space.
- might need to input the GPS-ADCP offset

## (4) Depth-dependent bias

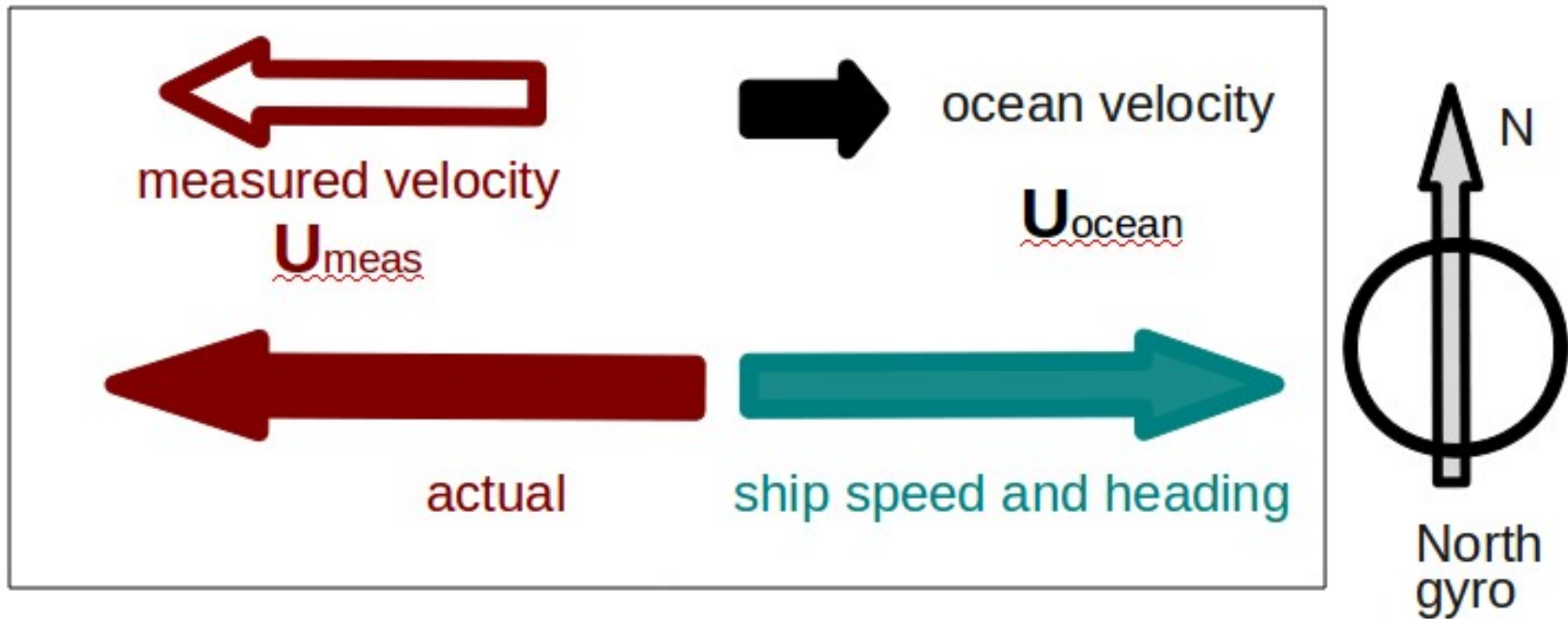
- Surface along-track bias: ringing
- Surface? Deep? Could be electrical noise, could be acoustic

# Examples of along-track error

- Acoustic interference
- Underway bias (bad weather)
- Scale factor (NB150 soundspeed correction)

# Along-track Error

Bias towards zero in measured velocity  
Alongtrack bias in ocean velocity

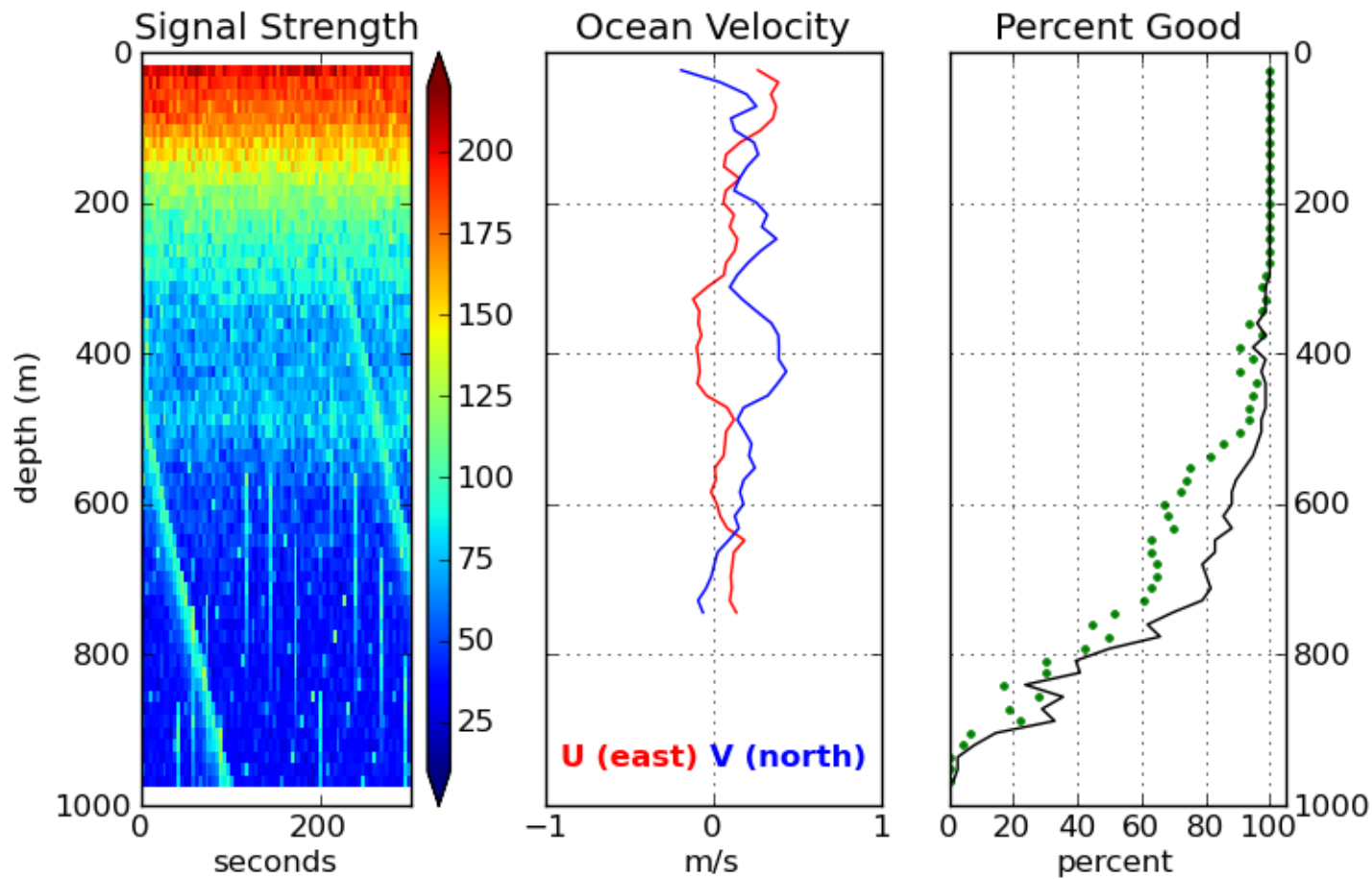




# Examples of along-track error

- Acoustic interference
- Underway bias (bad weather)
- Scale factor (NB150 soundspeed correction)

