RVTEC 2010 – UHDAS/ADCP

Part I: ADCP

- Getting Ocean Velocity
- What can go wrong
- ADCP Processing with CODAS

Part II: UHDAS

- What it does
- Where things are written
- Monitoring, Interpretation
- What can be changed, tested

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(I) ADCP: Getting Ocean Velocity

ADCP :

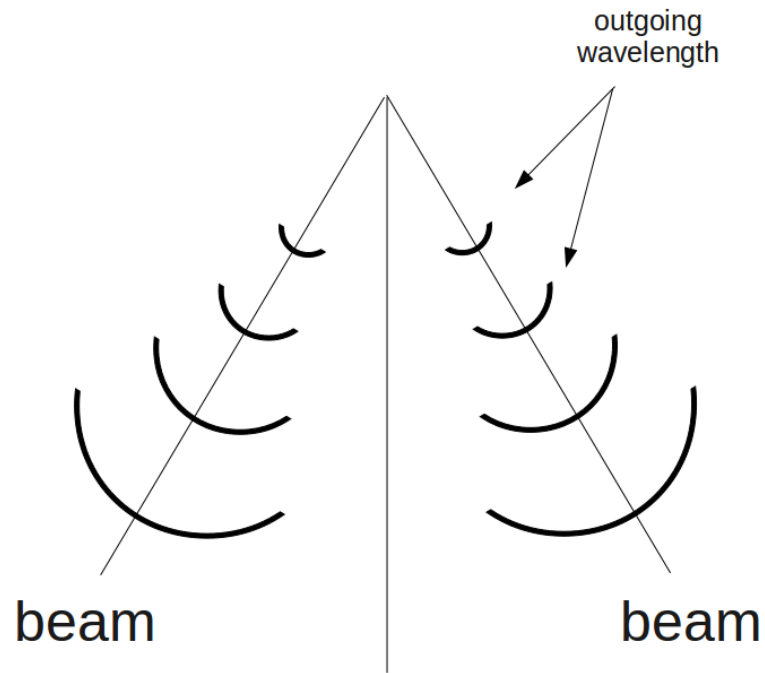**A**coustic (it pings along beams at a frequency)

Doppler (uses frequency shift to get
velocity along the beam)

Current (include many more steps to get
ocean velocity)

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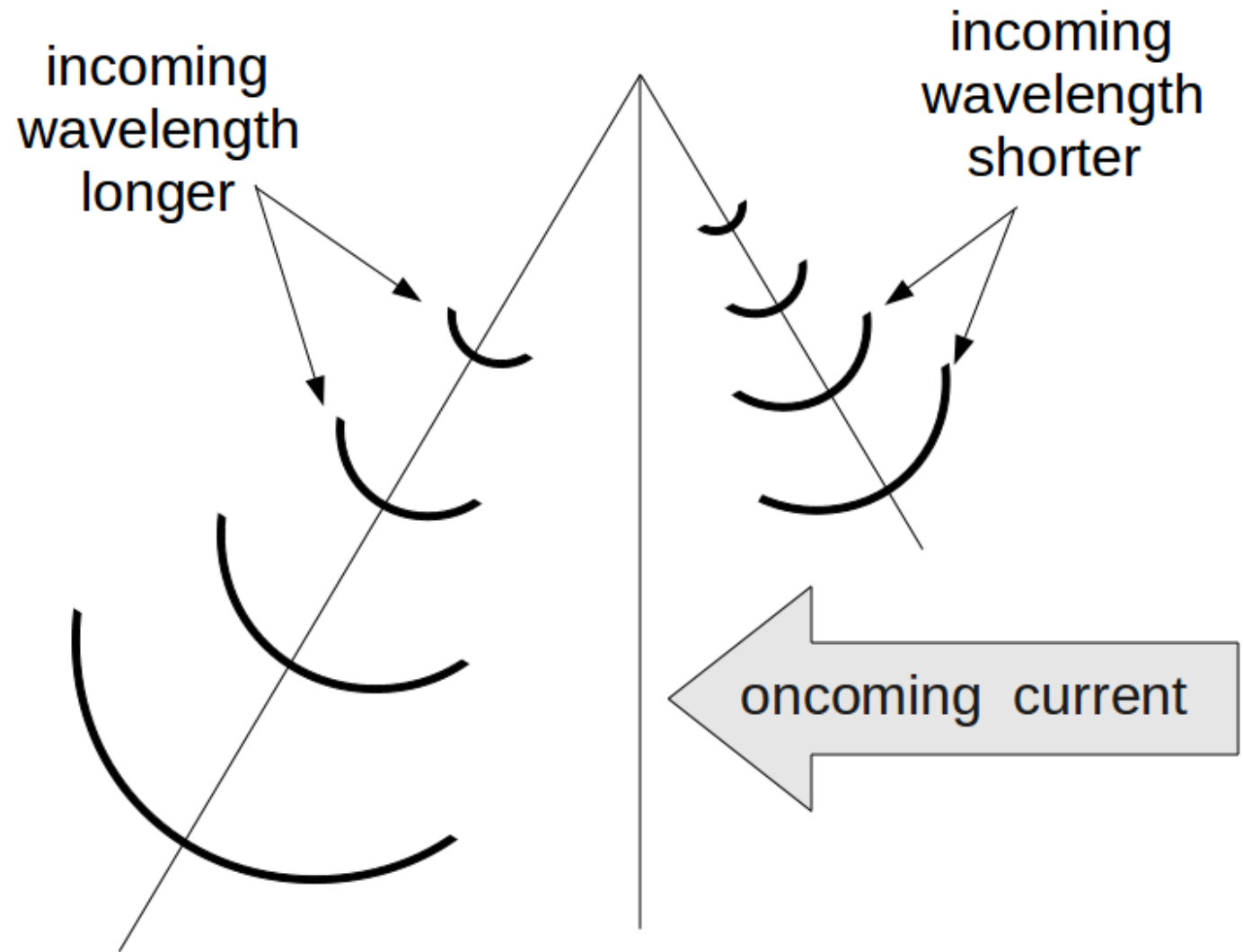time to create a vertical profile)

(I) ADCP: Getting Ocean Velocity

ADCP : **A**coustic

outgoing
wavelength

beam   beam

soundspeed = frequency X wavelength
(ocean)   (instrument)

ADCP :
Acoustic
Doppler

incoming
wavelength
longer

incoming
wavelength
shorter

oncoming current

lower frequency

higher frequency

soundspeed = frequency X wavelength
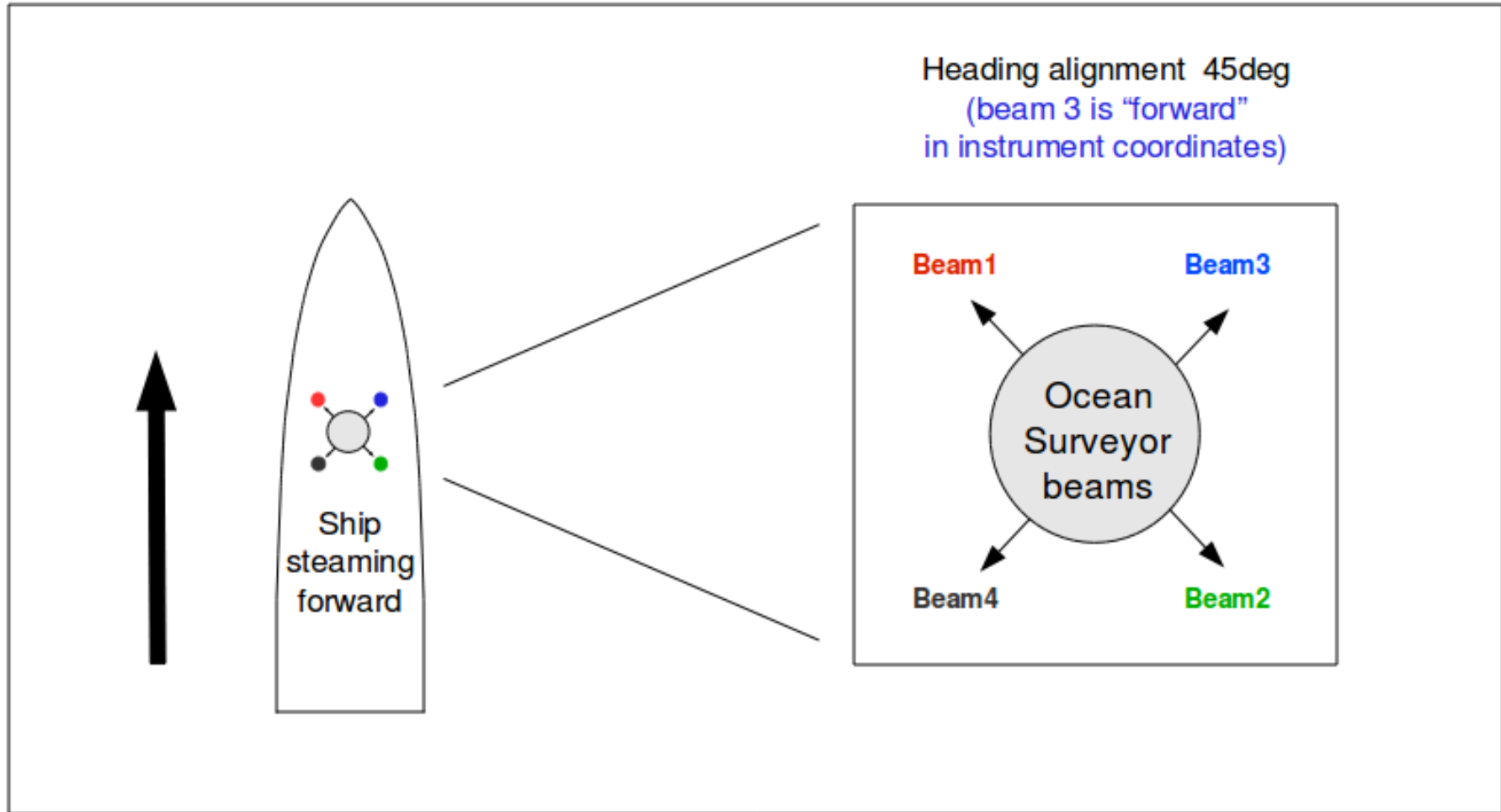(ocean)   (instrument)
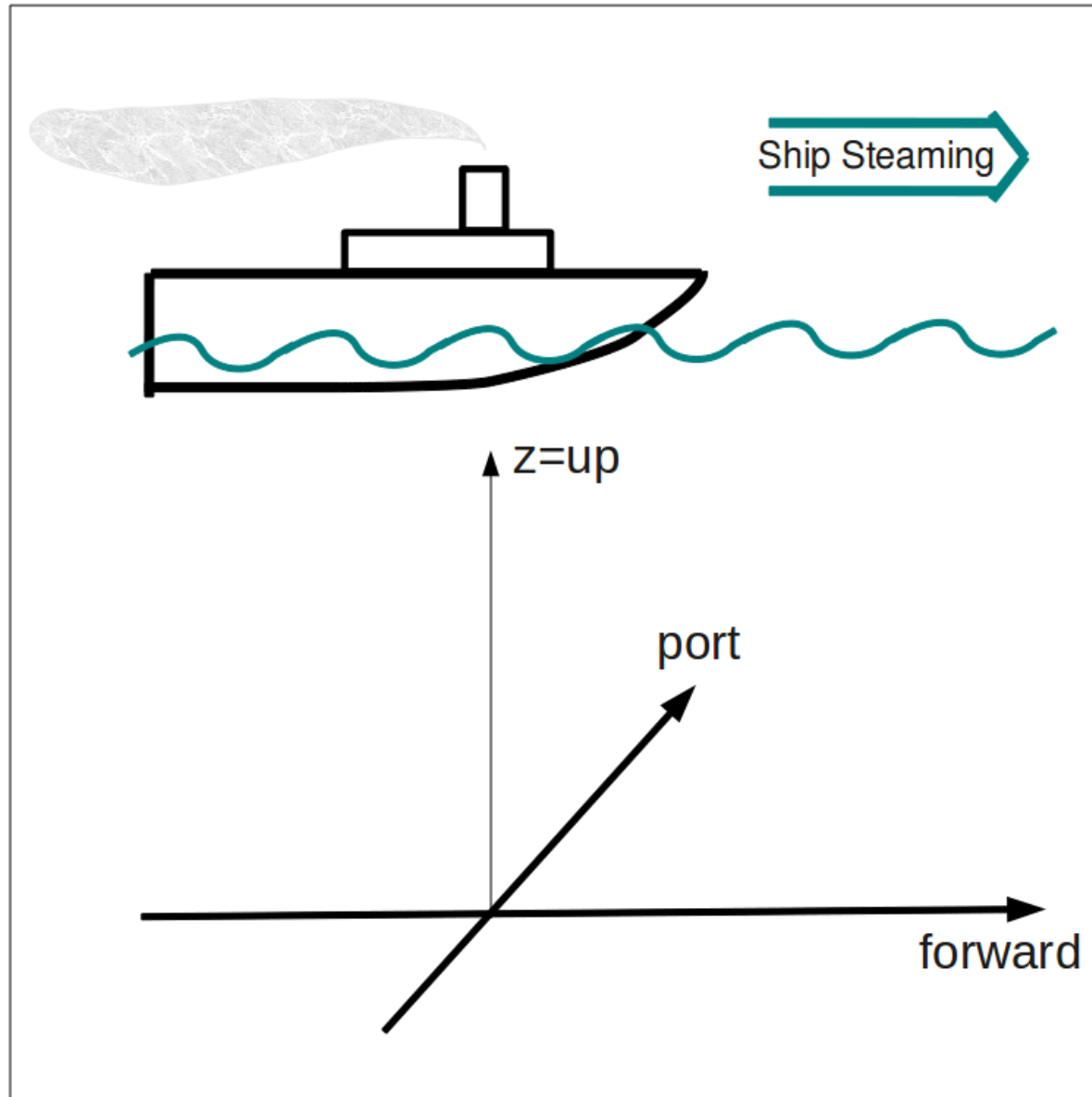
ADCP:

Acoustic
 Doppler
 Current
 Profiler
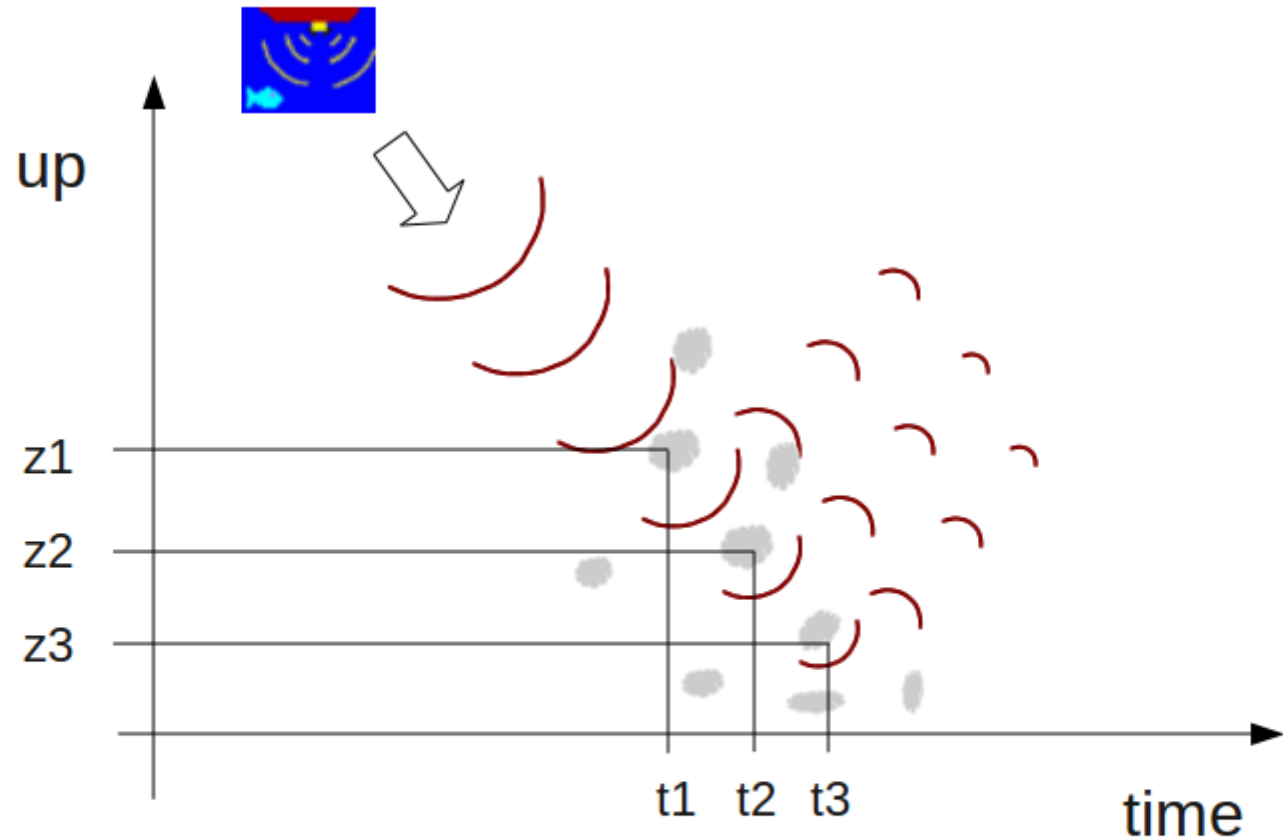
"Gating" the return over time results in "bins"
in the vertical, creating a profile of information

ADCP : Getting Ocean Currents

Plan View

Heading alignment 45deg
(beam 3 is "forward"
in instrument coordinates)

Beam1   Beam3

Ocean
Surveyor
beams

Beam4   Beam2

Ship
steaming
forward

ADCP : Getting Ocean Currents

Ship Steaming

z=up

port

forward

8: ADCP-- Current (2)

ADCP

Getting Ocean Currents

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

Ship Steaming

beam 4

beam 1

forward
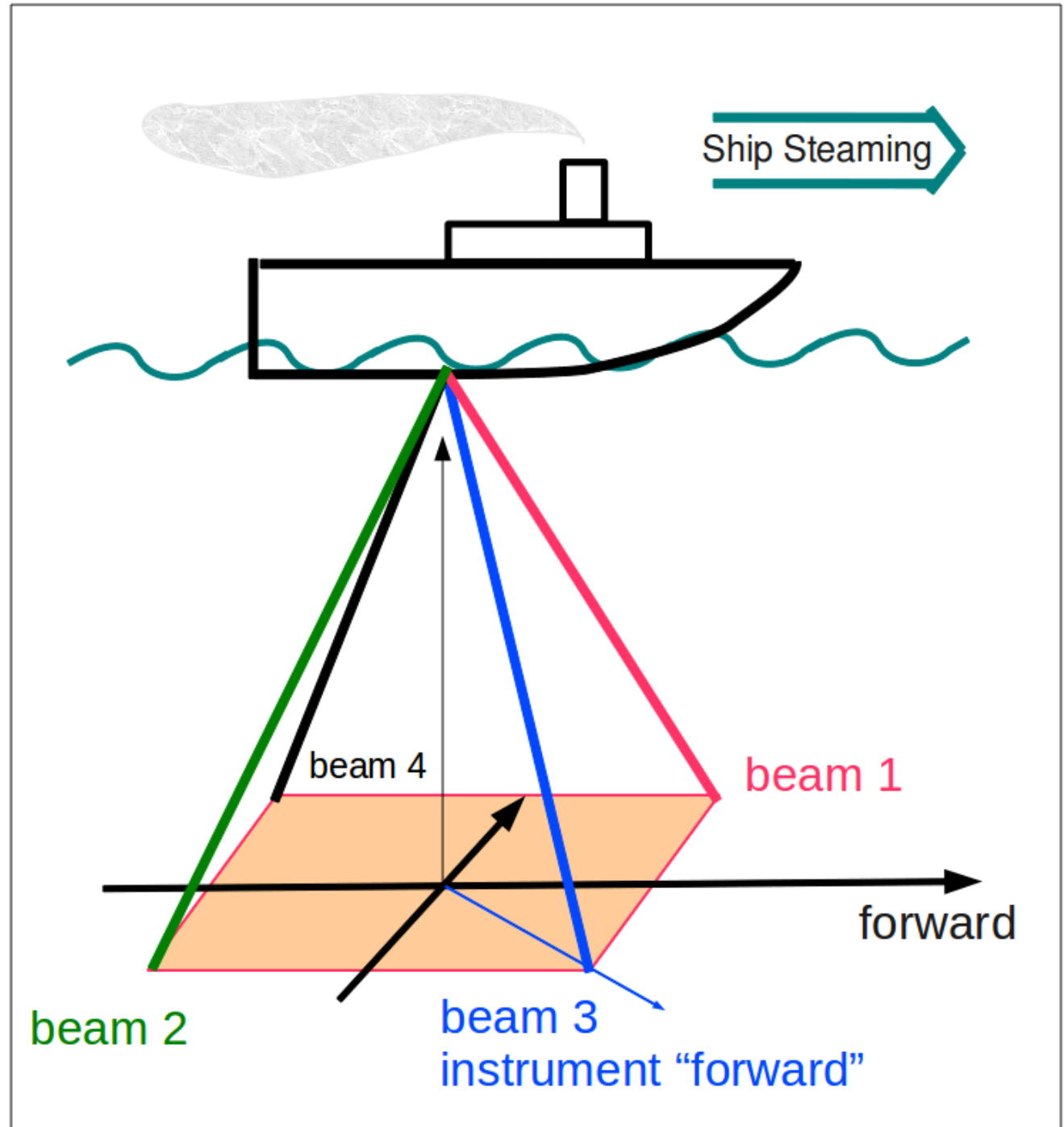
beam 2

beam 3
instrument "forward"