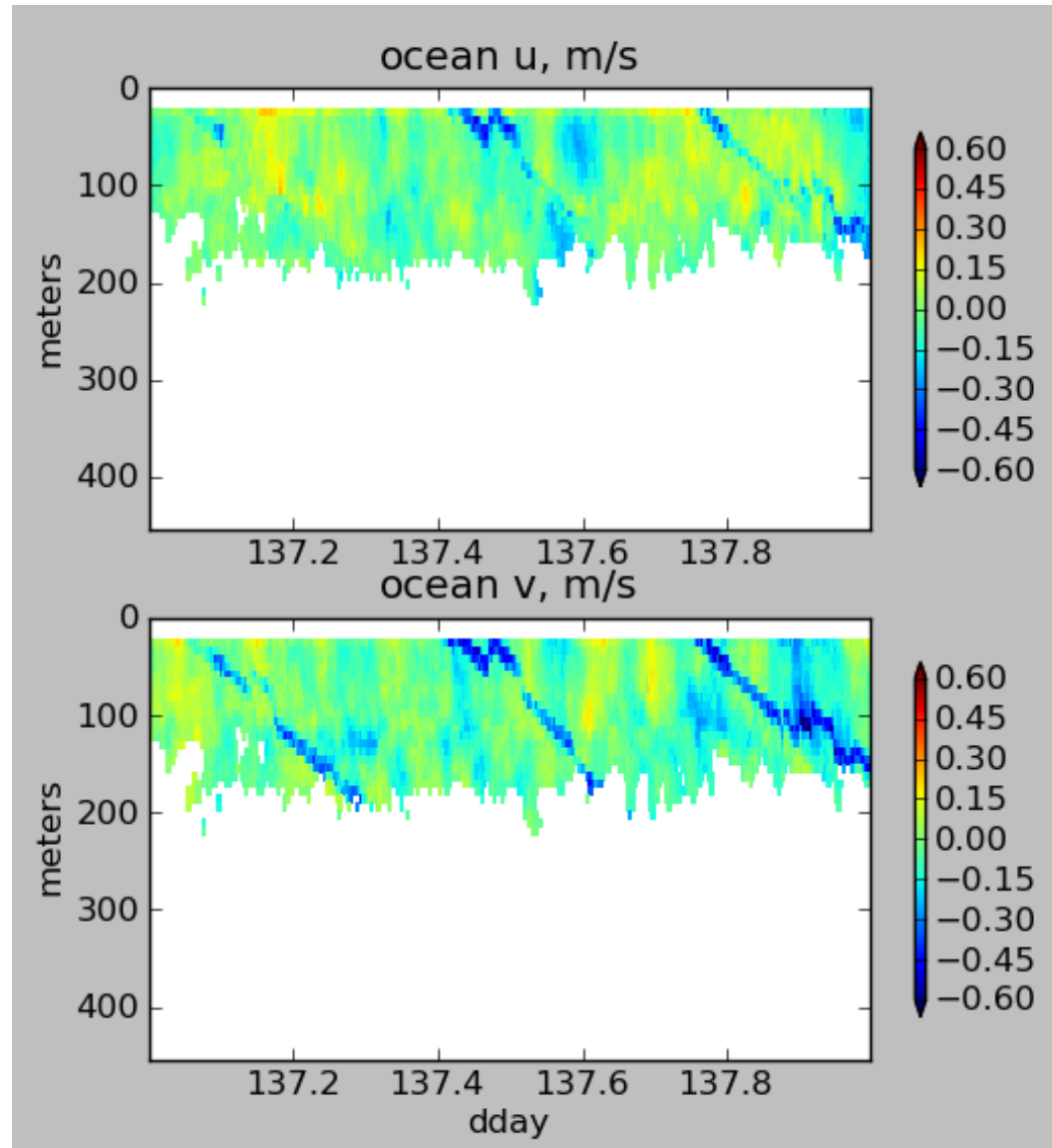
# Acoustic Interference: single ping



**os75nb**

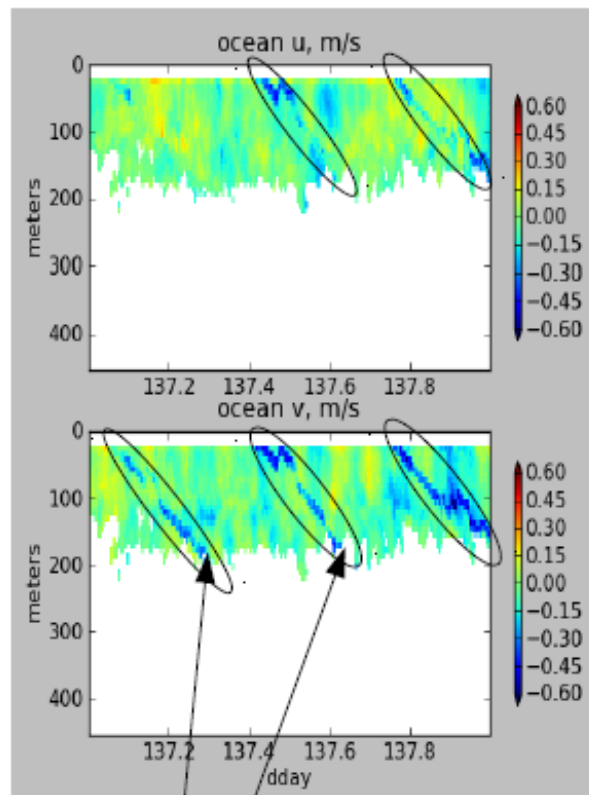
**heading correction: -3.52 deg, 2010/08/11 17:17:51 UTC**

# Acoustic Inference: averaged

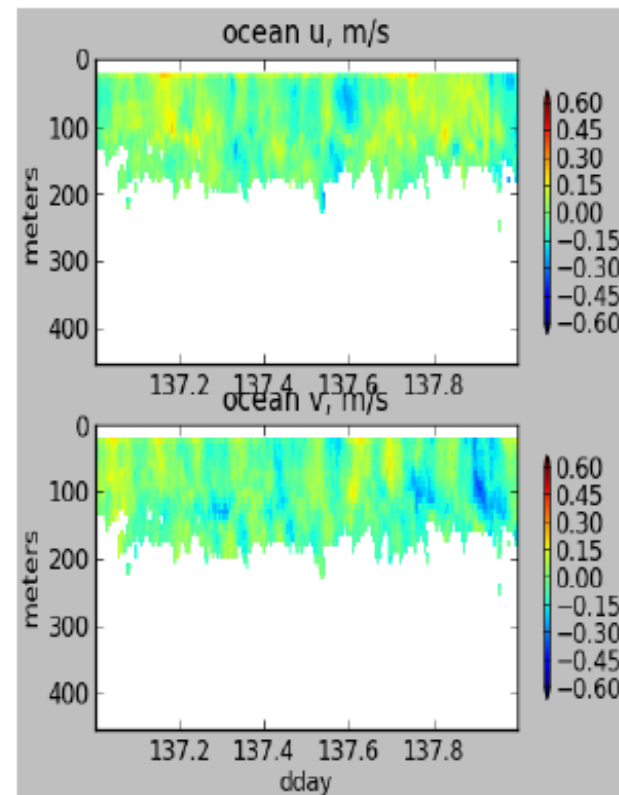


## Acoustic interference removed by CODAS processing

VmDAS LTA files:  
Unedited prior to averaging



VmDAS ENX files:  
Single-ping editing applied  
Prior to averaging

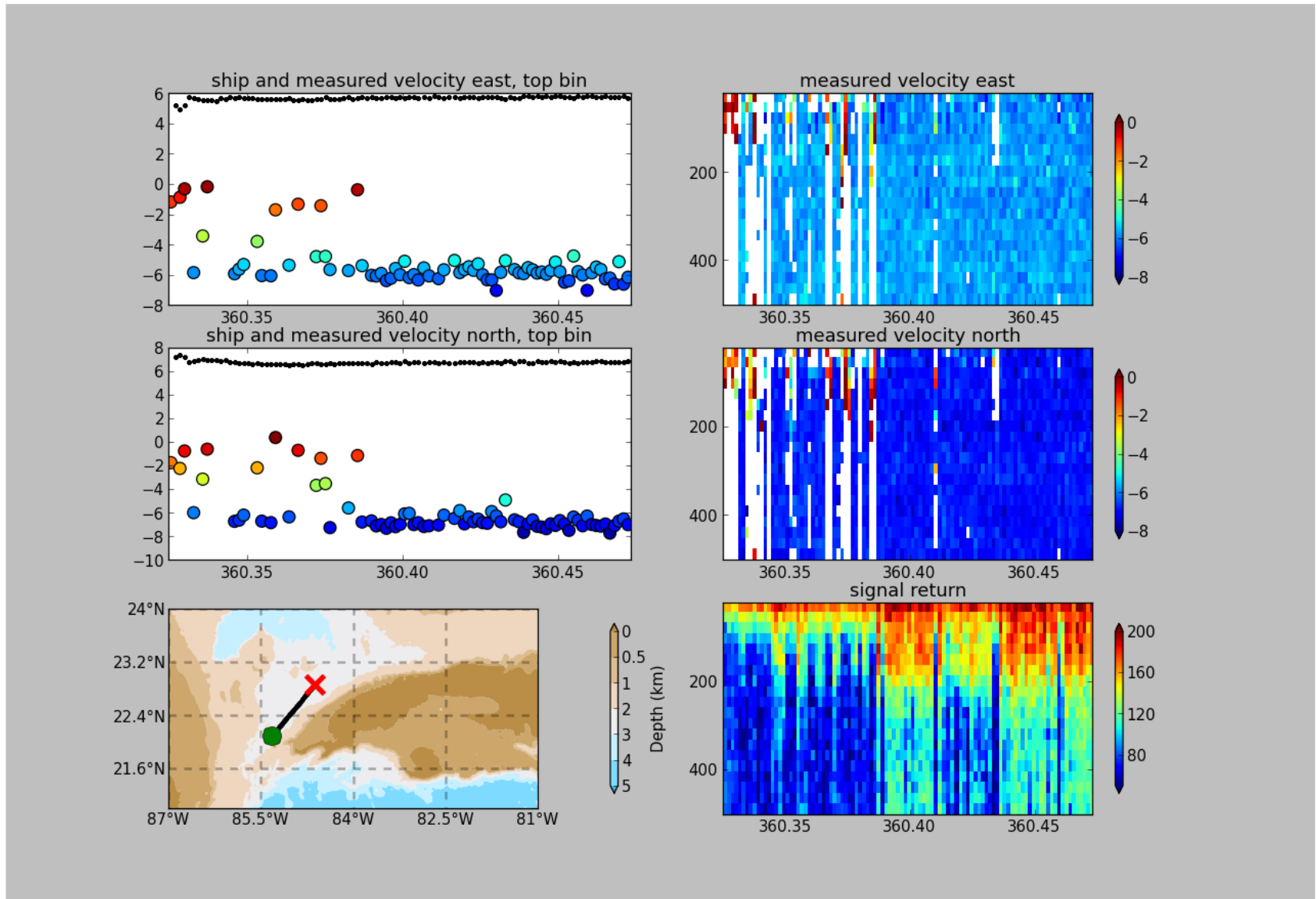


- interference from OS75 on OS150
- bias towards zero in measured velocity results in  
Bias "in the direction of motion" in ocean velocity
- ship was traveling Seattle-Honolulu, i.e. mostly southwest

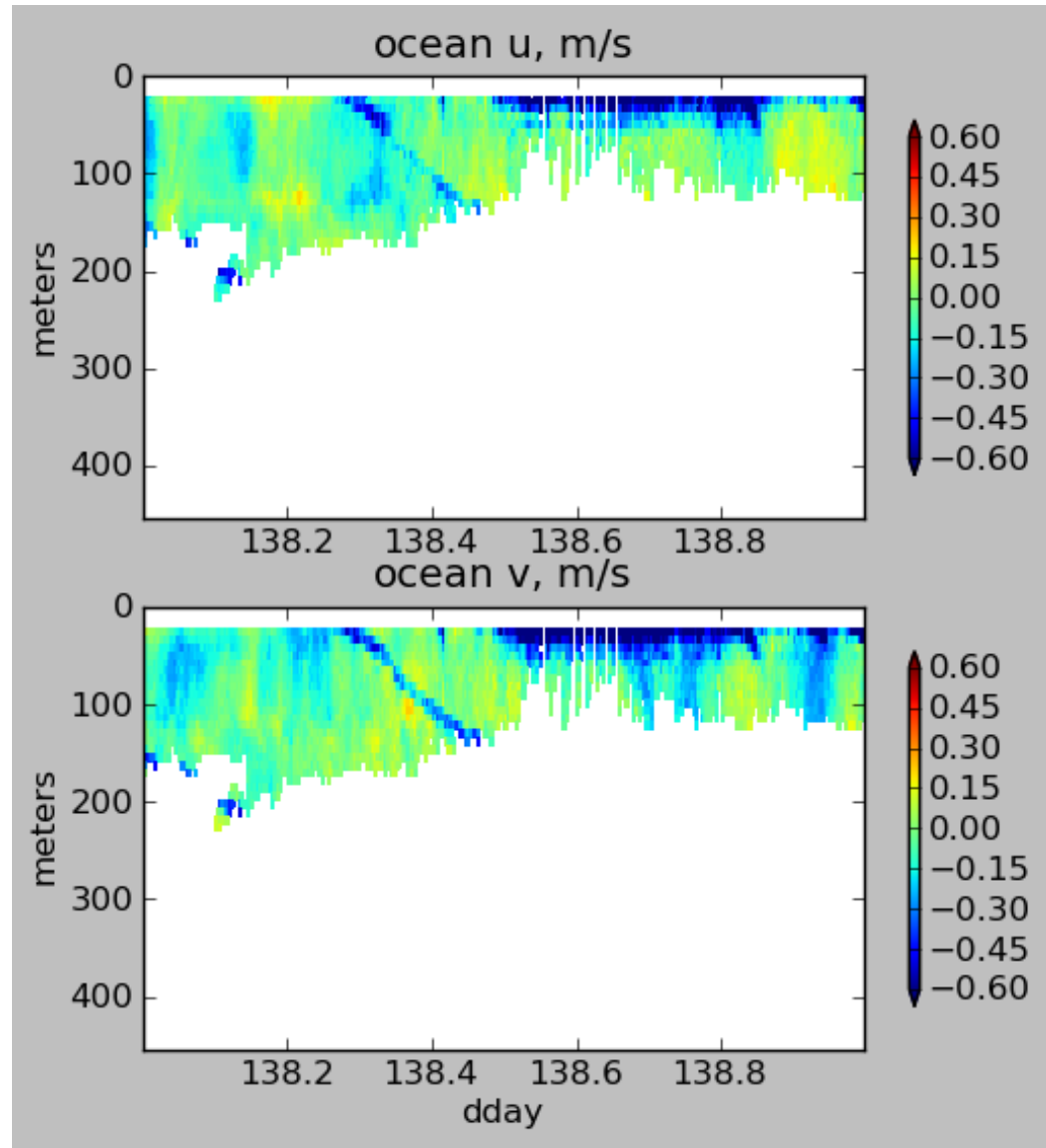
# Examples of along-track error

- Acoustic interference
- Underway bias (bad weather)
- Scale factor (NB150 soundspeed correction)