ADCP
Getting Ocean Currents

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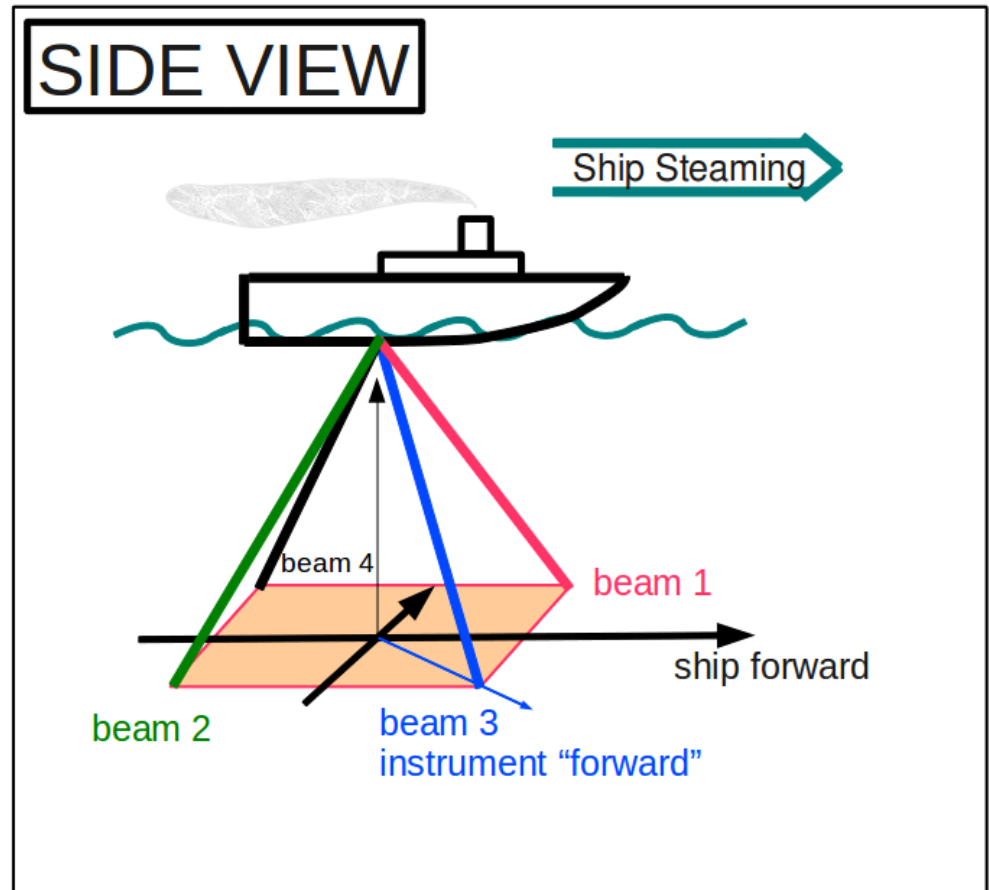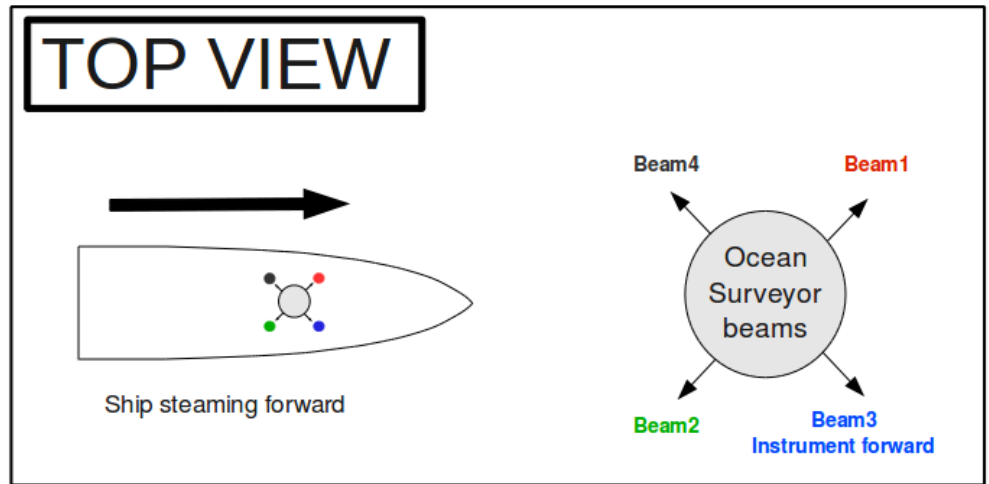- "forward beam" is #3
- usually 45deg starboard
    of forward

TOP VIEW

Ship steaming forward

Beam4　　Beam1

Ocean Surveyor beams

Beam2　　Beam3
Instrument forward

SIDE VIEW

Ship Steaming

beam 4

beam 1

beam 2

beam 3
instrument "forward"

ship forward

ADCP
Getting Ocean Currents

Two opposite beams make a vertical plane

Ship Steaming

Measured velocity

x=east
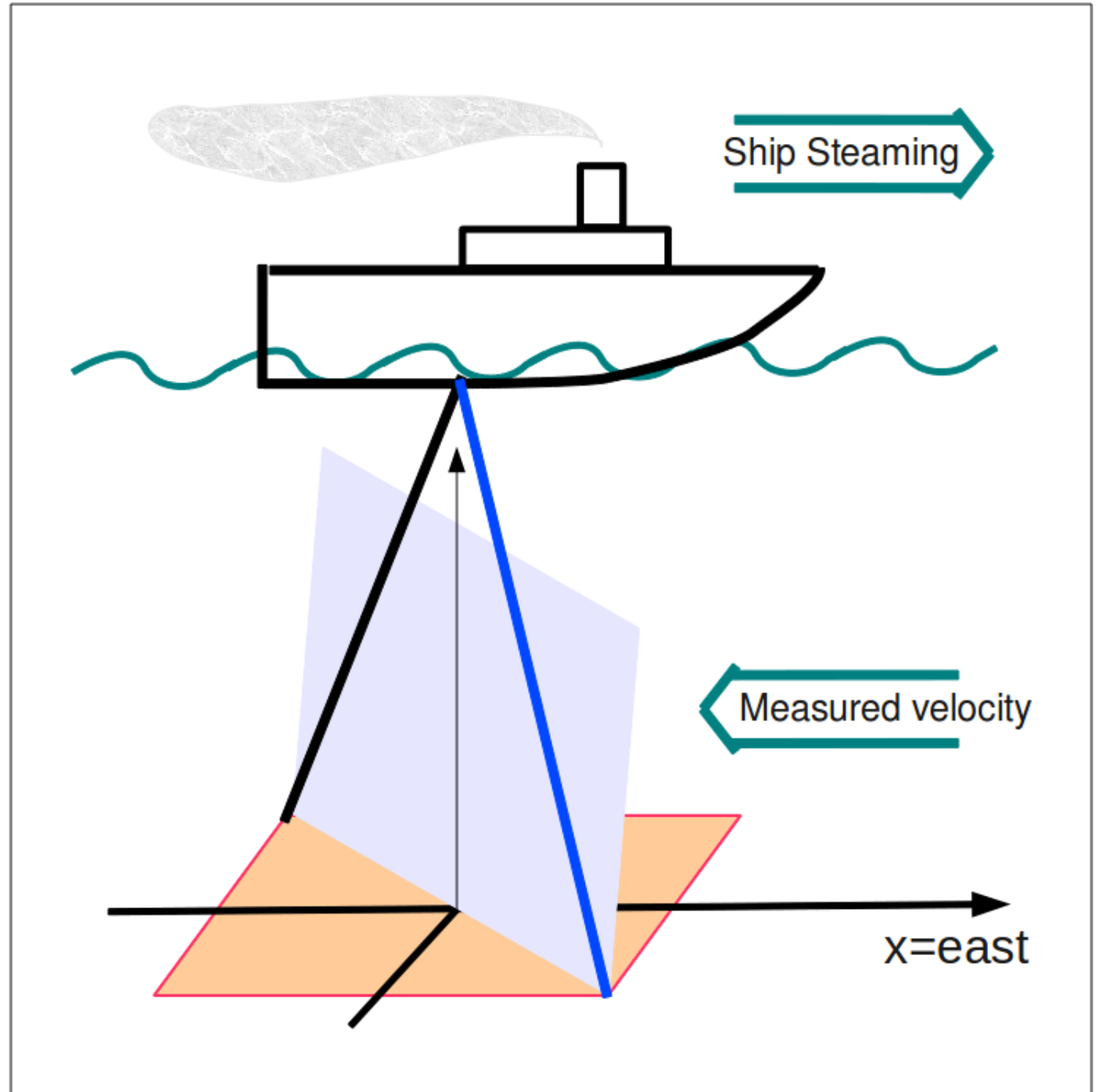
ADCP
Getting Ocean Currents

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

These are the basis of the horizontal and vertical velocitie

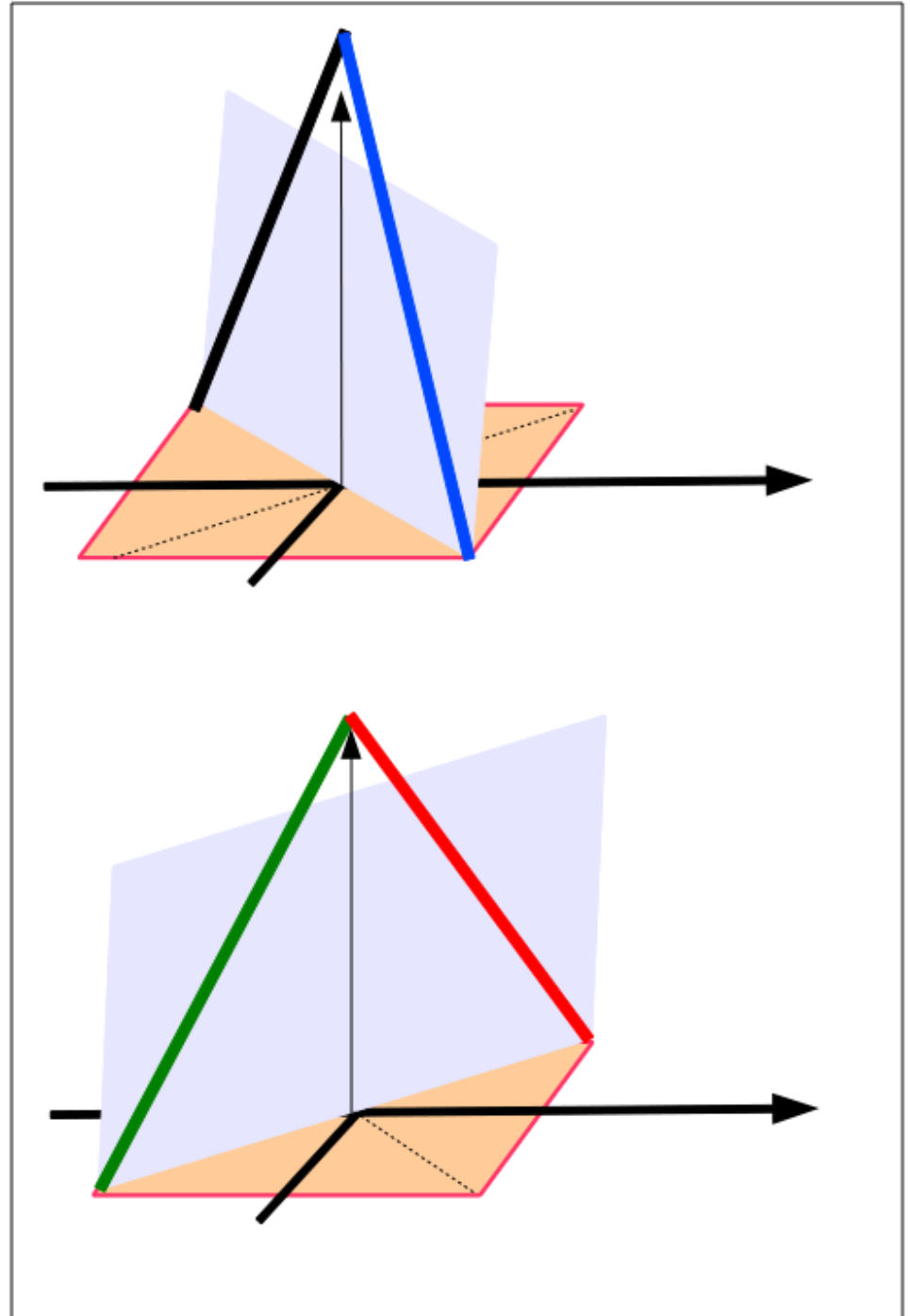Horizontal velocities will be us To get ocean velocities

Vertical velocities will be used error-checking

ADCP
Getting Ocean Currents

Two beams make one vertical plan

This shows the velocities determine by the Doppler shift:

"beam velocities"

Ship Steaming

aft beam has velocity < 0

forward beam has velocity > 0

Measured velocity
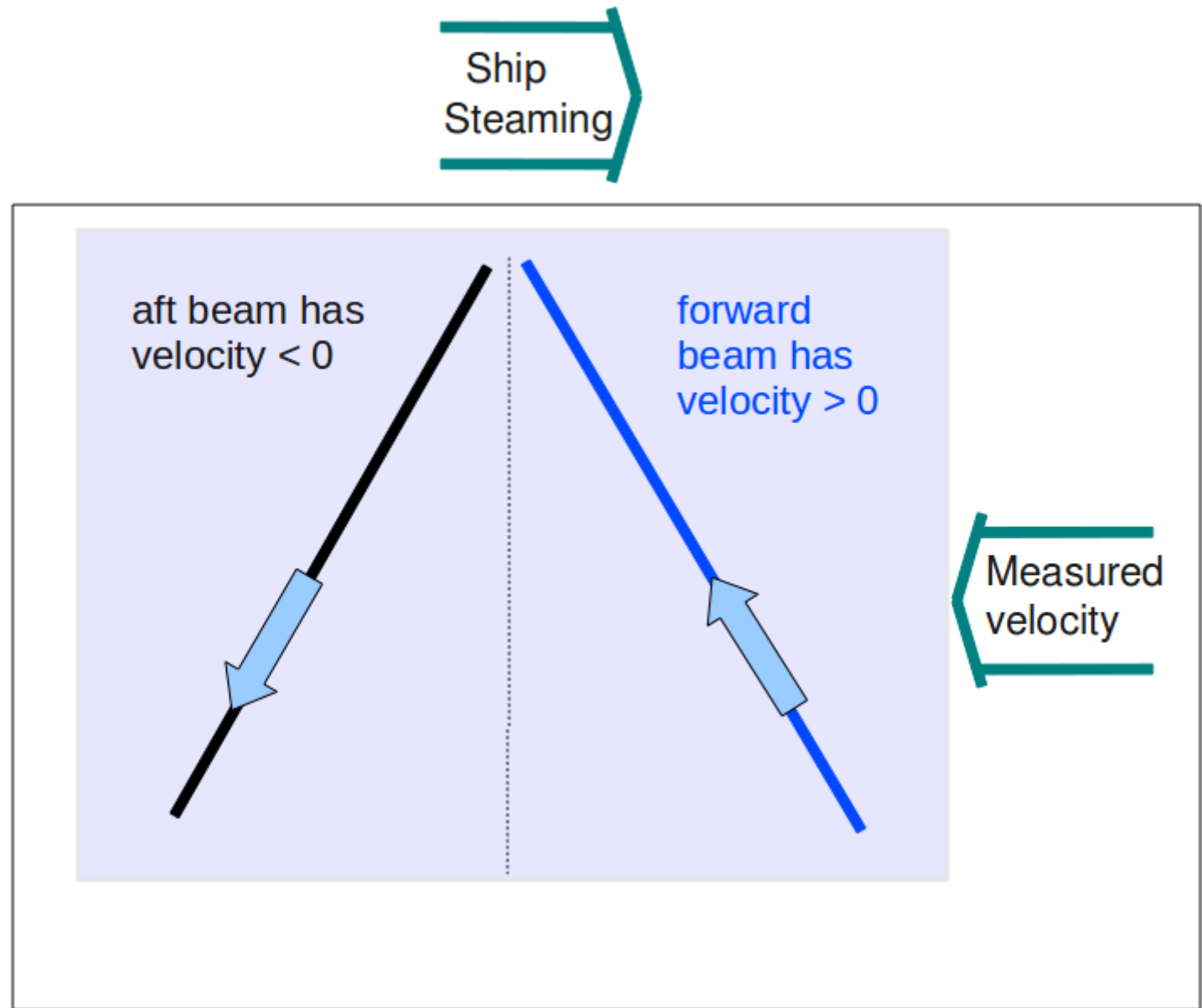
ADCP: Getting Ocean Currents

Interpret the two beam velocities one horizontal and one vertical velocity

Ship Steaming

Measured velocity
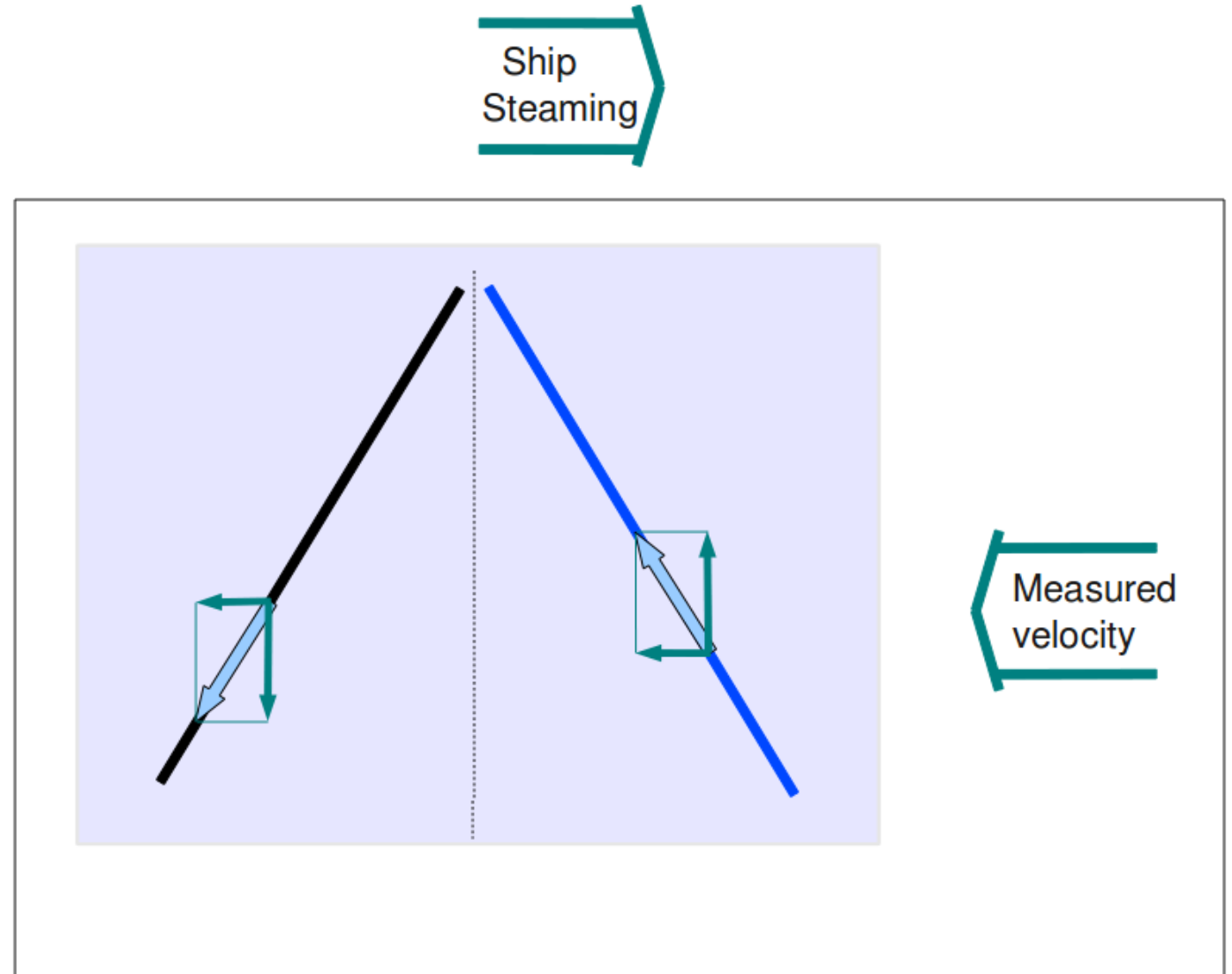
ADCP:
Getting Ocean Currents