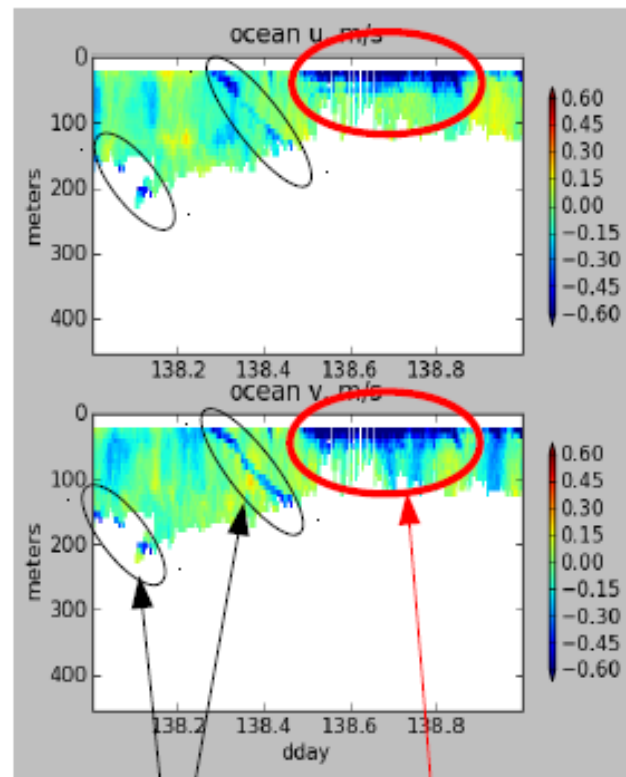
# single-ping editing: underway bias



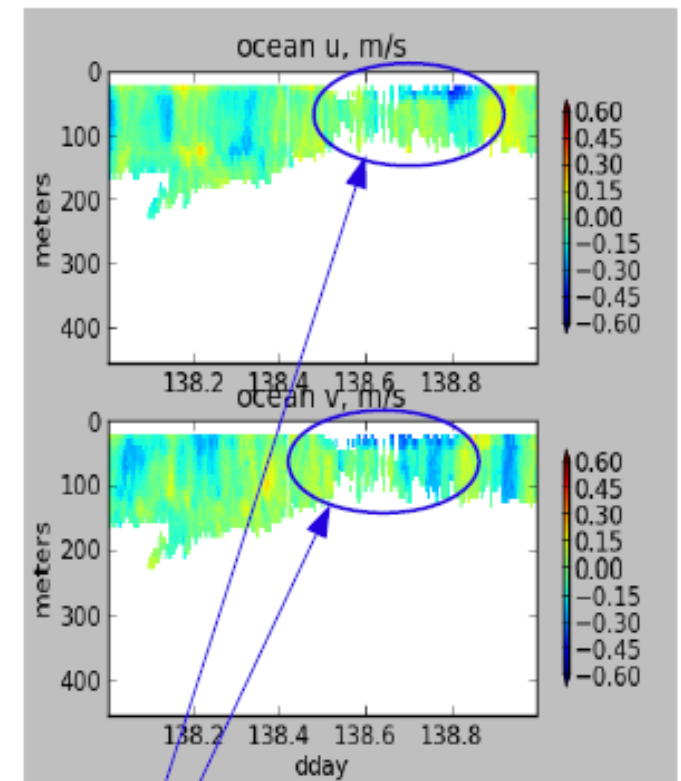
# Averaged (unedited) data: Acoustic interference and underway bias (bubbles)



## OS150 underway bias due to poor weather conditions



acoustic  
Interference  
from OS75  
on OS150



Biased pings mostly edited out, but  
manual post-processing is required

Biased pings, due to bad weather

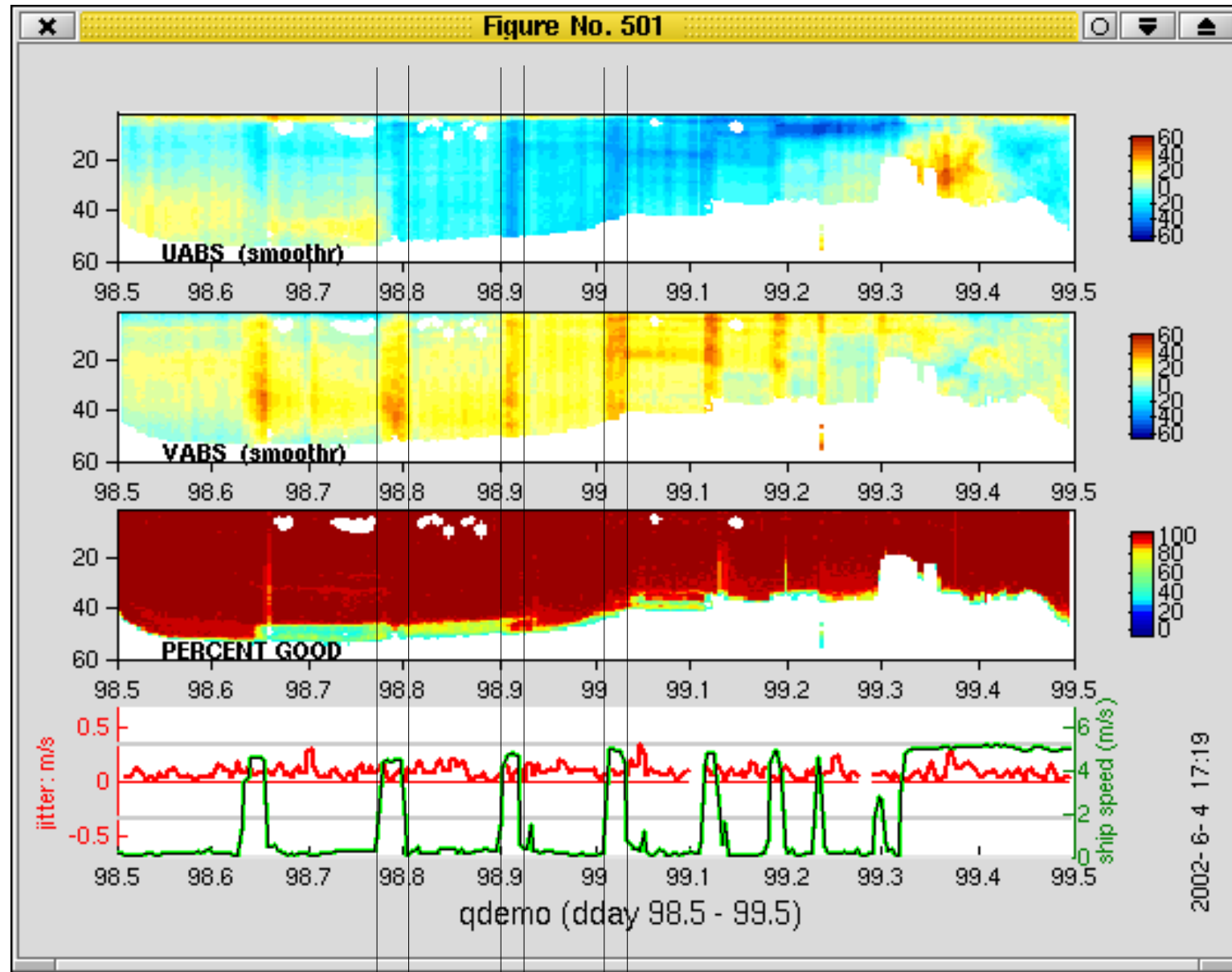
- bias towards zero in measured velocities
- bias in direction of motion in ocean velocities
- shorter profiles (degraded quality)