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

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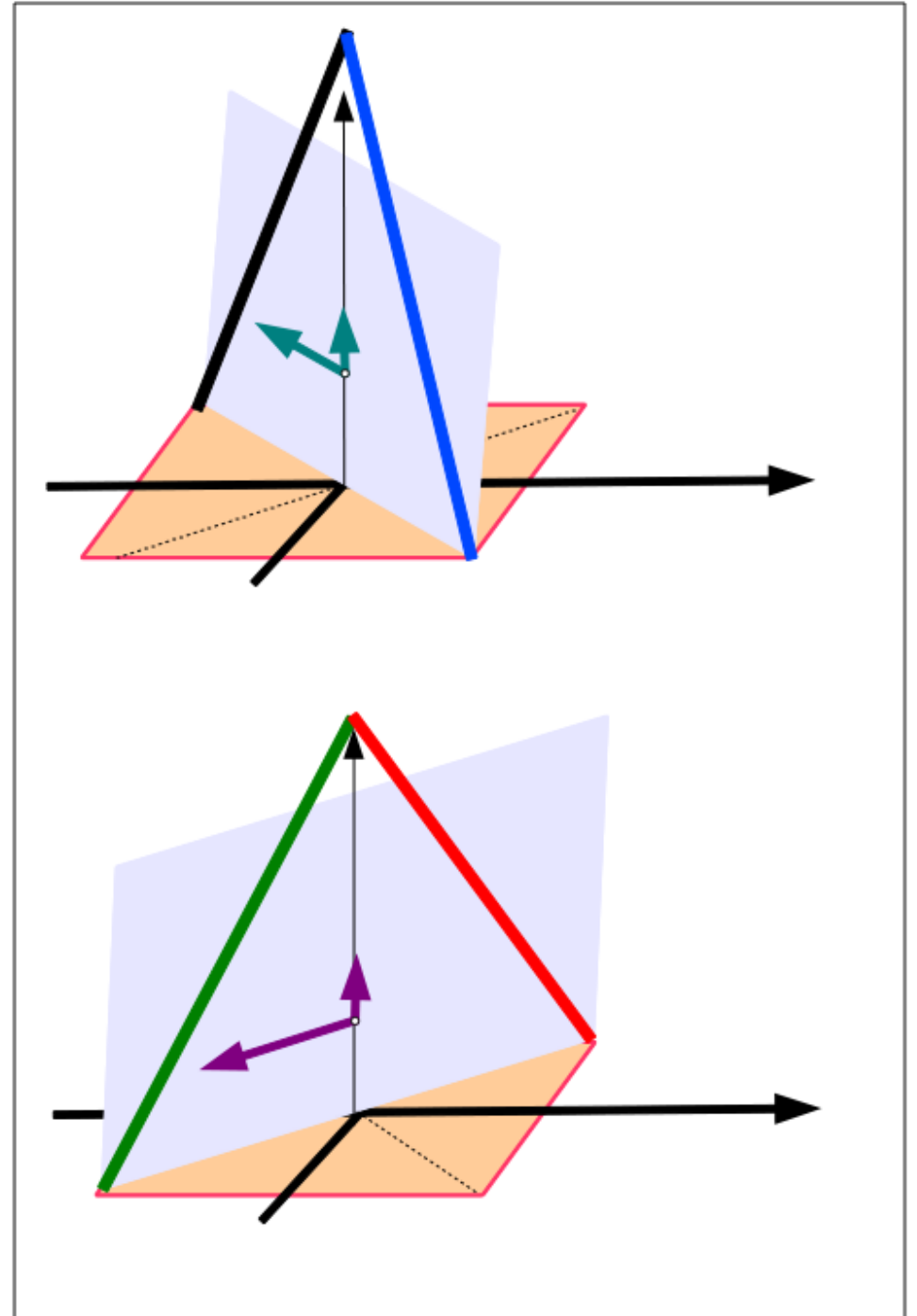
ADCP:

Getting Ocean Currents

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

(determining ocean velocities requires more steps)
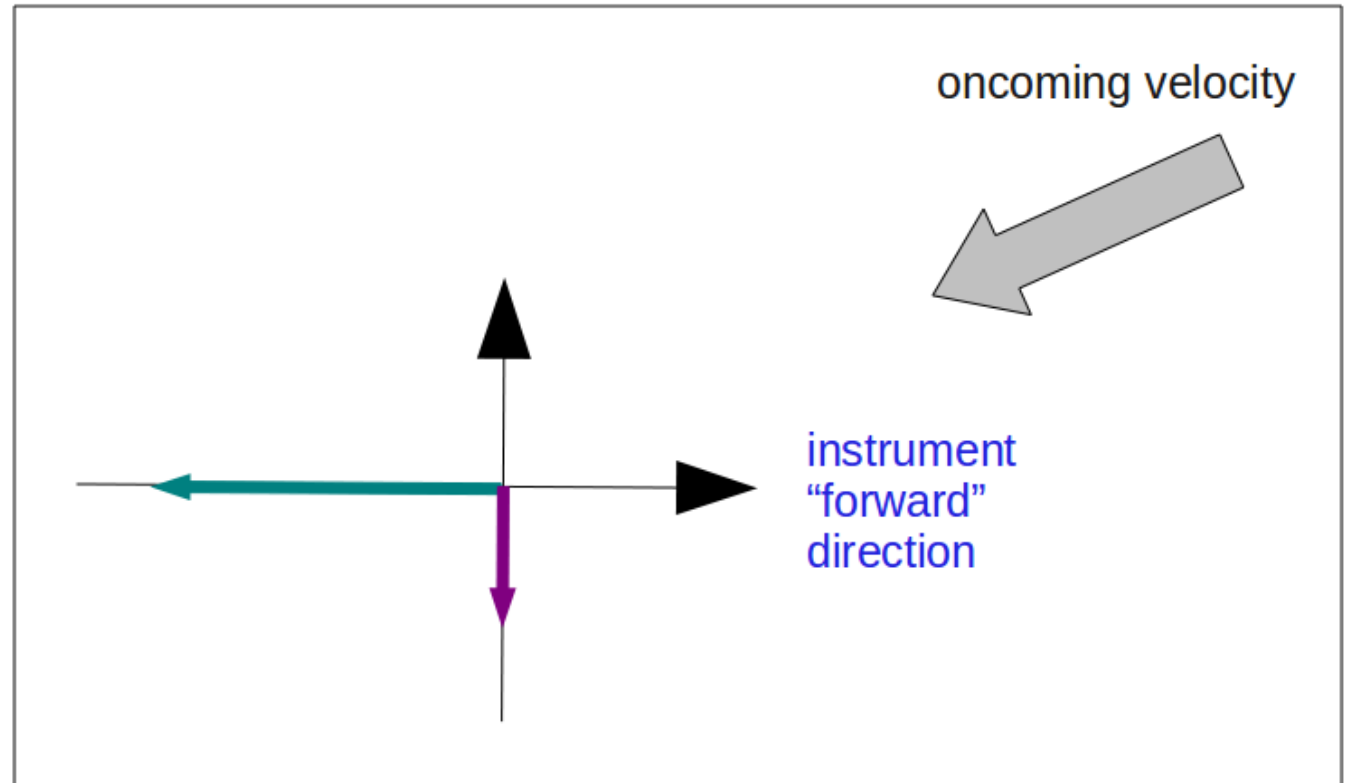
Instrument coordinates

oncoming velocity

instrument "forward" direction

ADCP:

Getting Ocean Currents

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

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

(determining ocean velocities requires more steps)

Ship coordinates
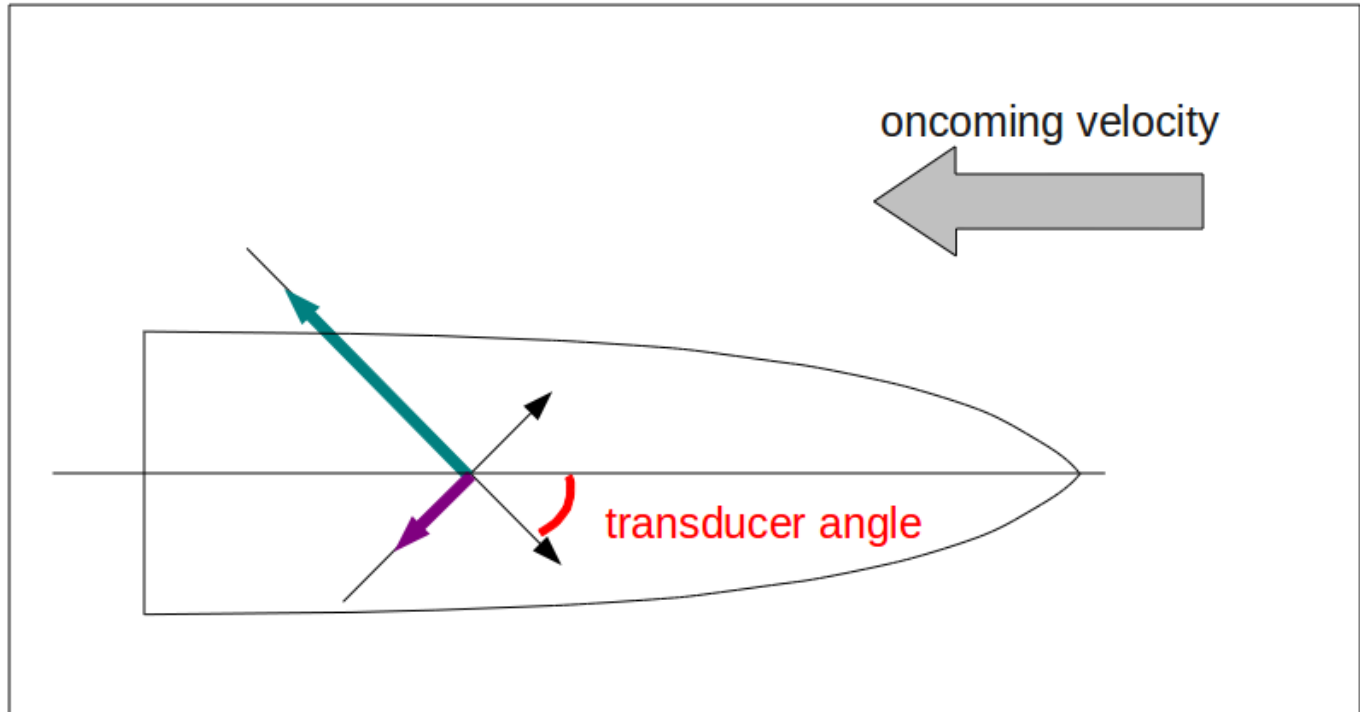
oncoming velocity

transducer angle

ADCP:

Getting Ocean Currents

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

The instrument coordinates values are rotated by the **ship's heading**.

(determining ocean velocities requires more steps)

Earth coordinates

NORTH

Ship angle = heading

oncoming velocity
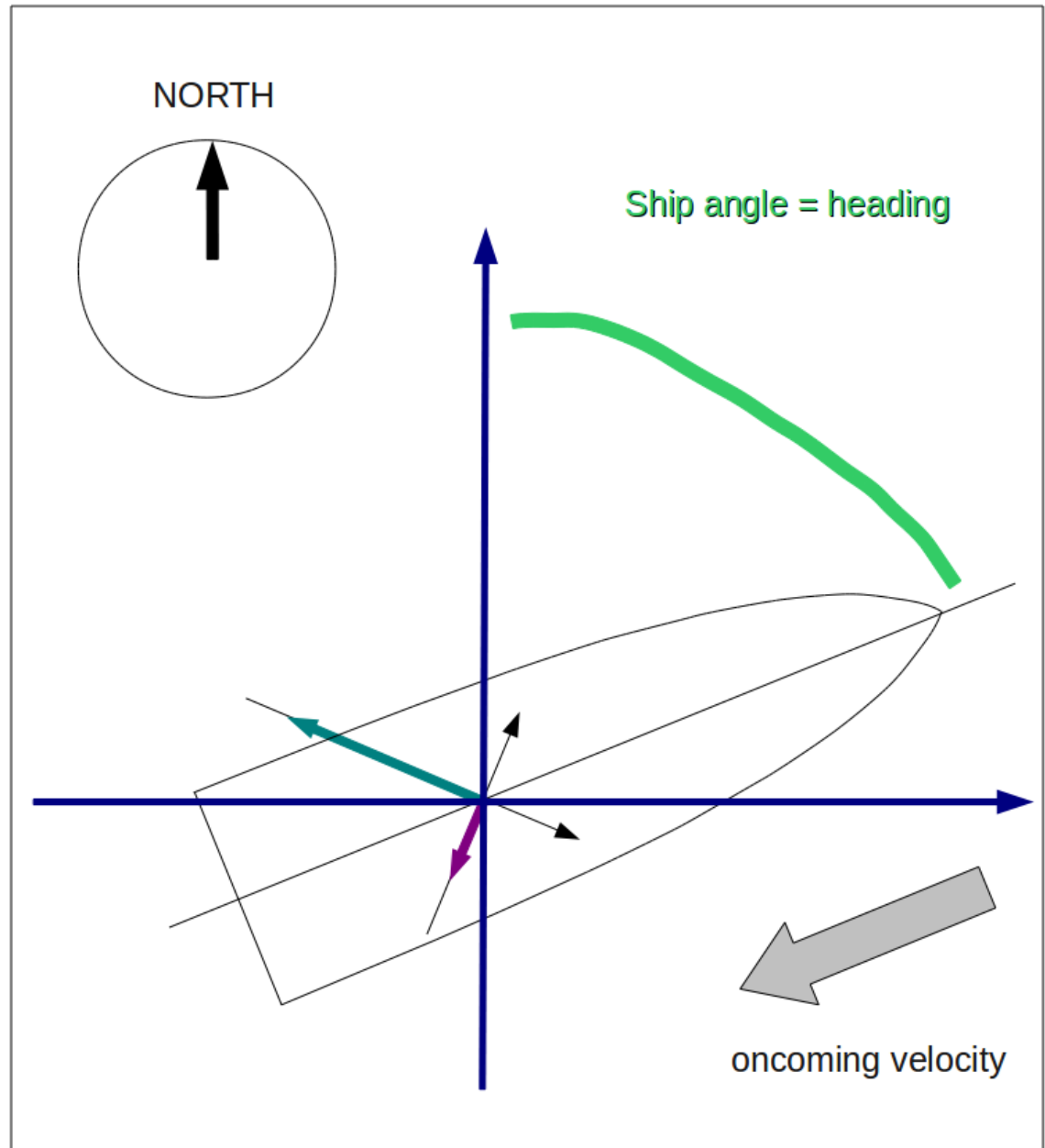
ADCP:

Getting Ocean
Currents

Summary of steps:

Doppler to beam
 (not shown)

below here: horizontal+vertical

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

beam coordinates

+ geometry

instrument coordinates:
2 horizontal, 1 vertical,
1 quality indicator

+ transducer orientation

ship coordinates

+heading

earth coordinates

measured velocity:
east, north, up, error
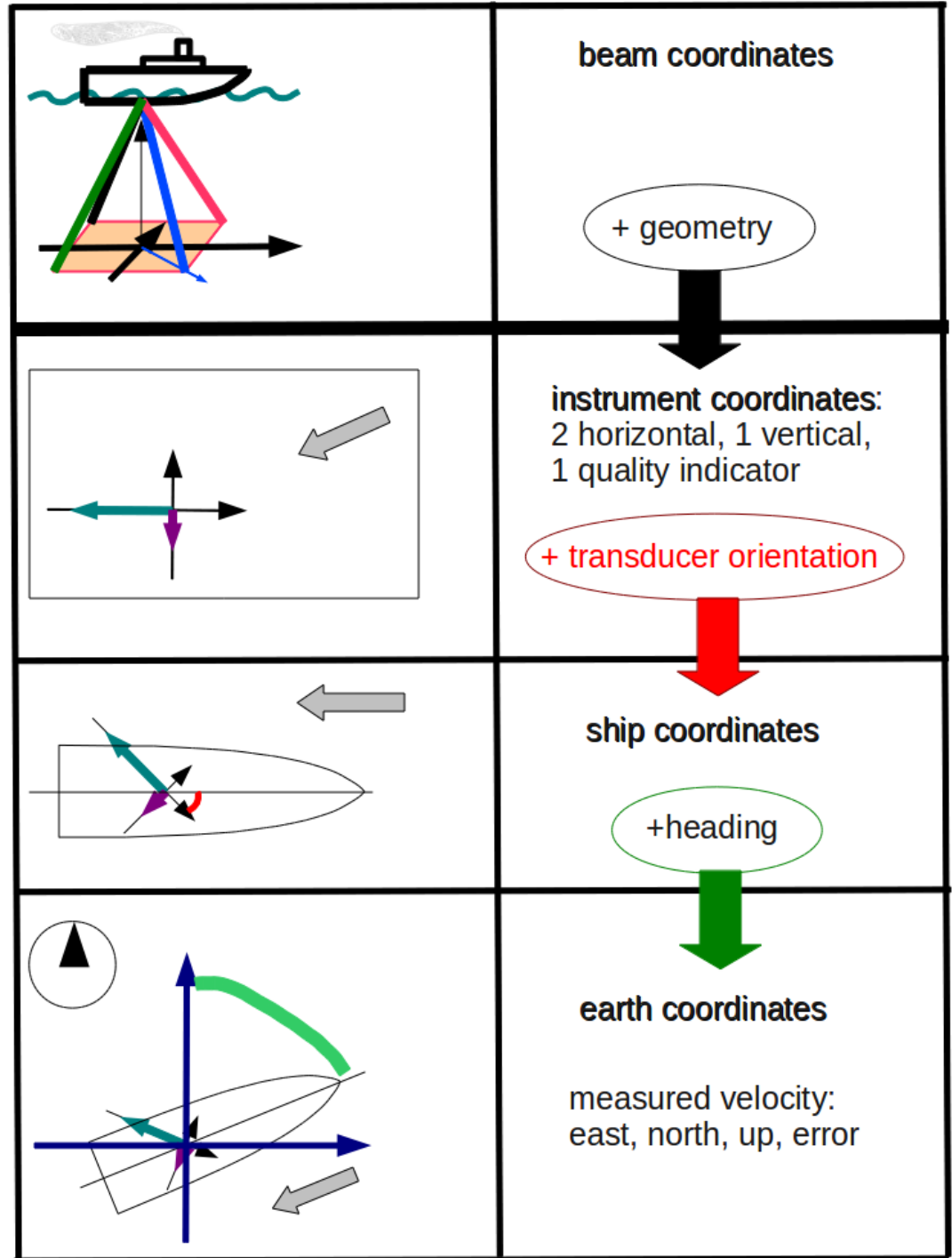
ADCP:
Getting Ocean
Currents

Earth coordinates + **GPS**
gives ship speed

add ship speed to
measured velocity
to get
ocean velocity

Earth coordinates

If no ocean currents:

Measured velocity   Ship Steaming
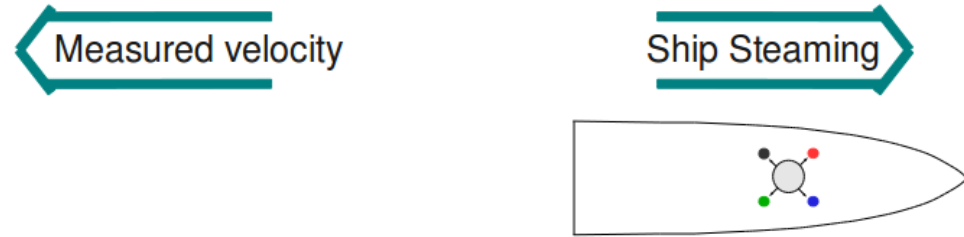
$$U_{meas} = -U_{ship}$$

With Ocean current

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

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

ADCP:

Getting Ocean
Currents

Complete summary:

beam velocities

+

transducer orientation +
+ heading

+

gps

↓
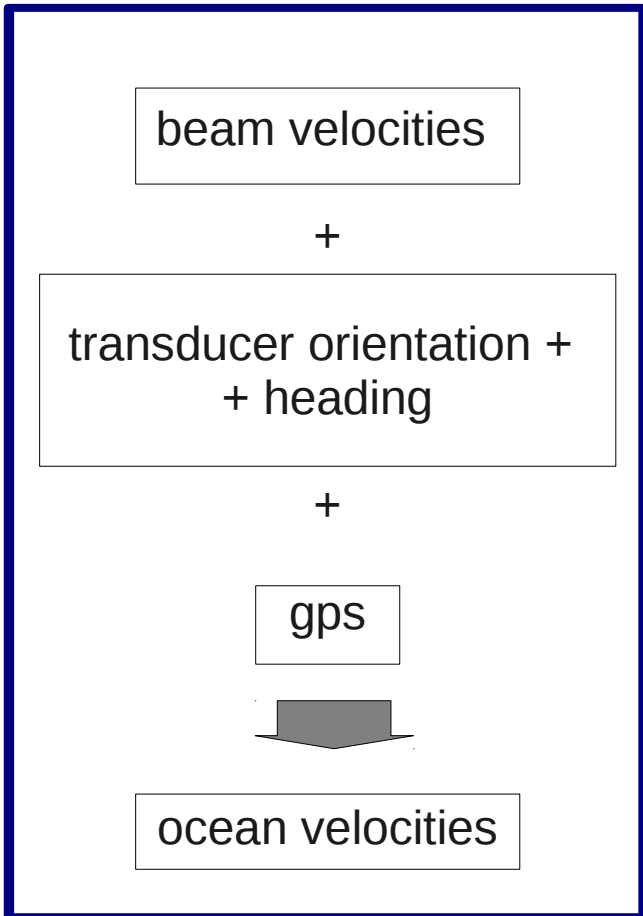
ocean velocities

Earth coordinates

With Ocean current

Measured velocity   Ship Steaming

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

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

beam velocities
geometry
transducer orientation
heading

$+$ gps
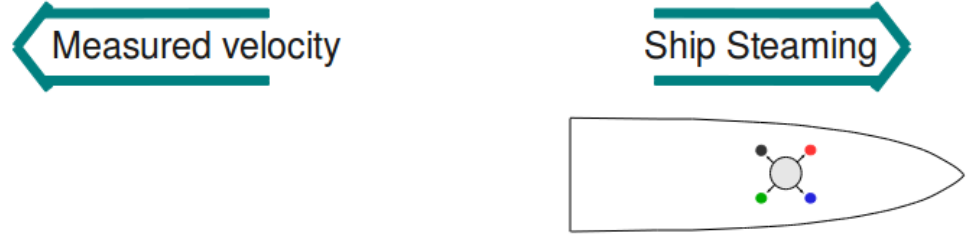
$$= U_{ocean}$$

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22: Outline

ADCP: what can go wrong

Viewed from the perspective of:

- Manifestation (symptoms)
- ADCP systems (components)

What can go wrong: "manifestation (symptom) of error"

(1) Data loss (just plain gone)

(2) Cross-track error:

- recovery requires accurate heading

(3) Along-track error:

- May indicate a serious problem

- recovery may be possible

- recovery may be incomplete

- recovery may be ambiguous

Bias towards zero in measured velocity
Alongtrack bias in ocean velocity

measured velocity
U_{meas}

ocean velocity
U_{ocean}

actual

ship speed and heading

N

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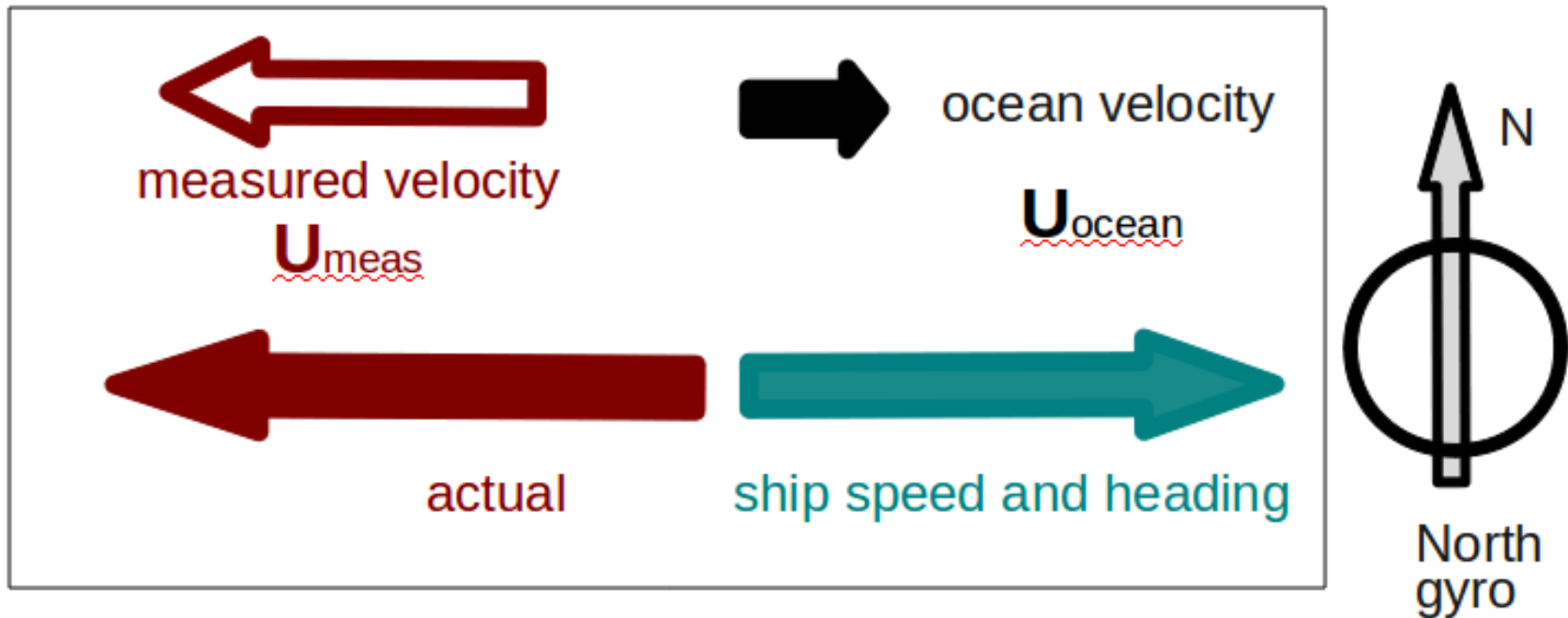
Cross-track bias in ocean velocity from angle error: (heading + transducer angle)

actual

ship speed and heading

measured velocity

U_{meas}

ocean velocity

U_{ocean}

gyro in error
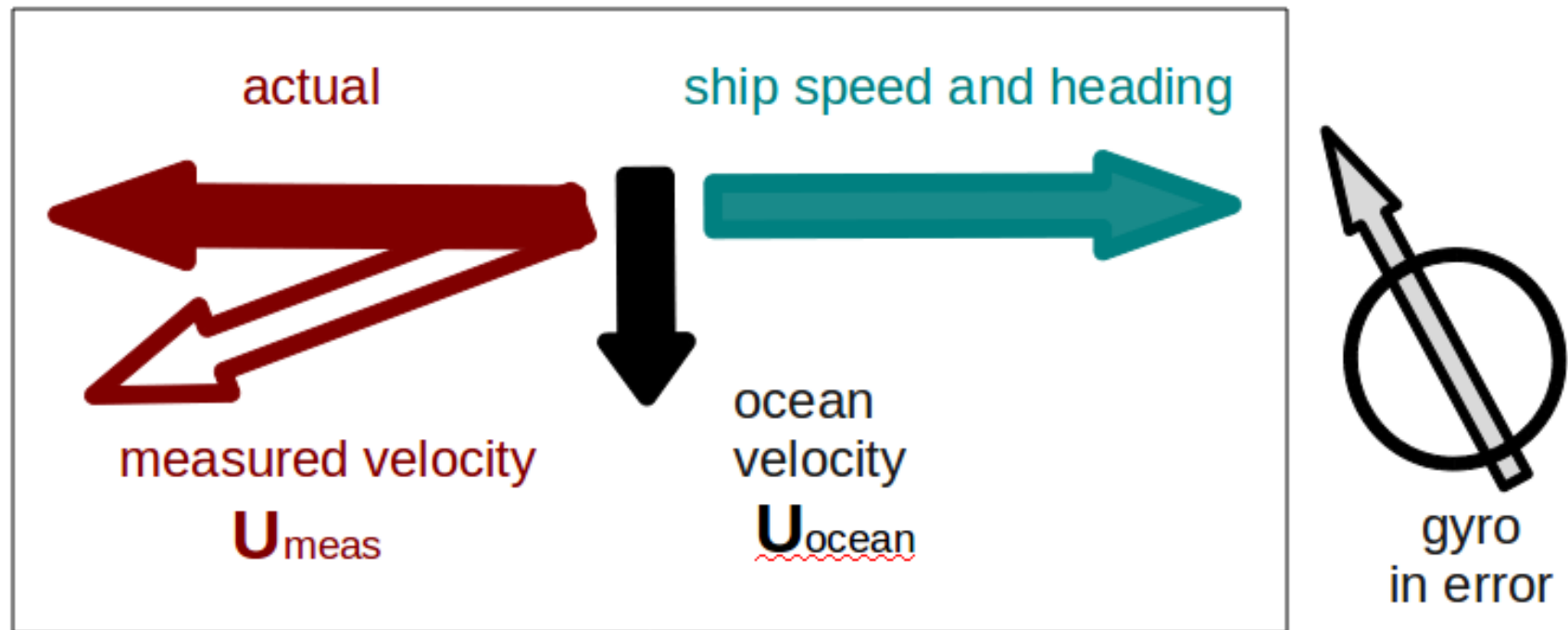
What can go wrong:
ADCP Systems

- ADCP fails

LOSS

- Acquisition or computer fails

- Complete loss/failure of GPS

LOSS

- ADCP simple data loss/degradation

- ADCP (data damaged)

Scale factor(usually)

- Loss/failure of attitude

Cross-track error

- unexpected calibration change

ADCP: data loss, degradation (1) degraded range and coverage

Bubbles
Acoustic noise
Ice
Thick window
Ringing

beam velocities

+

transducer orientation
+
heading

+

GPS

ocean velocities

Solution:
  Improve the installation
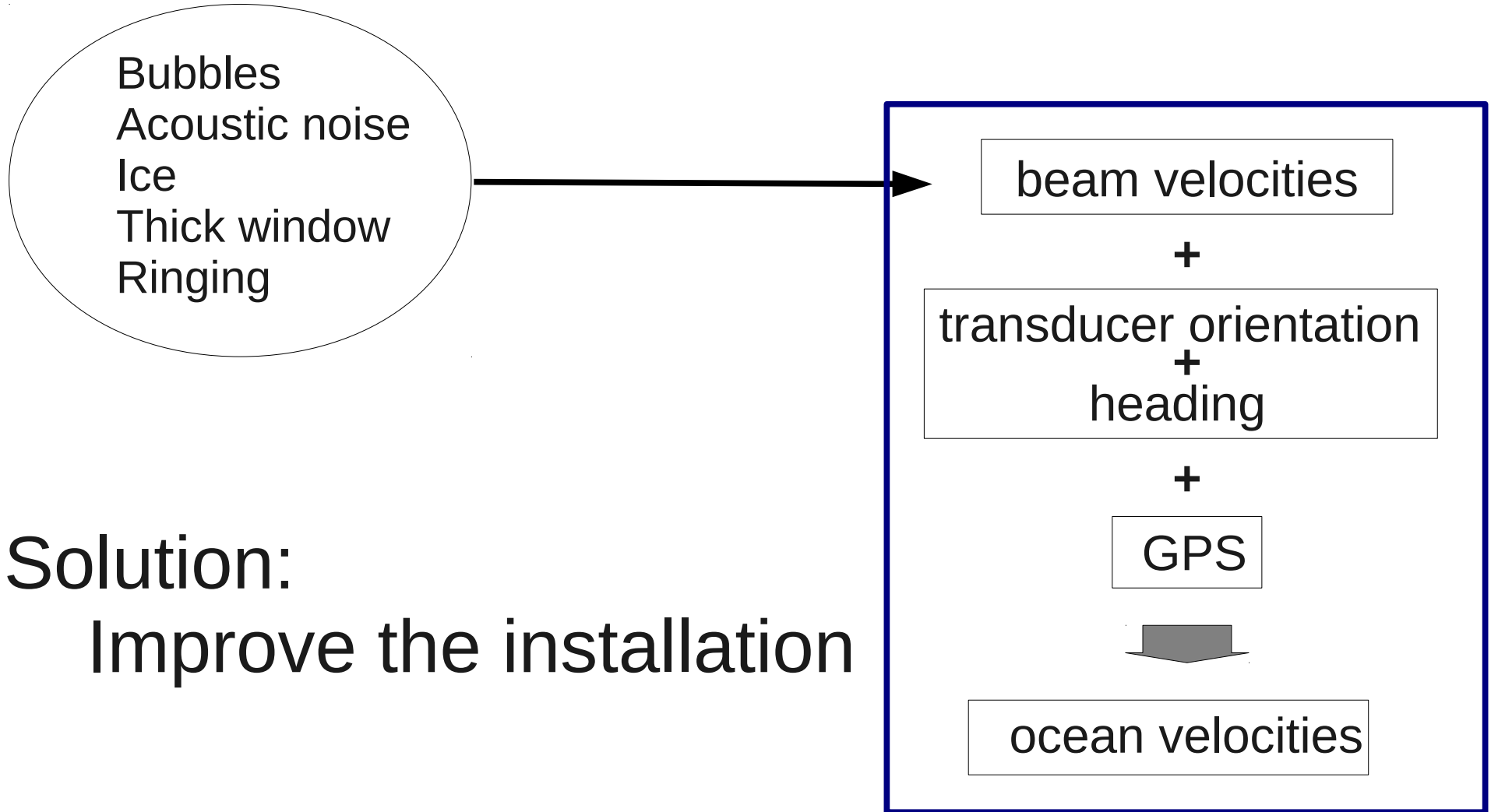
ADCP: data loss, degradation
(2) remaining data compromised

Bubbles
Electronic noise
Acoustic noise
Ice
Thick window
Ringing

Solution:
Edit out bad data
Review what remains

beam velocities

+

transducer orientation
+
heading

+

GPS
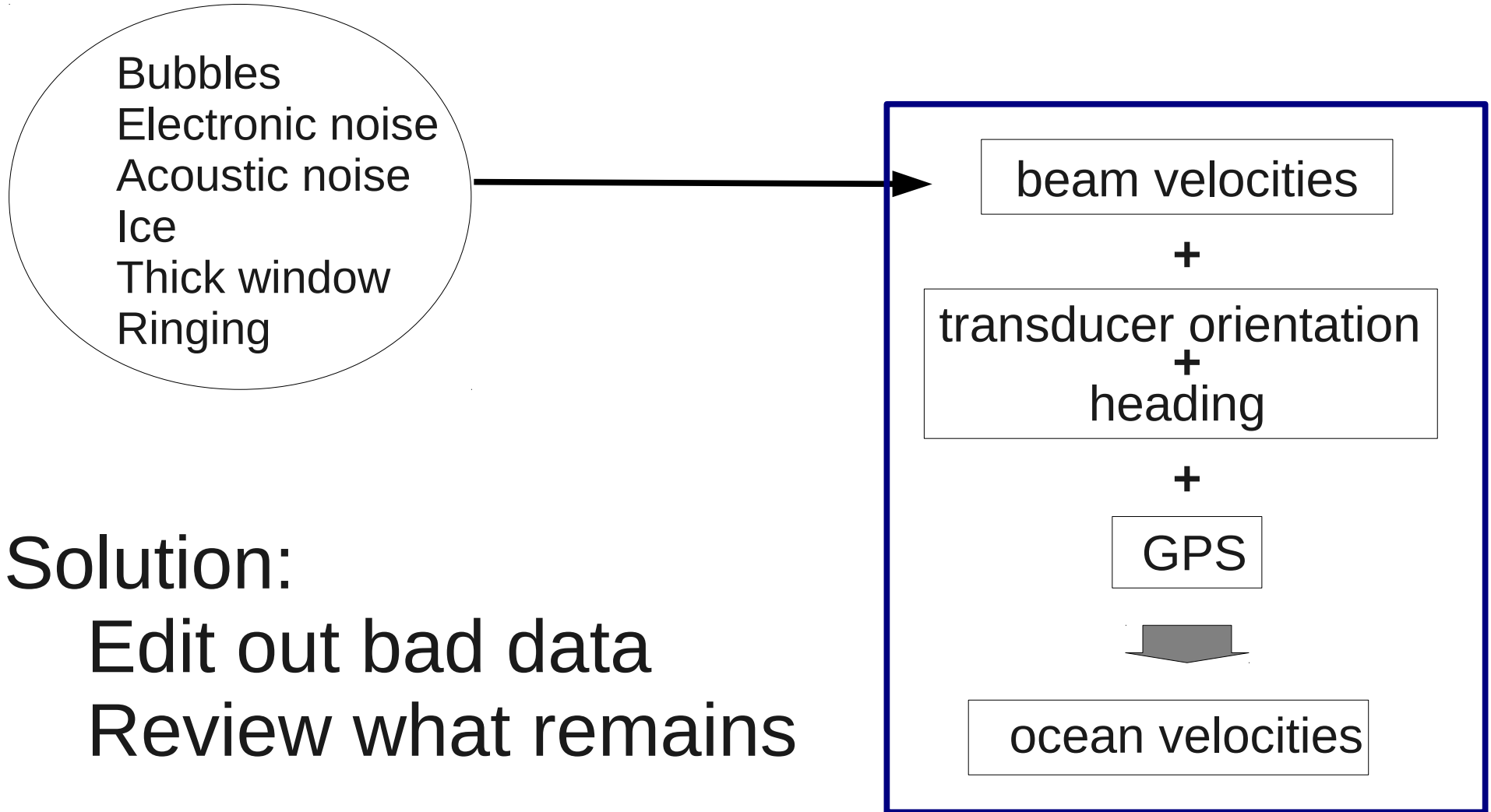
ocean velocities

Loss or failure of accurate heading

1deg error in heading

10cm/s error in ocean velocity

Diagnostic:
 Cross-track error

beam velocities
+
transducer orientation
+
heading
+
GPS
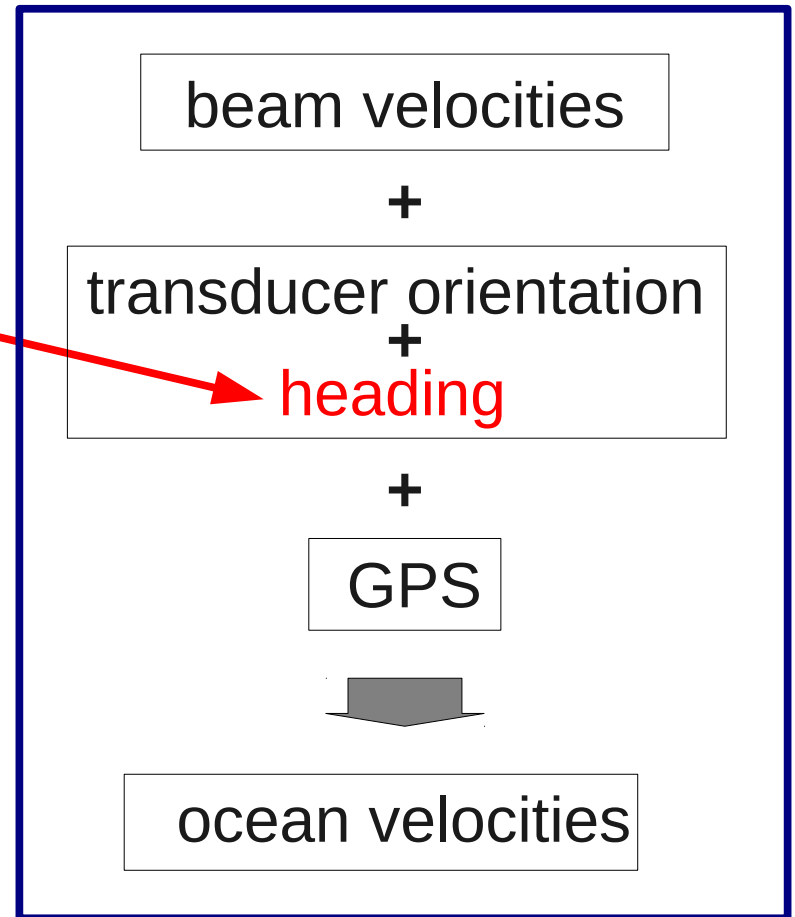
ocean velocities

Transducer misalignment (wrong angle)

1deg error in heading
⇕
10cm/s error in ocean velocity

Diagnostic:
  Cross-track error

beam velocities

+

transducer orientation
+
heading

+

GPS

ocean velocities
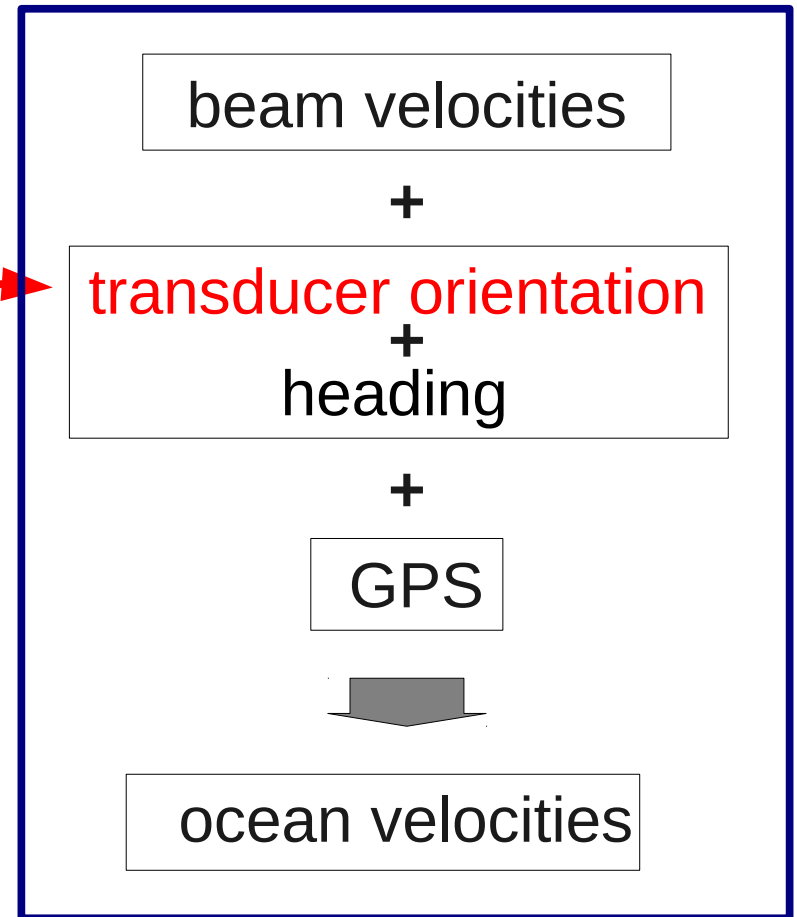
Loss or failure of GPS

No positions = BAD
No time = BAD

Solution:
  Record multiple GPS
  Switch to 2nd GPS
  Reprocess with 1st

beam velocities
+
transducer orientation
+
heading

+

GPS

ocean velocities
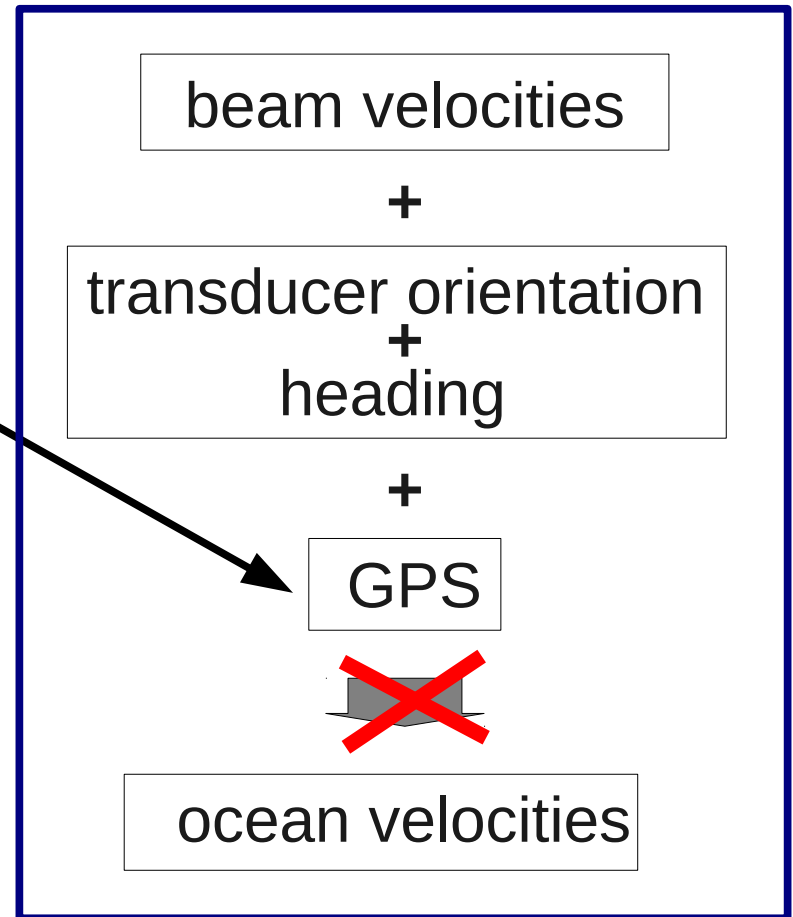
Examples in data of...

- Heading error
- Scale factor
- Acoustic interference
- Underway bias (bad weather)

Calibration: angle error -3.6deg

34: Errors
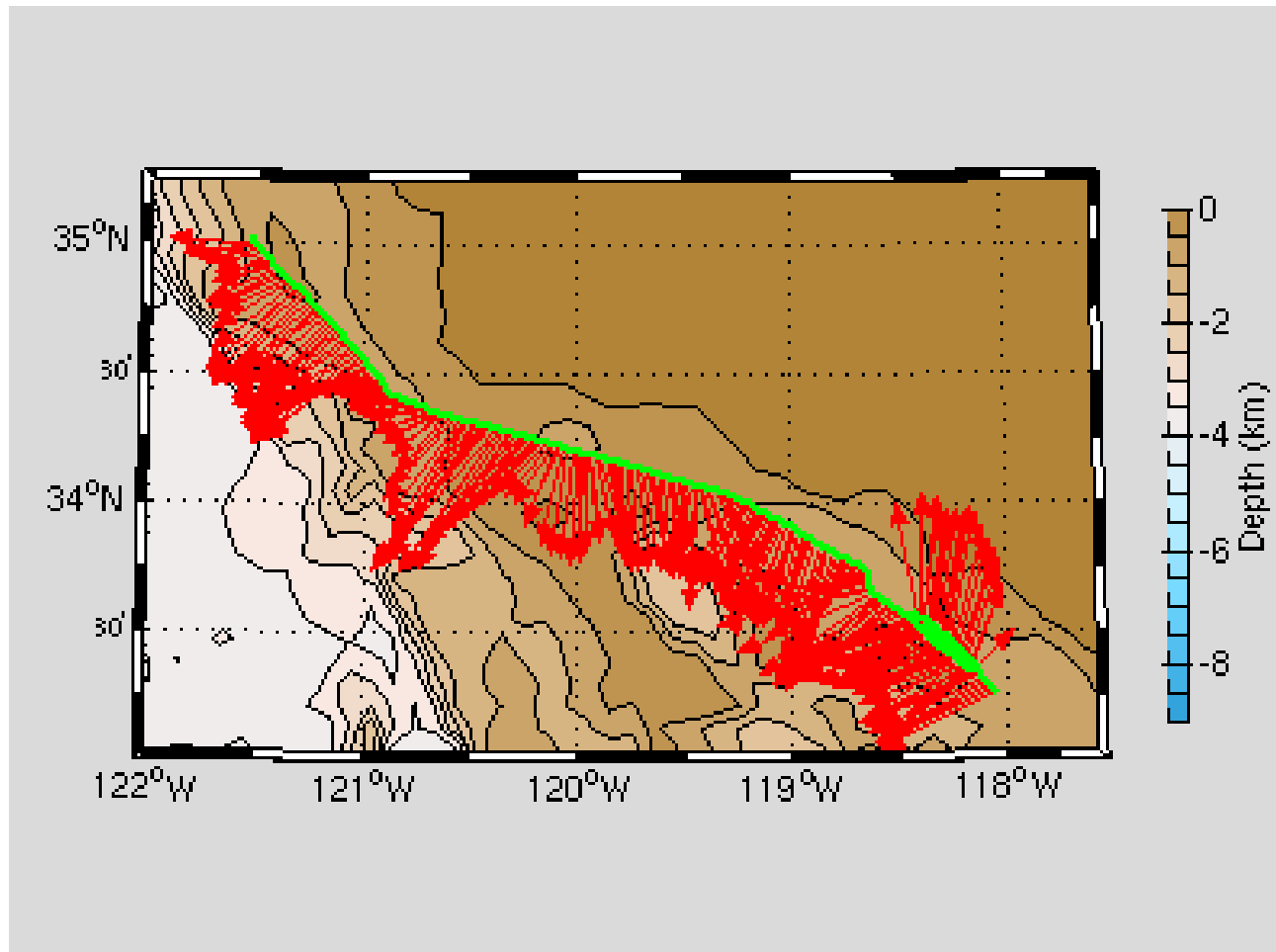
Calibration: angle error -1.6

35: Errors
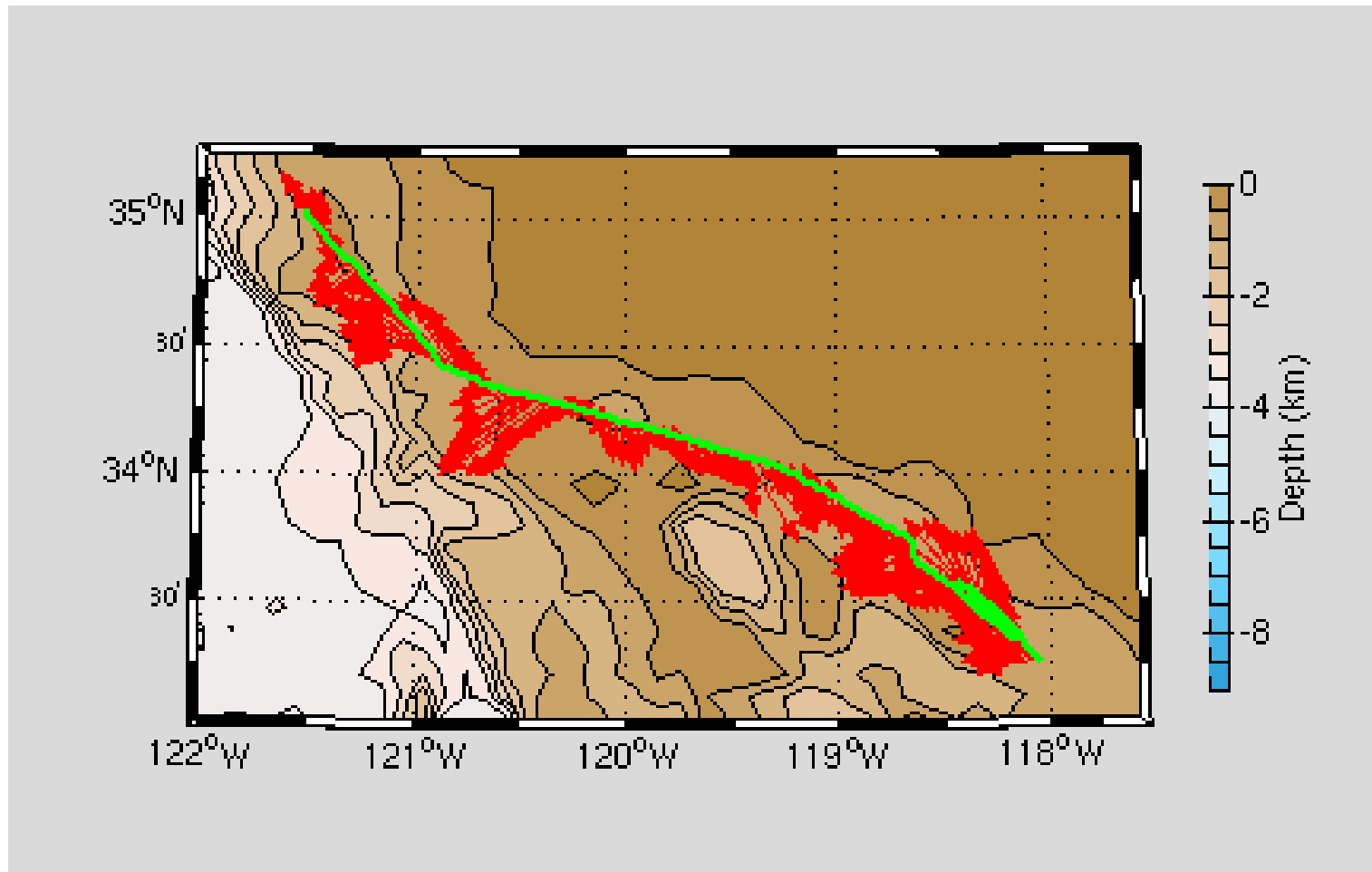
Calibration: angle error 0.4

36: Errors
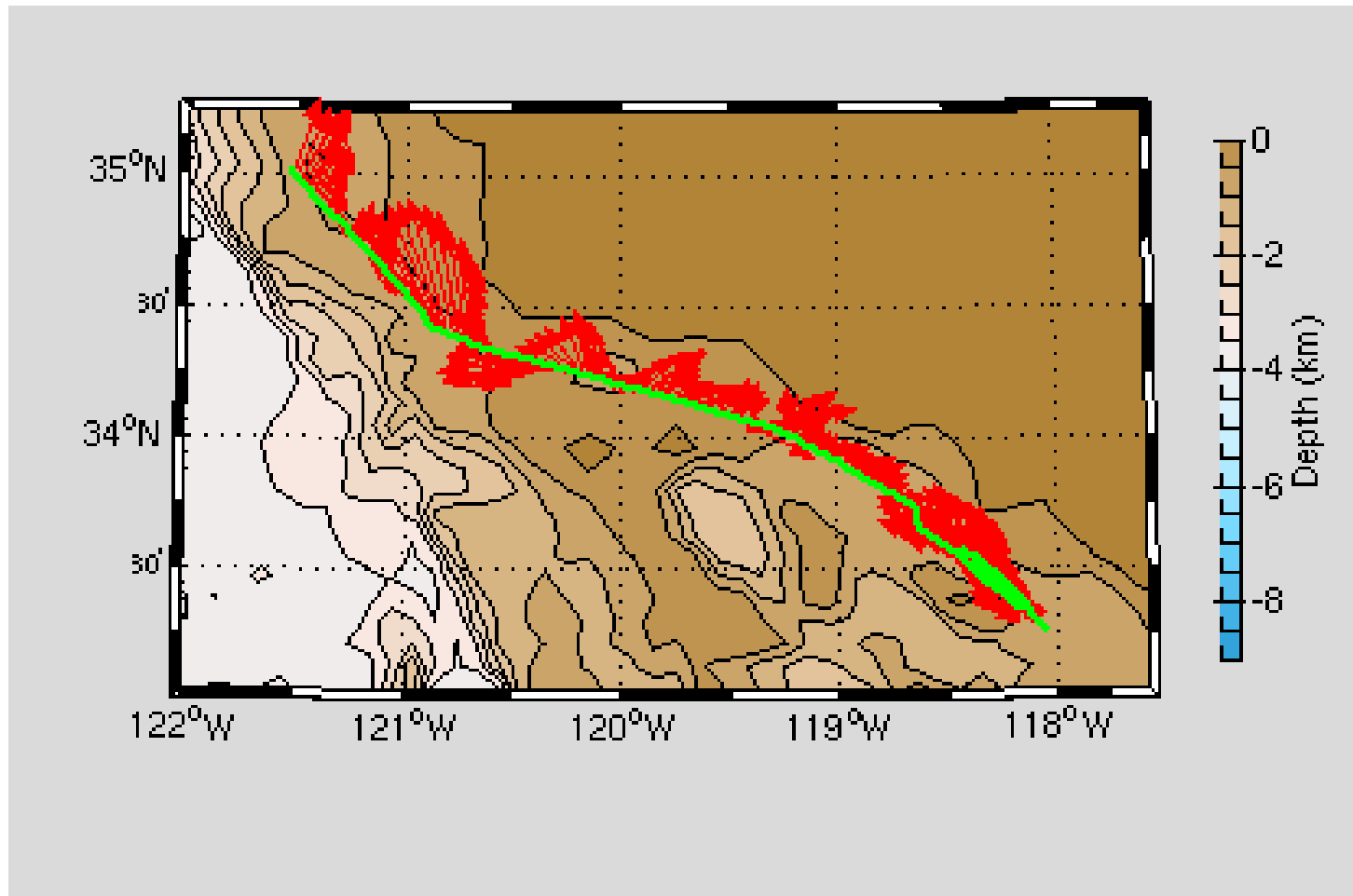
Is this a heading error?

37: Errors
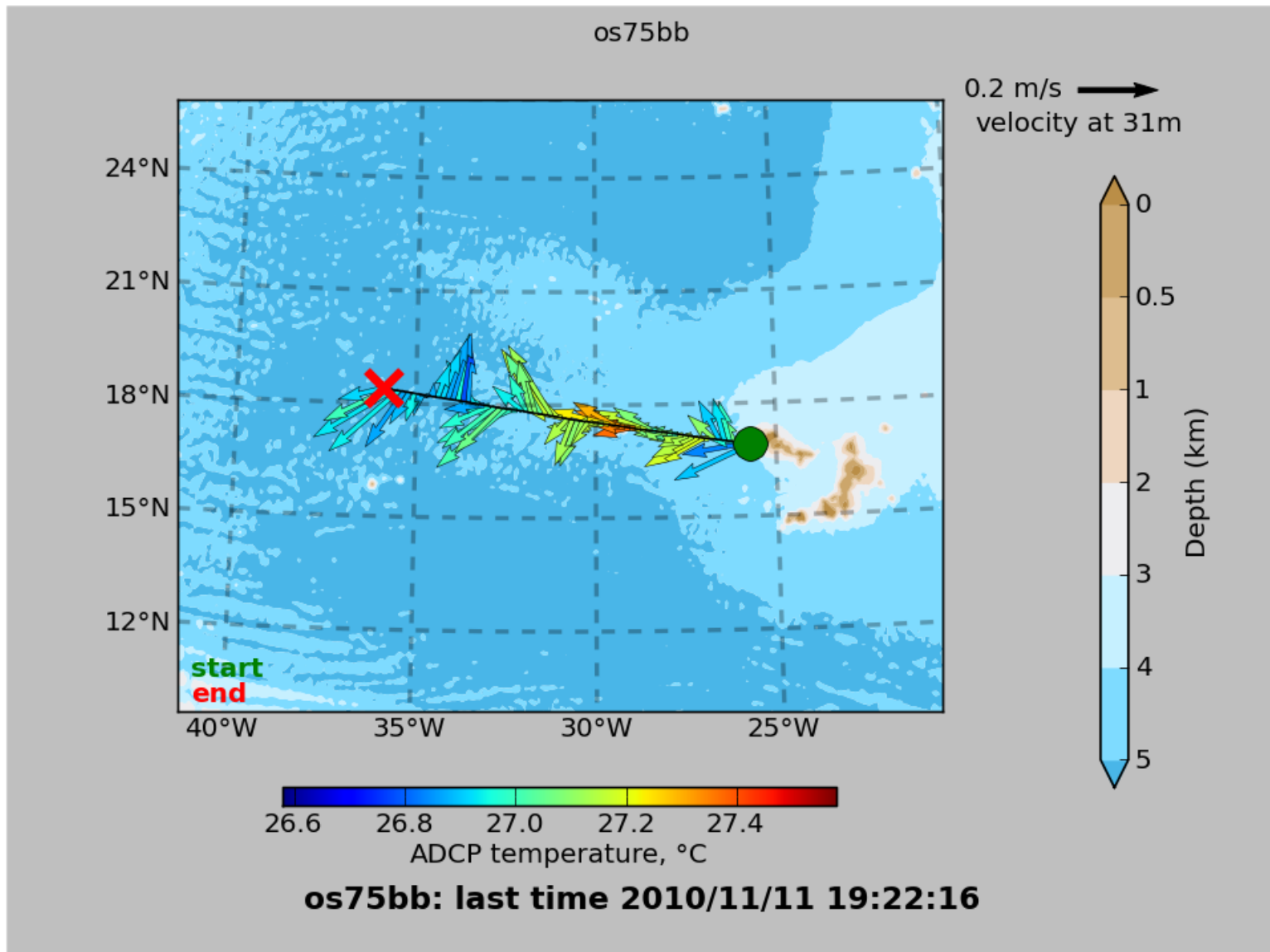
Contour plot:

Is this cross-track signal
(stripes in N/S ocean velocity)
due to a heading error?