# Examples of along-track error

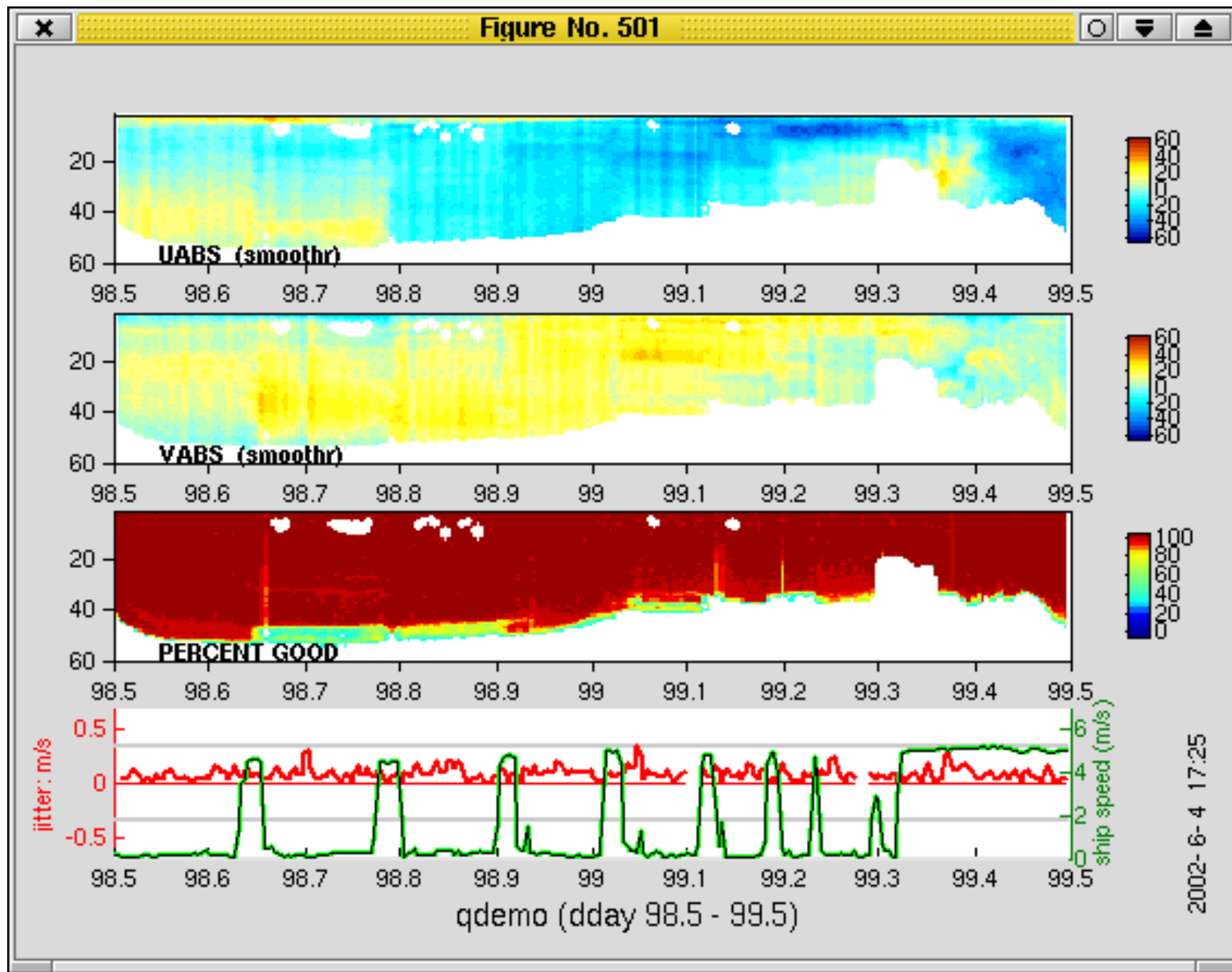
- Acoustic interference
- Underway bias (bad weather)
- **Scale factor (NB150 soundspeed correction)**

# scale factor: alongtrack bias



170: Things go wrong (scale factor, before)

# After scale factor applied



171: Things go wrong (scale factor, after)

# What can go wrong in the data product

---

## (1) Cross-track error:

- recovery requires accurate heading
- could be related to bad transducer angle

## (2) Along-track error:

- may indicate a serious problem
- recovery may be possible, incomplete or ambiguous