Ocean U (east)

Ocean V (north)
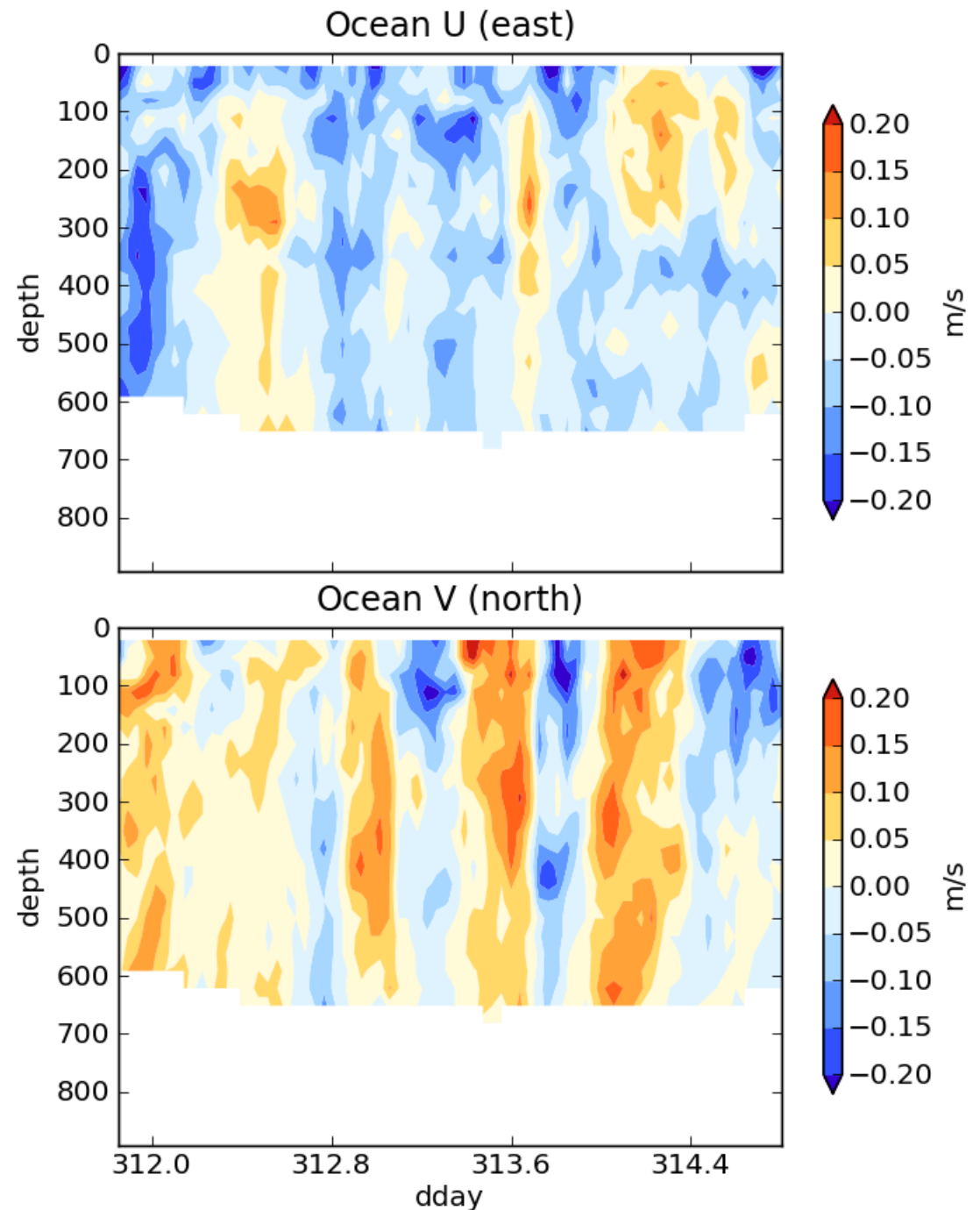
os75bb: last time 2010/11/11 19:22:16

Answer

Actually, it's really the ocean, but we can't tell without knowing the quality of the accurate heading device.

scale factor: alongtrack bias
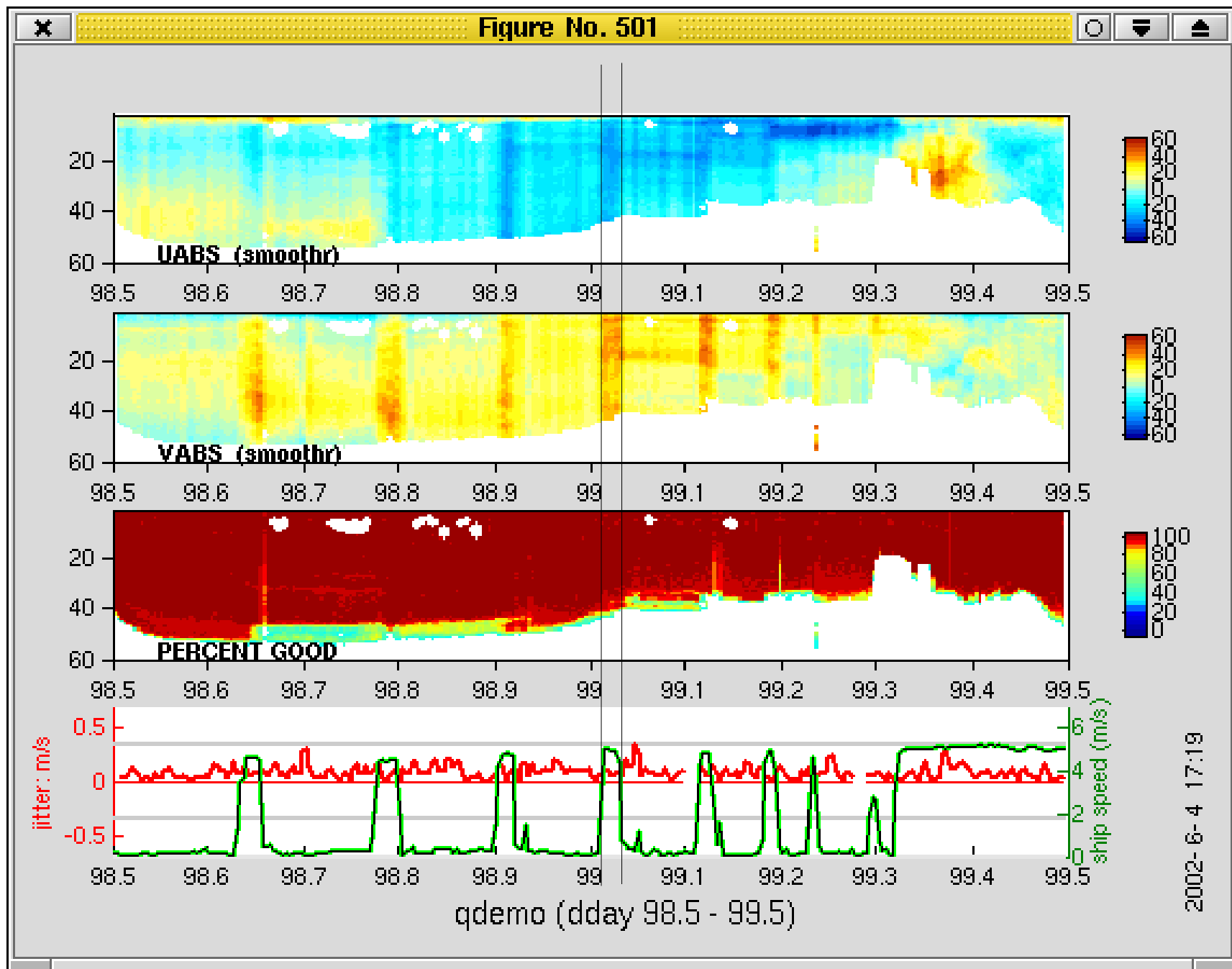
After scale factor applied
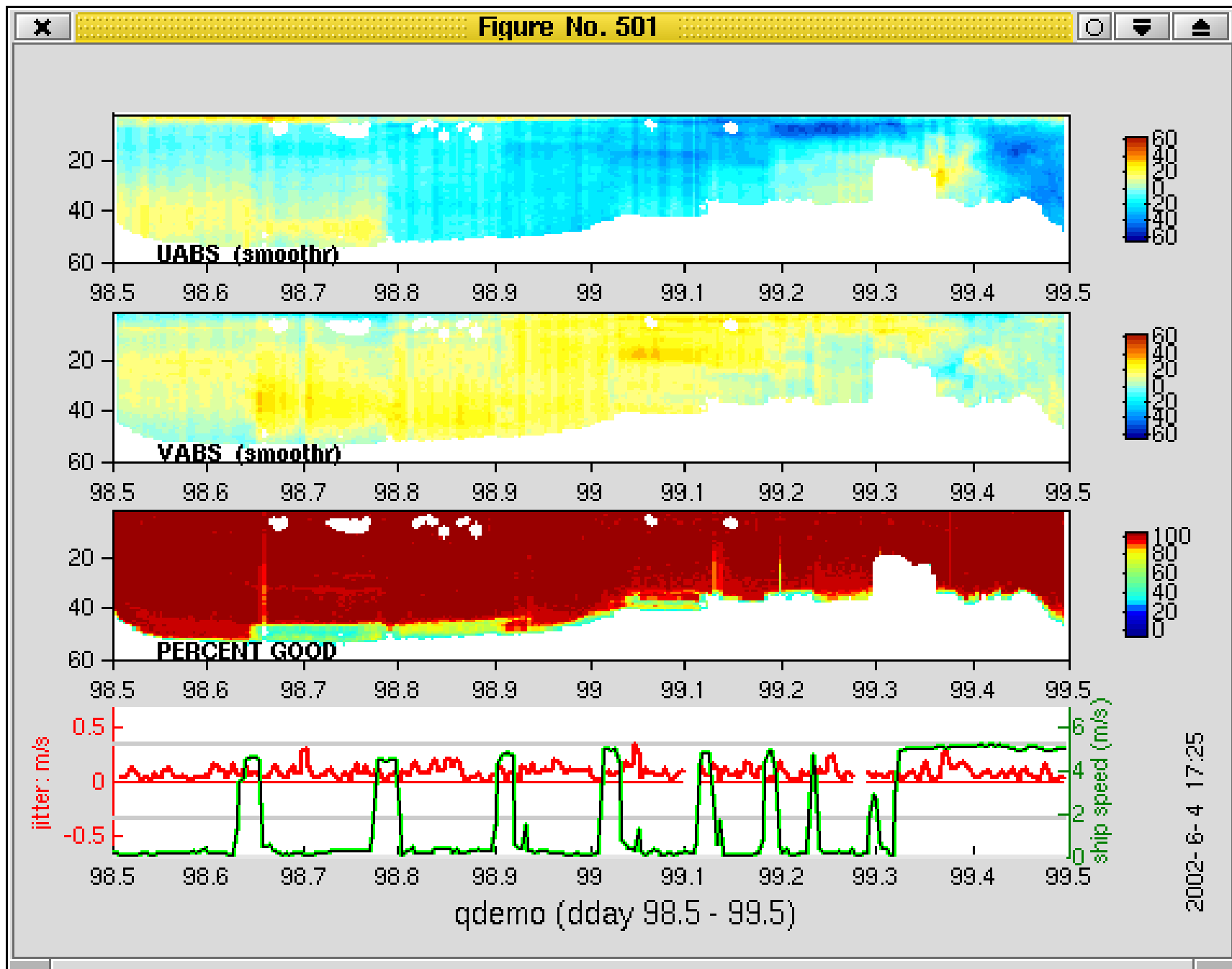
Acoustic Interference: single ping
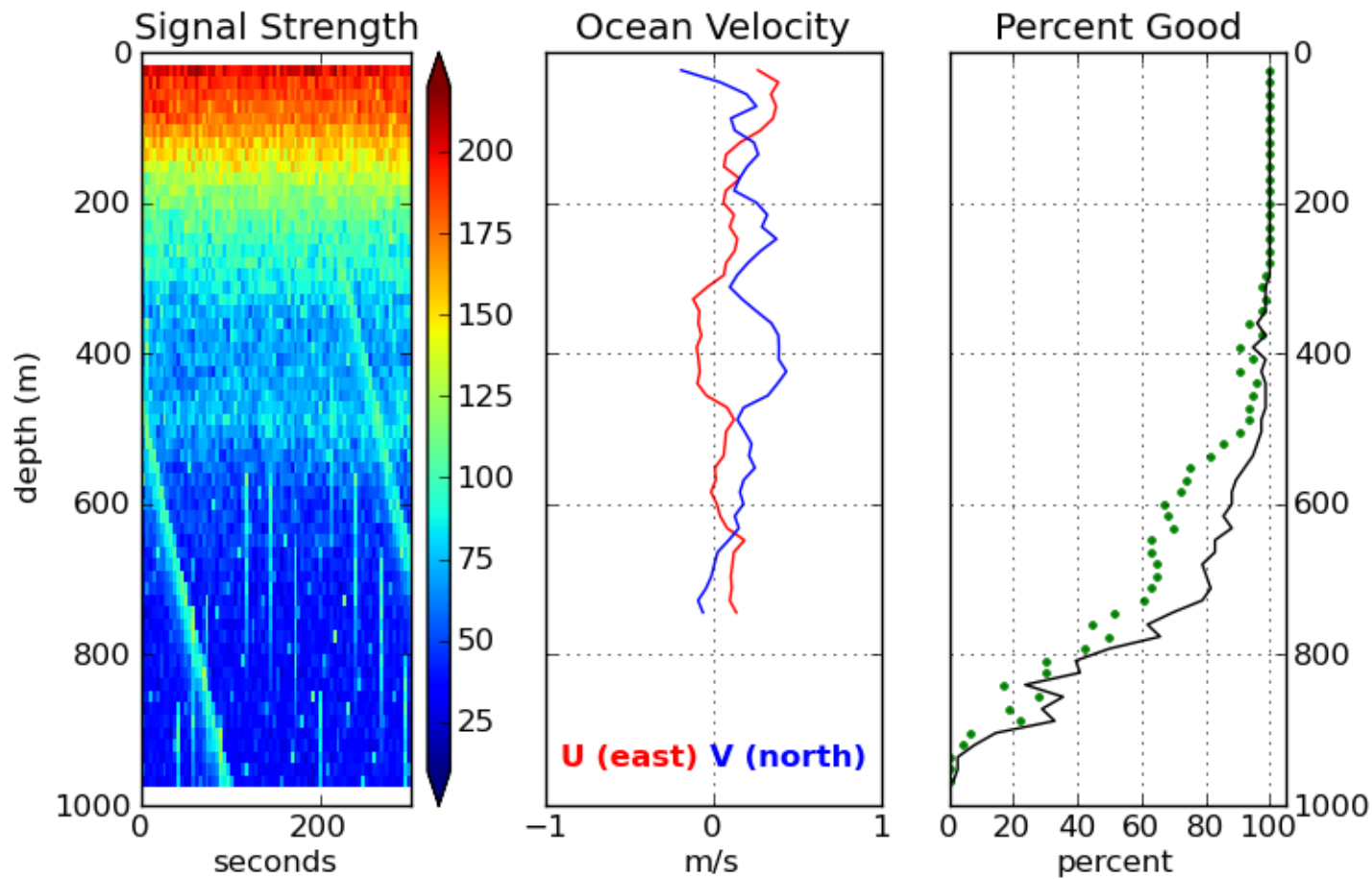
os75nb
heading correction: -3.52 deg, 2010/08/11 17:17:51 UTC

42: Errors

Acoustic Inference: averaged

43: Errors
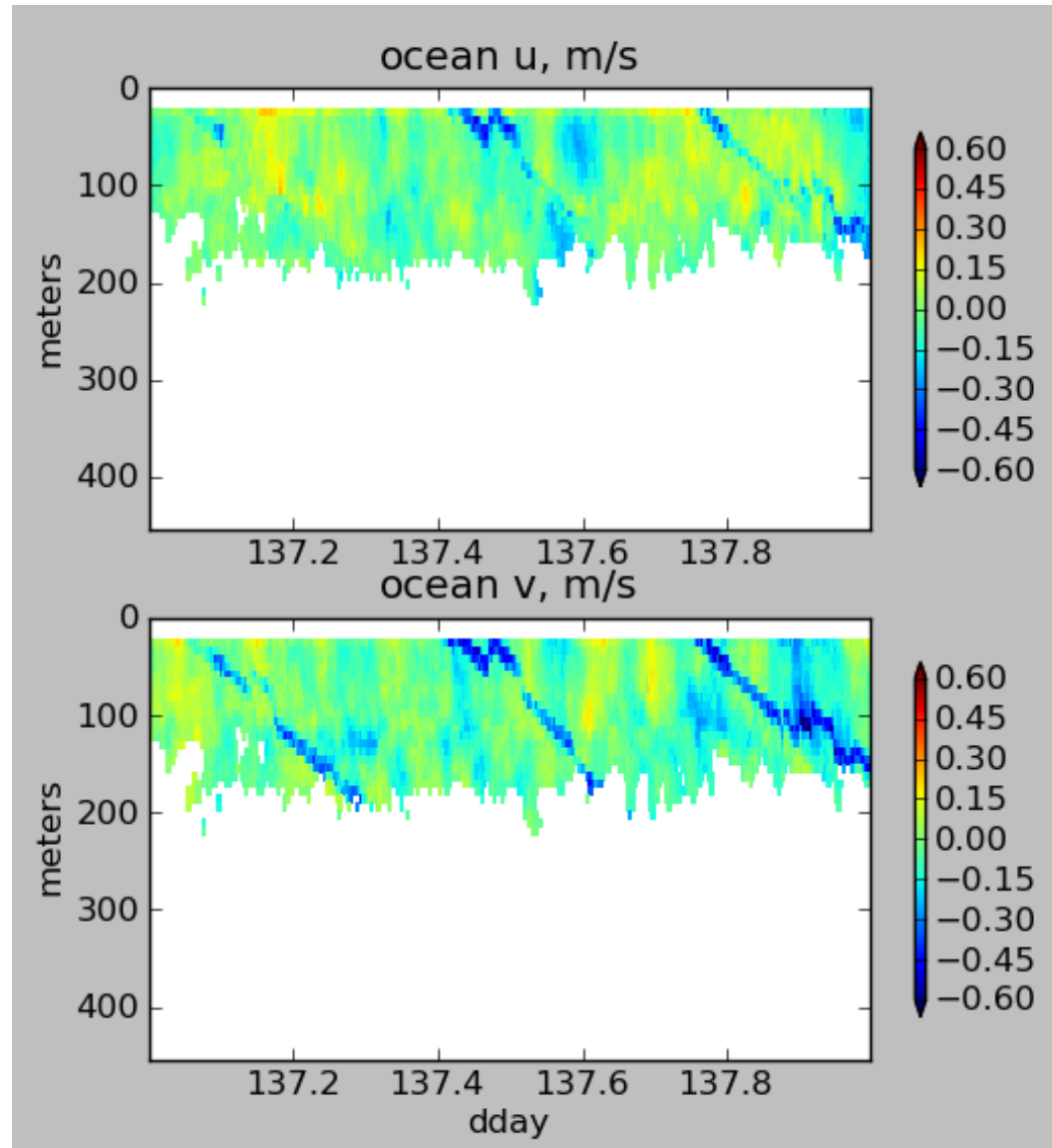
Acoustic interference removed by CODAS processing