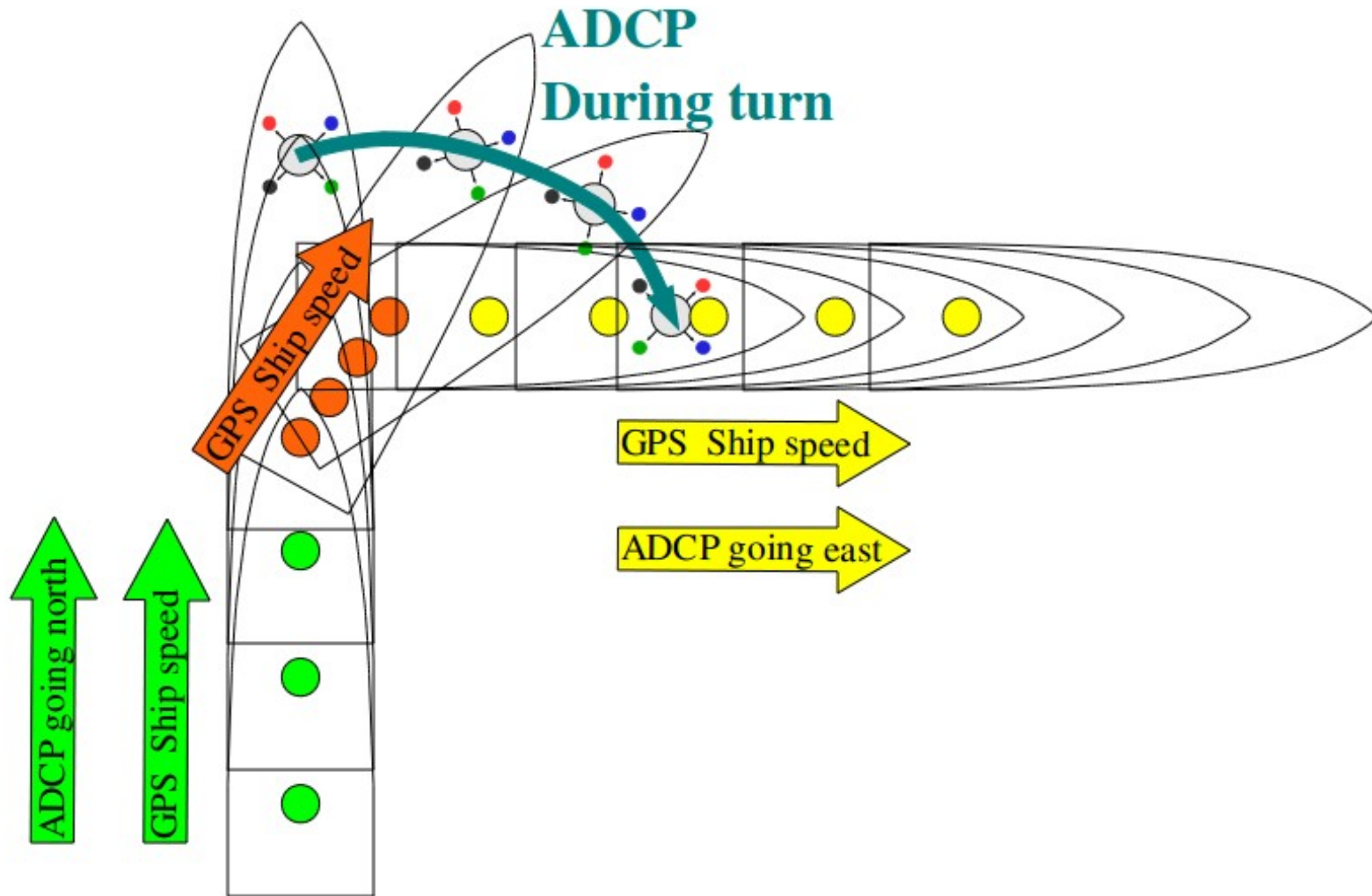
## (3) Transition/maneuvering error

- Lag or offset in time or space.
- might need to input the GPS-ADCP offset

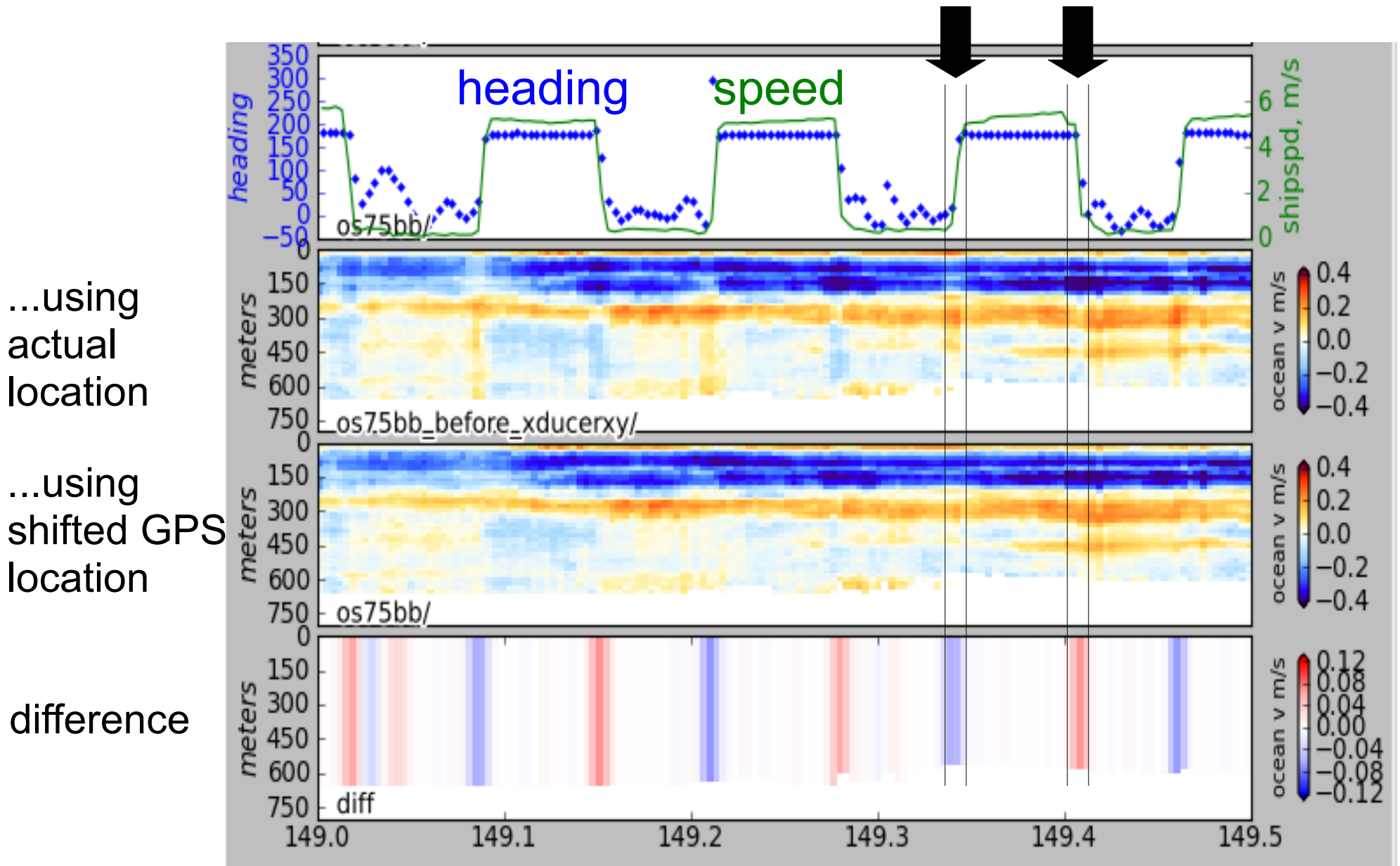
## (4) Depth-dependent bias

- Surface along-track bias: ringing
- Surface? Deep? Could be electrical noise, could be acoustic

# Example: offset between ADCP and GPS creates an artifact during maneuvering



# Transducer offset from GPS--error occurs: **transition** between on-station and underway



# What can go wrong in the data product

---

## (1) Cross-track error:

- recovery requires accurate heading
- could be related to bad transducer angle

## (2) Along-track error:

- may indicate a serious problem
- recovery may be possible, incomplete or ambiguous

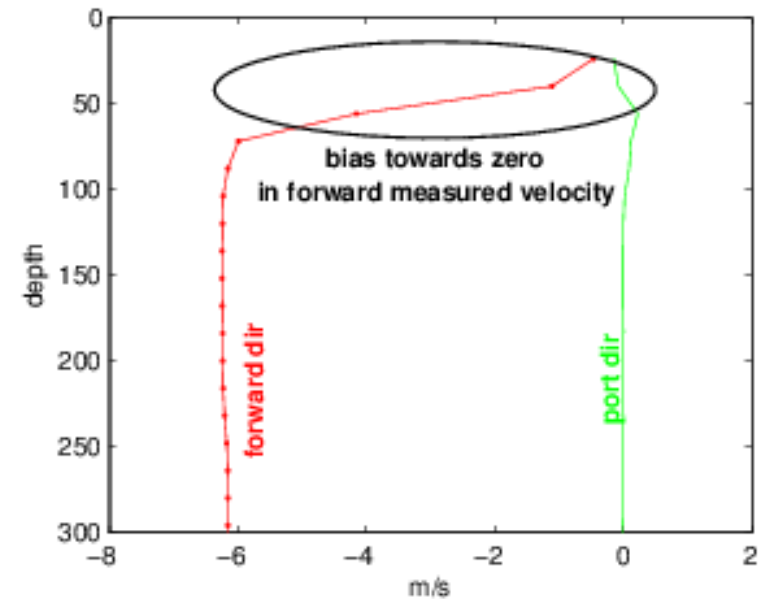
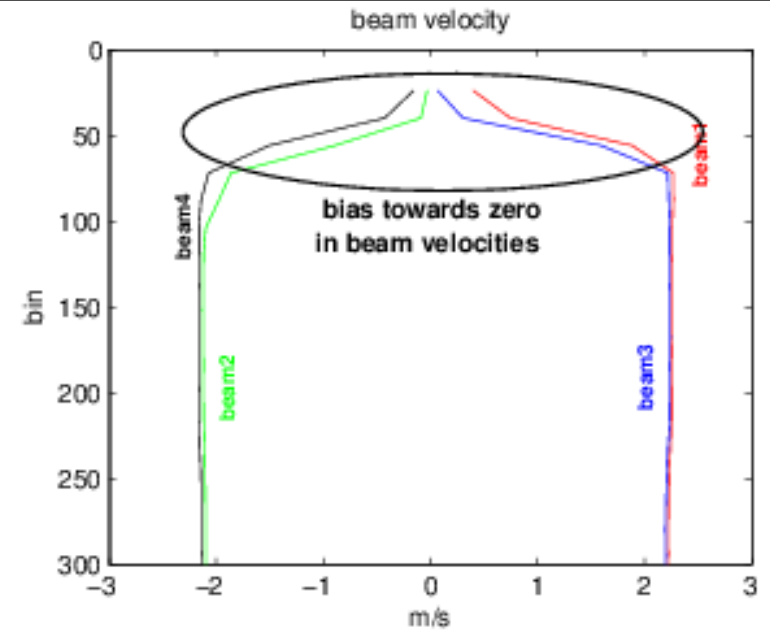
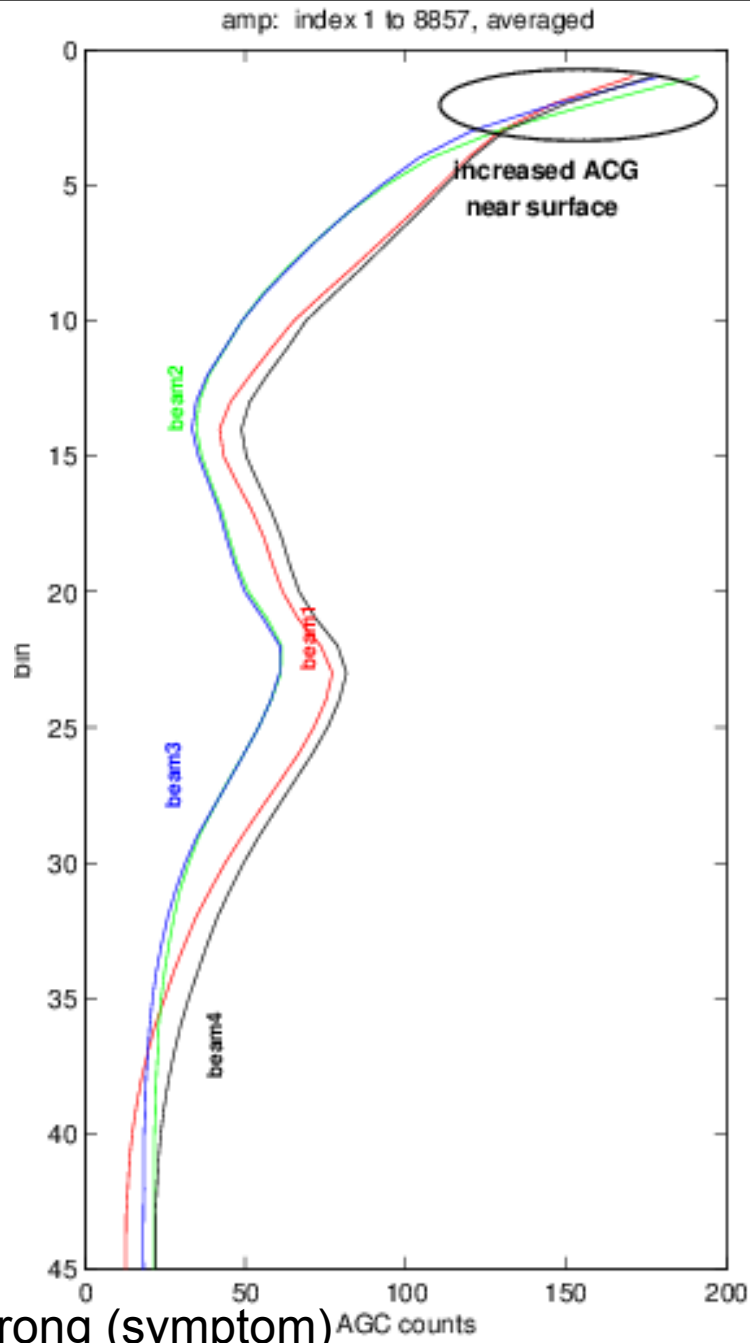
## (3) Transition/maneuvering error

- Lag or offset in time or space.
- might need to input the GPS-ADCP offset

## (4) Depth-dependent bias

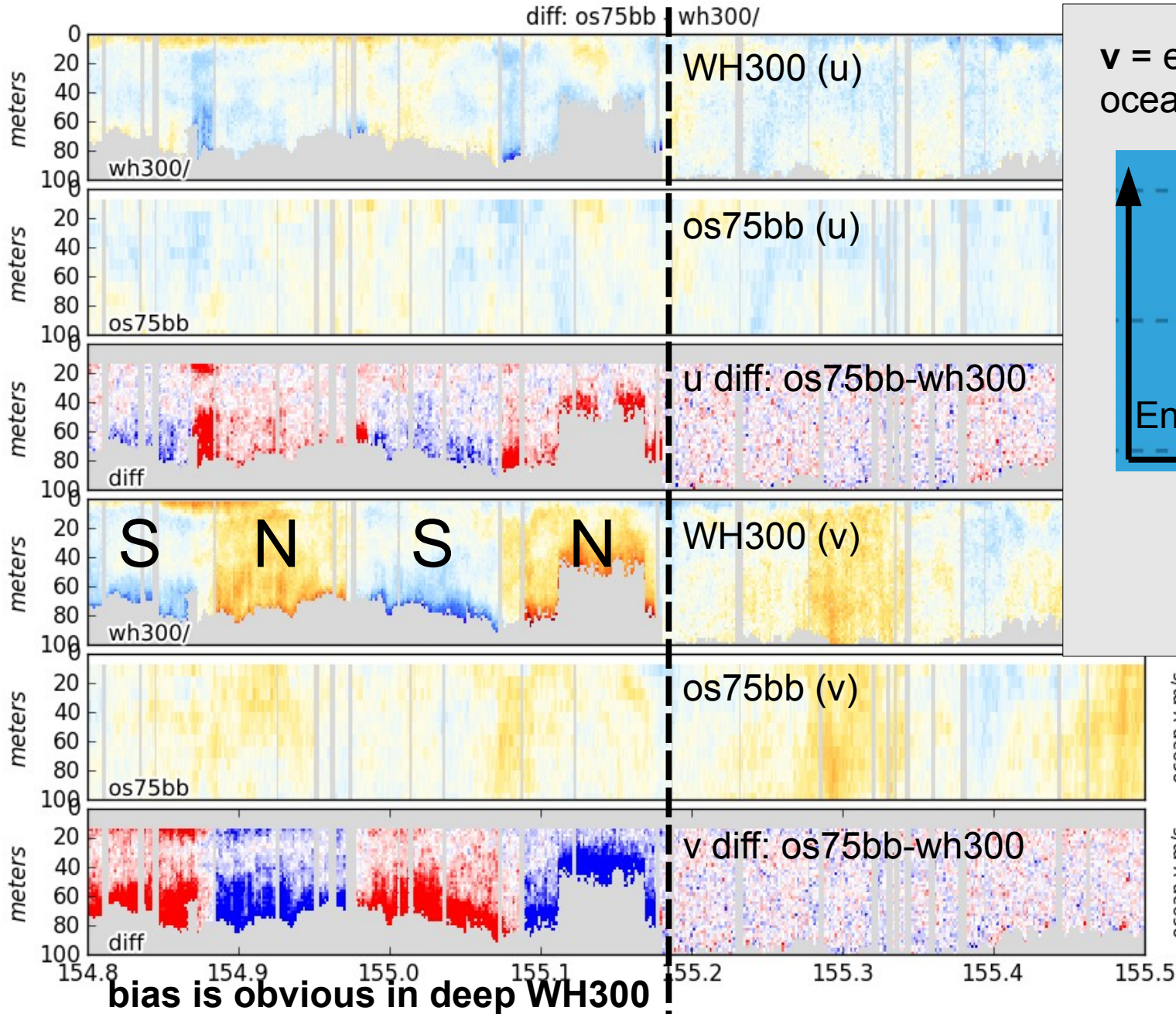
- Surface along-track bias: ringing
- Surface? Deep? Could be electrical noise, could be acoustic