VmDAS LTA files:
Unedited prior to averaging
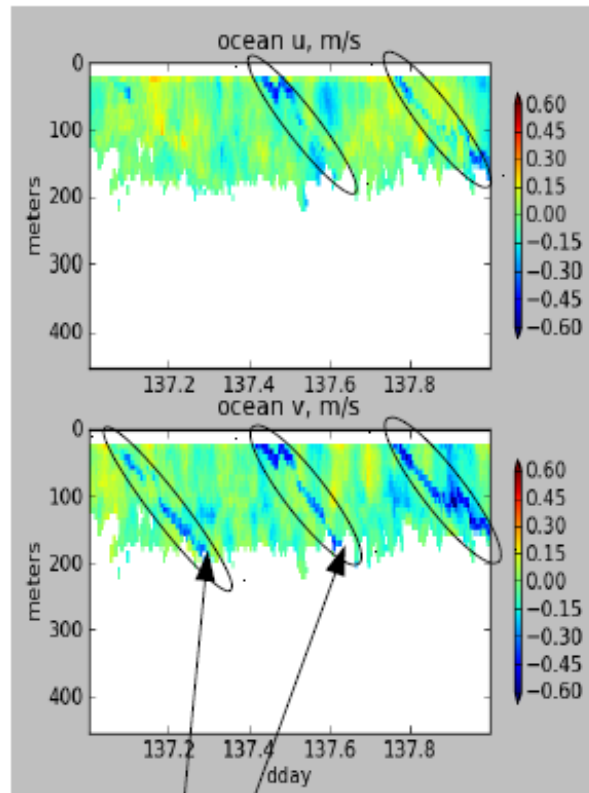
VmDAS ENX files:
Single-ping editing applied
Prior to averaging
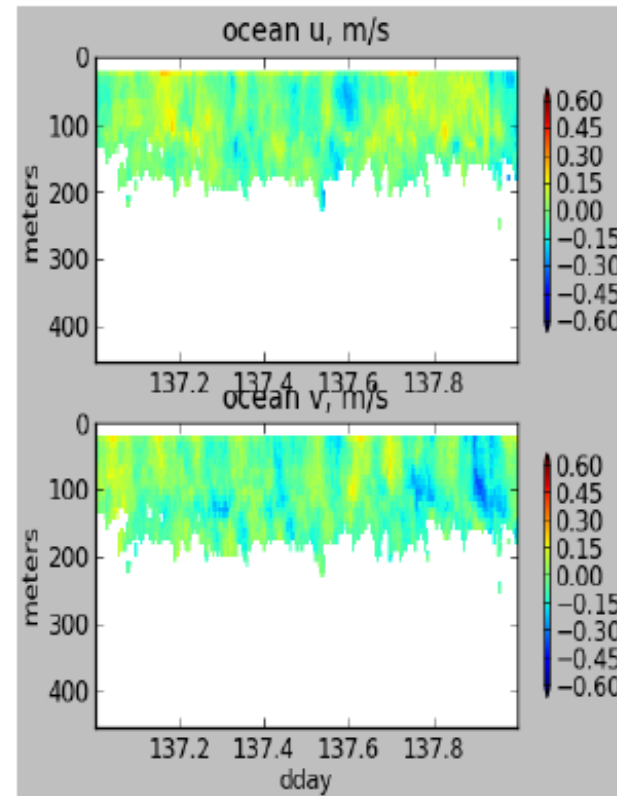
- interference from OS75 on OS150
- bias towards zero in measured velocity results in
    Bias "in the direction of motion" in ocean velocity
- ship was traveling Seattle-Honolulu, i.e. mostly southwest

44: Errors

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

45: Errors
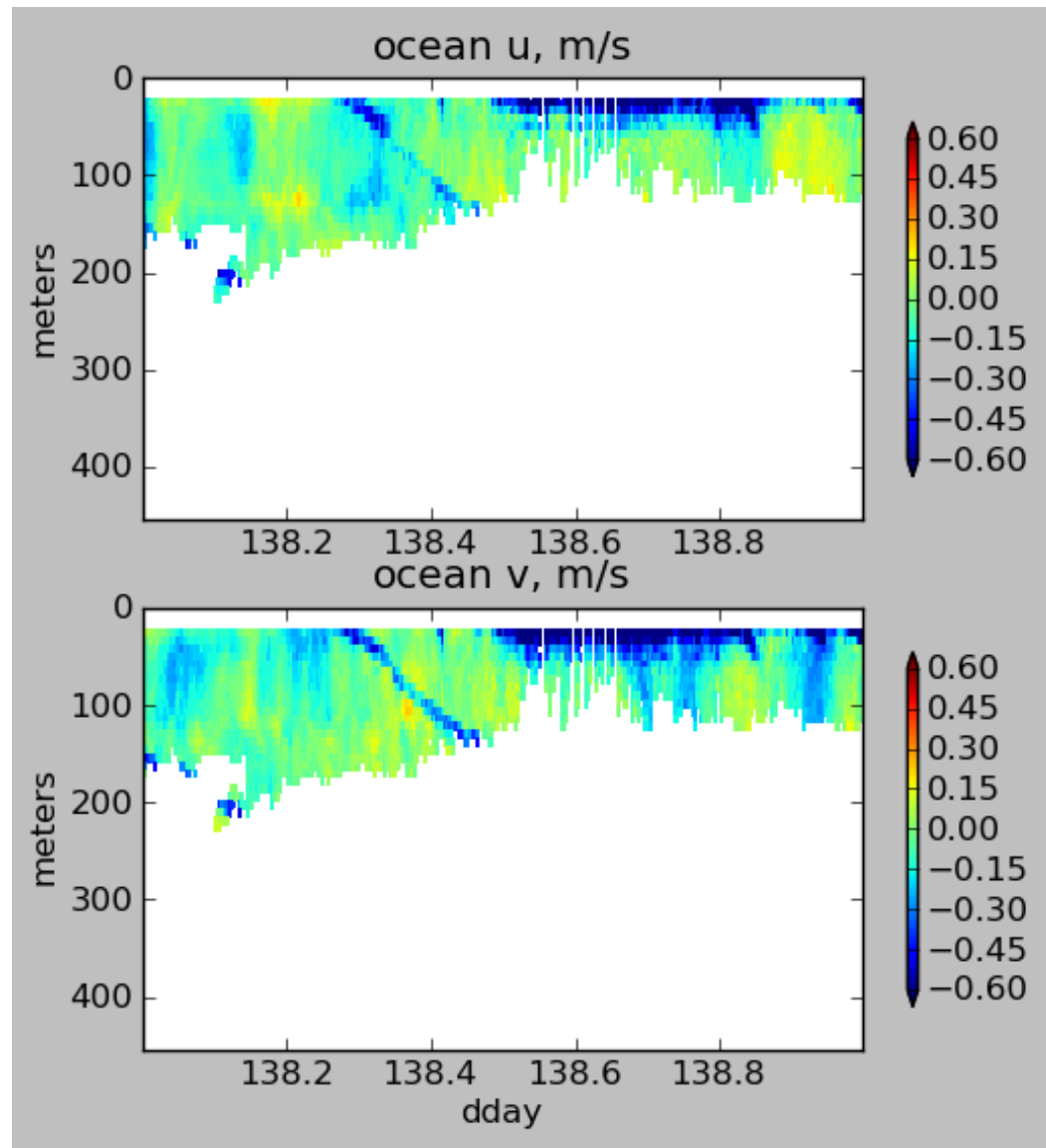
OS150 underway bias due to poor weather conditions
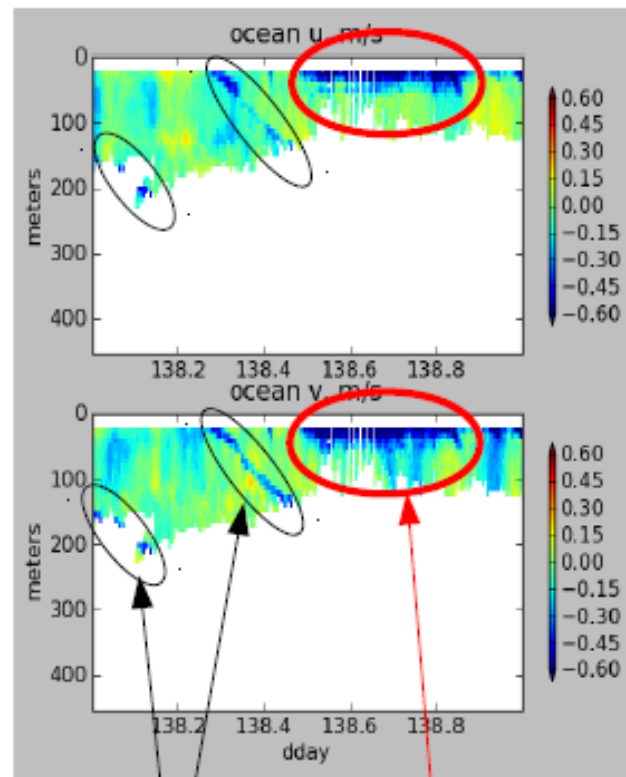
acoustic Interference from OS75 on OS150
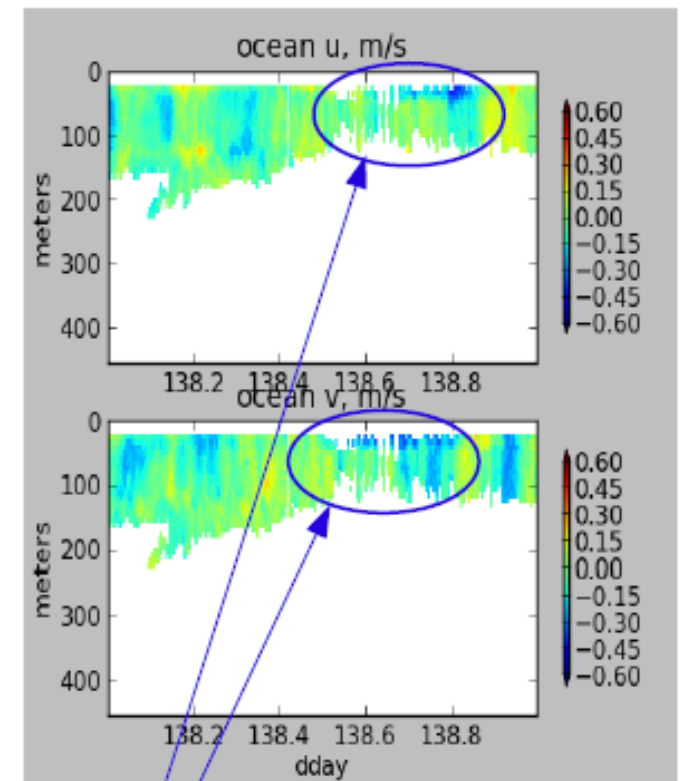
Biased pings mostly edited out, but manual post-processing is required

Biased pings, due to bad weather
- bias towards zero in measured velocities
- bias in direction of motion in ocean velocities
- shorter profiles (degraded quality)

46: Errors

single-ping editing:underway bias
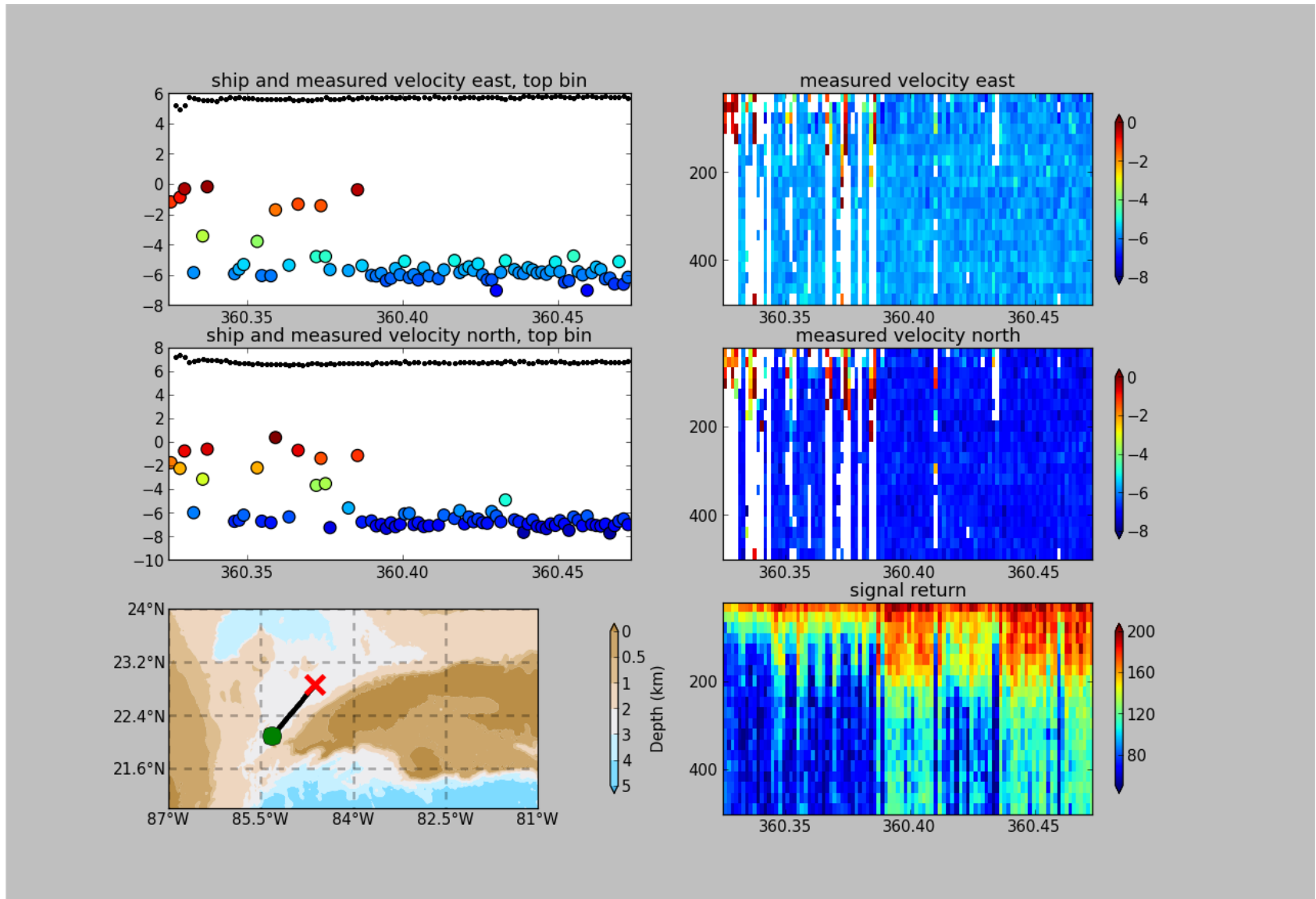
47: Errors

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CODAS Processing Overview

CODAS: Common Ocean Data Access System

- portable

- self-descriptive

- aggregated files (vs/ netCDF which is one file)

- designed for ADCP data

CODAS Processing

- tools to access and modify CODAS files

CODAS Processing Steps

- read
- [transform, edit, average]
- load into CODAS
- nudge positions to get smooth reference layer
- accurate heading device
- calibration (angle, scale factor)
- edit out bad profiles of averaged data

Acquire the data, write to disk ➡ **Fill the CODAS database**

acquisition	data stored to disk			load the database	
program name	averaged	singleping		translate to *.bin + *.cmd	executable (to load)
DAS2.48	pingdata.*			(no)	loadping
VmDAS	*.STA *.LTA			load_lta.m	ldcodas
VmDAS		*.ENR *.ENS *.ENX		load_ens.m	ldcodas
UHDAS		*.raw		load_uhblk	ldcodas

All subsequent steps use
only the data in the CODAS files

51: CODAS

These steps use only the CODAS files

"navigation steps"

do this	data type	how?
(1) extract navigation	all (except pingdata)	"ldcodas"
(2) smooth navigation	all	refsm
(3) put smoothed nav into CODAS	all	putnav

test calibration
(angle, scale factor)

method	where?
watertrack	cal/watertrk/adcpcal.out
bottom track	cal/botmtrk/btcaluv.out
reciprocal track	cal/watertrk/recip.m

apply calibrations

"rotate"   phase and/or scale factor

edit ADCP profiles   repeat as needed

run gautoedit, apply editing

SCIENCE

CODAS Processing Supports...

Acquisition program	instrument	ping type	Averaged??	file type	incremental?
DAS2.48 DAS2.49	NB150	nb	yes	pingdata	no
VmDAS	Broadband or Workhorse	bb	yes	LTA or STA	no
			no	ENS or ENX	no
VmDAS	Ocean Surveyor	bb	yes	LTA or STA	no
			no	ENS or ENX	no
		nb	yes	LTA or STA	no
			no	ENS or ENX	no
		bb+nb	yes	first ping ENS or ENX	no
			no	first ping ENS or ENX	no
UHDAS	NB150	nb	no	raw	yes
	OS	bb	no	raw	yes
		nb	no	raw	yes
		bb+nb	no	raw	yes
	WH300	bb	no	raw	yes

At
Sea

At
Home

UHDAS

At Sea

UHDAS Data acquisition

Files on the disk

adcptree.py, quick_adcp.py
(single-ping processing)
heading correction (if possible)
amplitude and fixed rotation
gautoedit (automated) editing

codas processing directory,
codas database

At Home

change amplitude correction?
change constant rotation?
fix heading correction?
manual gautoedit editing

final processed data

**Post-processing
(dataset from the ship)**

At Home

adcptree.py,
quick_adcp.py
(single-ping

codas processing
directory,
codas database

amplitude correction?
constant rotation?
heading correction?
gautoedit editing

final processed data

**Process data
from scratch**

At Sea

VmDAS Data acquisition

Files on the disk

adcptree.py,
quick_adcp.py
- single-ping (ENX)
or
- averaged (STA, LTA)

codas processing directory,
codas database

amplitude correction?
constant rotation?
heading correction?
gautoedit editing

final processed data

**Process data
from scratch**

VmDAS

54: CODAS

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55: Outline

UHDAS: what it does

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

UHDAS: what it does:

Data acquisition …

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

…. and processing

- grids, edits, averages, loads
- all CODAS processing

UHDAS: What it does:

Data Access...