# Example of bias due to ringing

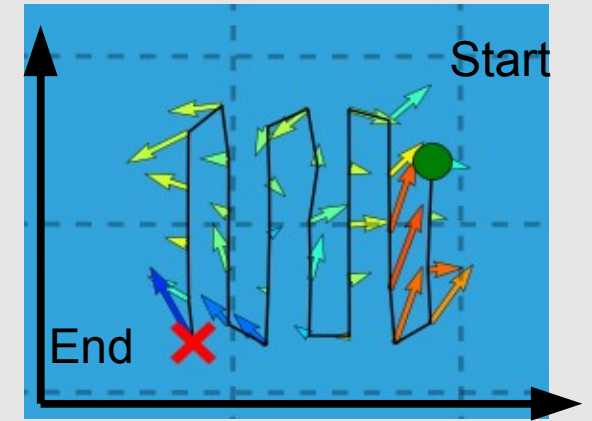




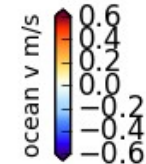
# Example of bias due to Electrical Noise



$v$  = eastward  
ocean velocity



$u$  = eastward  
ocean velocity



**bias is obvious in deep WH300**

bias is gone

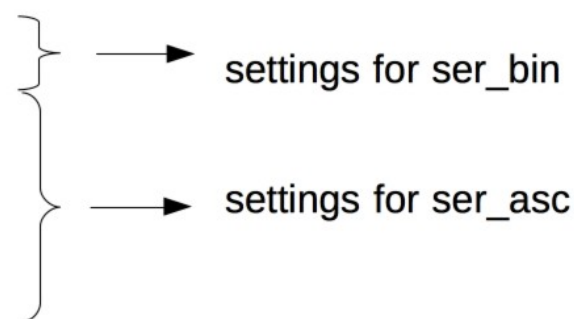
# Appendix

- **sensor\_cfg.py** block diagrams

## Block diagram of sensor\_cfg.py

This is a python program.  
Python is sensitive to  
Case  
Indentation  
Punctuation

# sensor\_cfg.py

<code>## header comments</code>	
<code>ignore_ADCPs = []</code> <code>ignore_other_sensors = []</code> <code>use_publishers = True</code>	editable – ignore ADCP editable – ignore other sensor zmq_publishers: True/False
<code>shipabbrev = "km"</code>	ship designation
<code>ADCPs = [</code> <code>adcp1_setupdict,</code> <code>adcp2_setupdict</code> <code>]</code>	set up communication with ADCPs
<code>common_opts = '-f %s -F -m 1 -H 2' % (shipabbrev,)</code> <code>nb_opts = '-rIE -c -l'</code> <code>oswh_opts = '-rIE -c -O -l'</code>	switches for ser_asc and ser_bin (logging)
<code>sensors = [</code> <code>adcp1_logdict,</code> <code>adcp2_logdict,</code> <code>serial1_logdict,</code> <code>serial2_logdict,</code> <code>serial3_logdict,</code> <code>serial4_logdict,</code> <code>serial5_logdict,</code> <code>serial6_logdict,</code> <code>]</code>	
<code>speedlog_config = {}</code>	speedlog configuration
<code>Publishers = [0,0]</code>	zmq_publisher configuration
<code>ADCPs = ...</code> <code>sensors = ...</code> <code>if use_publishers==True:...</code>	redefine according to beginning: ("ignore", True/False)



## sensor\_cfg.py : ADCP communications setup

```
adcp1_setupdict = {  
    'instrument' : 'os75',  
    'setup'      : 'rdi_setup',  
    'terminal'   : 'oswh_term',  
    'defaultcmd' : 'os75_default.cmd',  
    'commands'   : ('EA04500',),  
    'datatypes'  : ('os75bb', 'os75nb'),  
    'wakeup_baud' : 9600  
}
```

Only one editable field in this block: This “EA” command must be similar to (within 5-10deg) of the transducer angle, i.e. the angle beam 3 makes from the bow (viewed clockwise from above).

```
ADCPs = [  
    adcp1_setupdict,           set up communication  
    adcp2_setupdict         with ADCPs  
]
```

It is **CRITICAL** to get the EA command in the right ballpark. A bad specification can irrevocably damage the data. The Python program “EA\_estimator.py” may help.

# sensor\_cfg.py: diagram for passive serial logging setup

```
adcp1_logdict = {  
    'instrument' : 'os75',  
    'device'    : 'ttyUSB3',  
    'baud'     : 38400,  
    'format'   : 'binary',  
    'subdir'   : 'os38',  
    'ext'      : 'raw',  
    'opt'      : oswh_opts  
}
```

Two editable fields:  
serial port [0,1,2,...7]  
baud rate

```
serial3_logdict = {  
    'instrument' : 'ADU5',  
    'device'    : 'ttyR6',  
    'baud'     : 9600,  
    'format'   : 'ascii',  
    'subdir'   : 'ashtech',  
    'ext'      : 'adu',  
    'strings'  : ('$PASHR,ATT', '$GPGGA'),  
    'messages' : ('gps', 'adu'),  
    'opt'      : '-tc'}  
}
```

Two editable fields:  
serial port  
baud rate

These are related to processing... TAKE CARE

```
sensors =[  
    adcp1_logdict,  
    adcp2_logdict,  
    serial1_logdict,  
    serial2_logdict,  
    serial3_logdict,  
    serial4_logdict,  
    serial5_logdict,  
    serial6_logdict,  
]
```

settings for ser\_bin  
settings for ser\_asc