- 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

  - CODAS database (and tools to access)

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

59: UHDAS: what it does

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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

subdirectory	contents	importance	back up for...
raw	all raw data	critical	○ archiving ○ scientists who ask for it
rbin	intermediate files	nice to have	anyone who gets **raw**
gbin	intermediate files	nice to have	anyone who gets **raw**
proc	○ final processing ○ codas database ○ underway figure archive ○ matlab files	final product	science CDs after cruise

61: Where things are written

UHDAS: cruise sequence

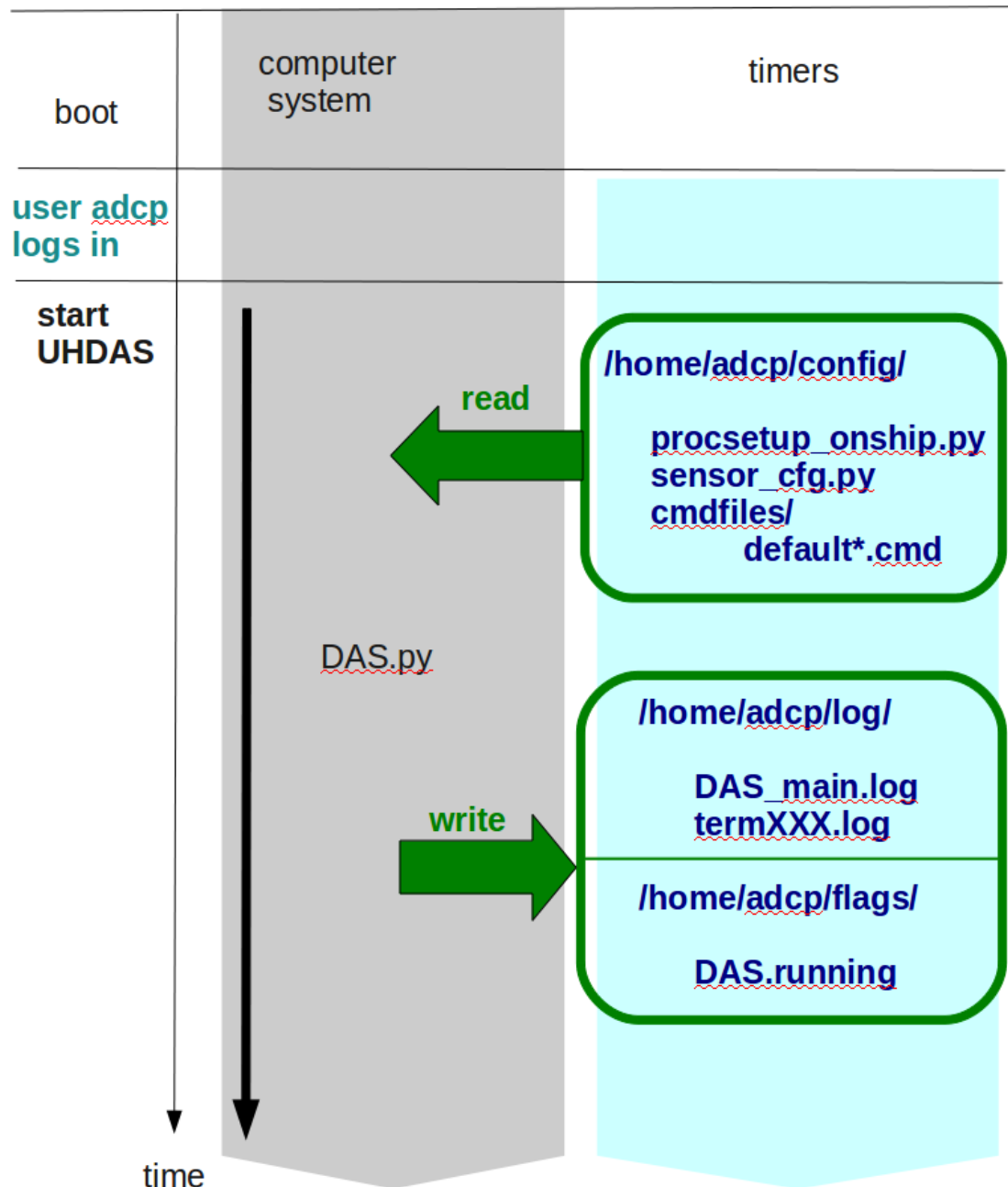| boot	computer system	files in /home/data /home/adcp	timers
user adcp logs in			
start UHDAS	DAS.py	**logfiles**	
start cruise		***cruise directories*** **symlink, logfiles**	2-hour rsync
start logging	ser_bin ser_asc → **always**	serial data ***raw, rbin***	5 30
	→ **5-min**	gridded data ***gbin, proc*** **profile plot**	
	→ **30-min**	CODAS ***proc*** **contour plot**	
stop logging			
end cruise		**break symlink** last rsync	

time

62: Where things are written

Much detail follows (10 slides)

- Start UHDAS gui

- Start cruise

- Start logging; directory contents of..

  - **raw**

  - **rbin**

  - **gbin**

  - **proc**

start UHDAS gui (DAS.py)

boot

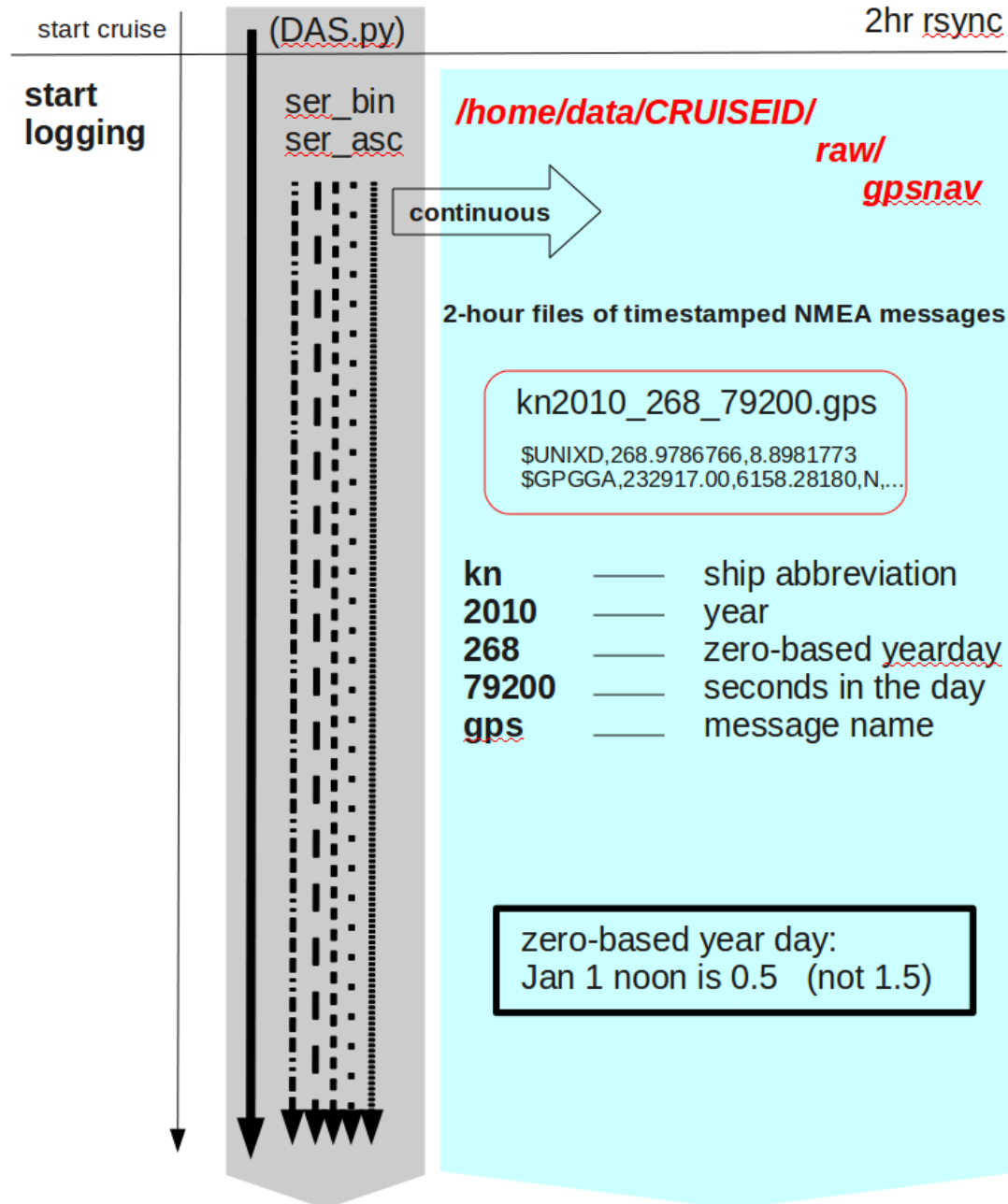computer system

timers

user adcp logs in

start UHDAS

DAS.py

read

/home/adcp/config/

procsetup_onship.py
sensor_cfg.py
cmdfiles/
        default*.cmd

write

/home/adcp/log/

DAS_main.log
termXXX.log

/home/adcp/flags/

DAS.running

time

64:

UHDAS: "start cruise"

start UHDAS	DAS.py	

start cruise "CRUISEID"	2-hour rsync	make directories
		/home/data/CRUISEID/
		  raw
		  rbin
		  gbin
		  proc
		    nb150 (CODAS tree)
		    os75bb (CODAS tree)
		    os75nb (CODAS tree)
		make symbolic link
		/home/data/current_cruise
		  → ***/home/data/CRUISEID***

		make symbolic link **/home/adcp/cruise** → ***/home/data/CRUISEID***

		write log files
		 /home/adcp/log
		  DAS_main.log
		  DAS_while_cruise.log

time

65:

serial logging (raw files)

start cruise | (DAS.py)

start logging

ser_bin
ser_asc

/home/data/CRUISEID/

continuous

raw/
    gpsnav
    gyro
    ashtech
    posmv
    nb150
    os75

Two-hour files are filled, one timestamped message at a time, to each of these directories.

66:

serial logging (write raw file)

start cruise   (DAS.py)   2hr rsync

**start
logging**

ser_bin
ser_asc

/home/data/CRUISEID/
         raw/
             gpsnav

continuous

2-hour files of timestamped NMEA messages

kn2010_268_79200.gps

$UNIXD,268.9786766,8.8981773
$GPGGA,232917.00,6158.28180,N,...

kn	——	ship abbreviation
2010	——	year
268	——	zero-based yearday
79200	——	seconds in the day
gps	——	message name

zero-based year day:
Jan 1 noon is 0.5   (not 1.5)

67:

serial logging (rbin file contents)

start cruise   (DAS.py)   2hr rsync

start logging   ser_bin   ser_asc

/home/data/CRUISEID/

continuous

raw/
    gpsnav

2-hour raw timestamped files

$UNIXD,268.9786766,8.8981773
$GPGGA,232917.00,6158.28180,N,...

rbin/
    gpsnav

2-hour rbin files

header					
logging computer time	GGA decimal day (UTC)	decimal longitude	decimal latitude	quality	hdop

68:

serial logging (raw ➡ rbin)

start cruise | (DAS.py) | 2hr rsync

start logging

ser_bin
ser_asc

/home/data/CRUISEID/

continuous ➡ parsing ascii messages to binary files readable by Matlab or Python

raw/
gpsnav
gyro
ashtech
posmv

rbin/
gpsnav
gyro
ashtech
posmv

69:

serial logging (raw, rbin)

start cruise | (DAS.py) | 2hr rsync

start logging

ser_bin
ser_asc

/home/data/CRUISEID/

continuous, each serial port is independent

2-hour files of time-stamped NMEA messages

kn2010_268_79200.gps

$UNIXD,268.9786766,8.8981773
$GPGGA,232917.00,6158.28180,N,...

raw/
gpsnav
gyro
ashtech
posmv
nb150
os75

2-hour rbin files

header

logging computer time | GGA decimal day (UTC) | decimal longitude | decimal latitude | quality | hdop

rbin/
gpsnav
gyro
ashtech
posmv

70:

UHDAS: 5min timer (make gbins)

start cruise   (DAS.py)   2hr rsync

start logging

ser_bin
ser_asc

5-min
nb150

rbin files

ADCP
position
reliable heading
accurate heading
Time

raw (rbin) data have independent timestamps

gbin files

ADCP
position
reliable heading
accurate heading

must **grid** rbin data onto ADCP timestamps

71:

UHDAS 5-minute timer: make profile

start cruise (DAS.py)

start logging

ser_bin
ser_asc

5-min
nb150

/home/data/CRUISEID/
  raw
  rbin
  gbin
  proc
    nb150 (CODAS tree)

5min avg
5min avg
5min avg
5min avg
5min avg
5min avg
5min avg
5min avg

average profile

http://currents/adcp
5-minute profile plot

72:

UHDAS 30min timer: CODAS processing

73:

RVTEC 2010 – UHDAS/ADCP

Part ɪ: ADCP

- Getting Ocean Velocity
- ADCP Processing with CODAS
- What can go wrong

Part ɪɪ: UHDAS

- What it does
- Where things are written
- **Monitoring, Interpretation**
- What can be changed, tested

Monitoring: At Sea

- There are three catoriges of monitoring:

(1) CODAS Processing

(2) health of components (Ashtech)

(3) data acquisition

Monitoring At Sea: UHDAS web site
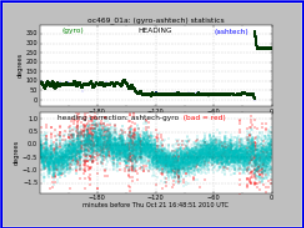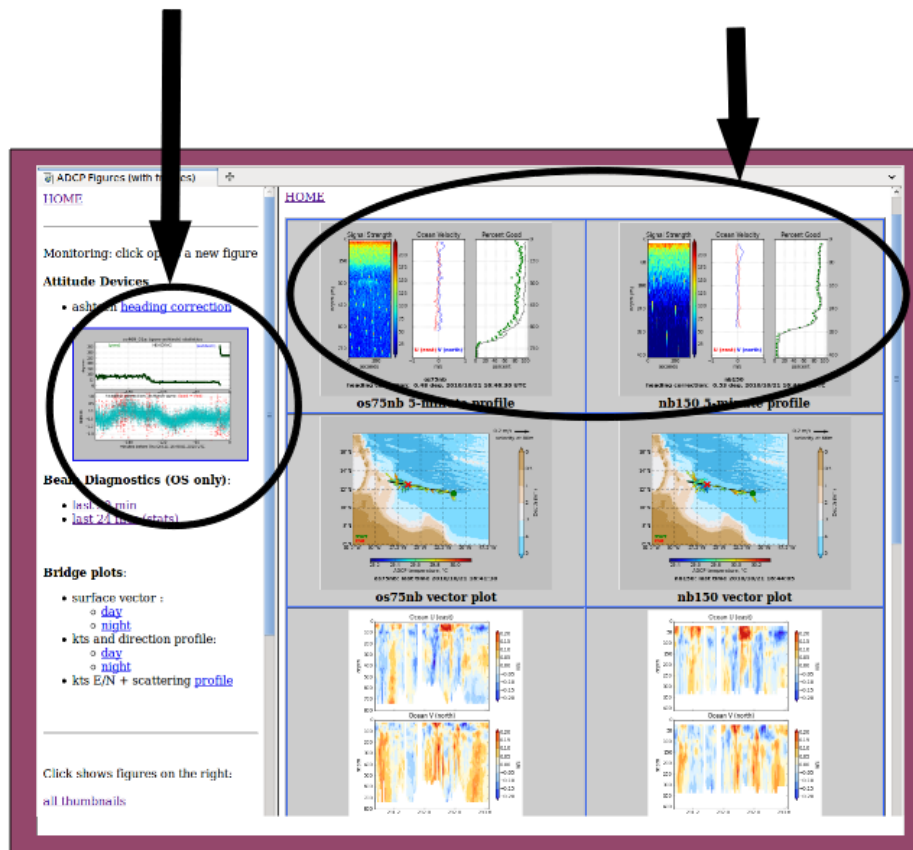

76: Monitoring (at sea)
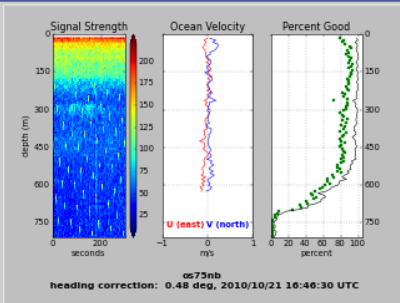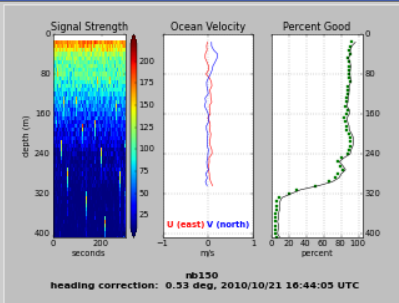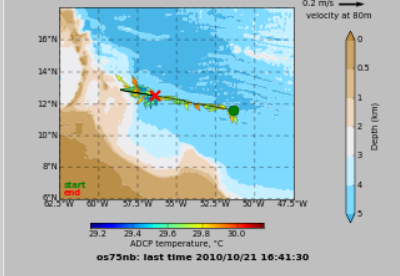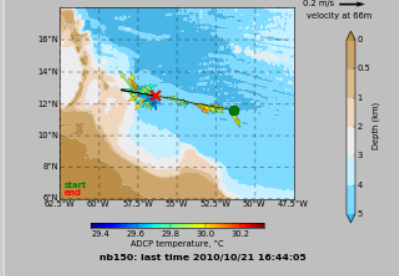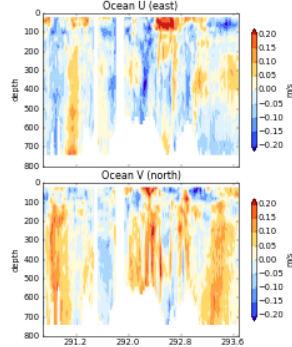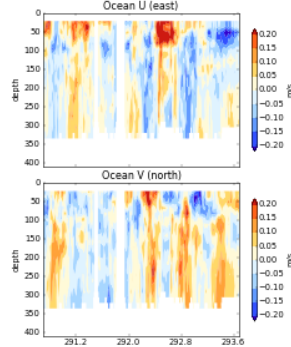
Monitoring the 5-minute timer:
Check: less than 10 minutes old?

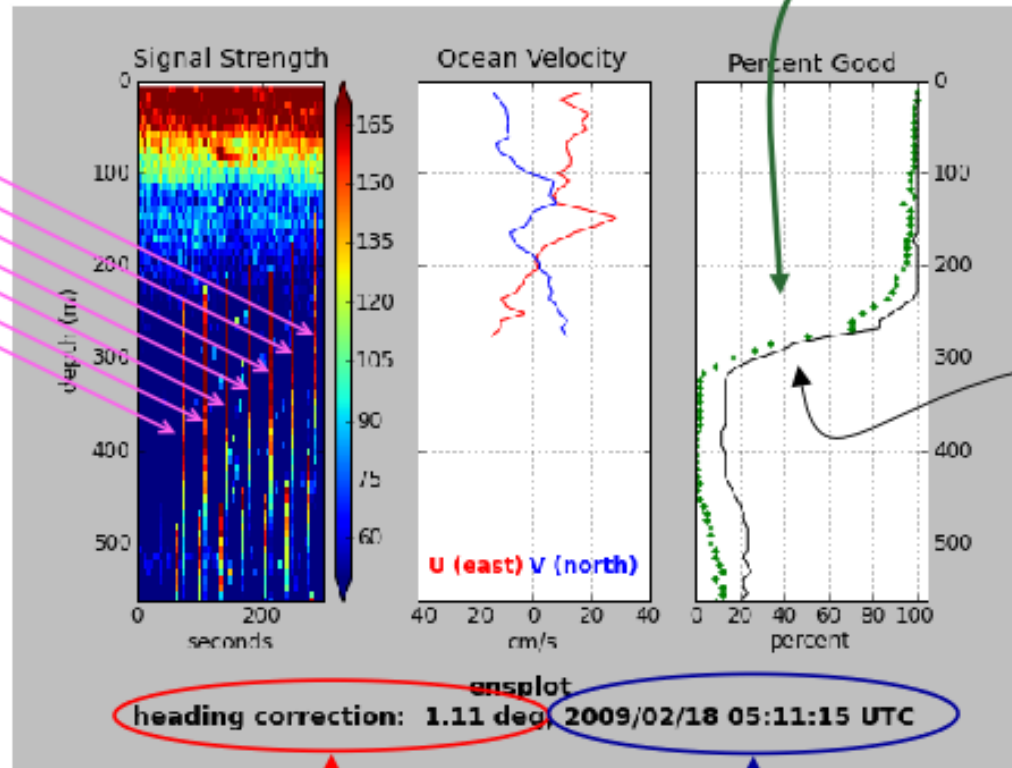**Accurate Heading Device**

Ashtech, POSMV, Seapath
Phins, Mahrs

5-minute profile
of each
ADCP+Pingtype

77: Monitoring (at sea)

UHDAS average (5-minute) profile plot

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

Acoustic interference (edited out; decreases percent good)

Signal Strength

Ocean Velocity

Percent Good

U (east) V (north)

percent good before UHDAS editing

heading correction: 1.11 deg

2009/02/18 05:11:15 UTC

heading correction (ashtech - gyro)

UTC time of last sample

78: Monitoring (at sea)

Signal strength ("amplitude") in counts. Note the bottom at 350-400m

velocity

Percent of pings considered "good" in each bin. Cutoff is 50% or better.
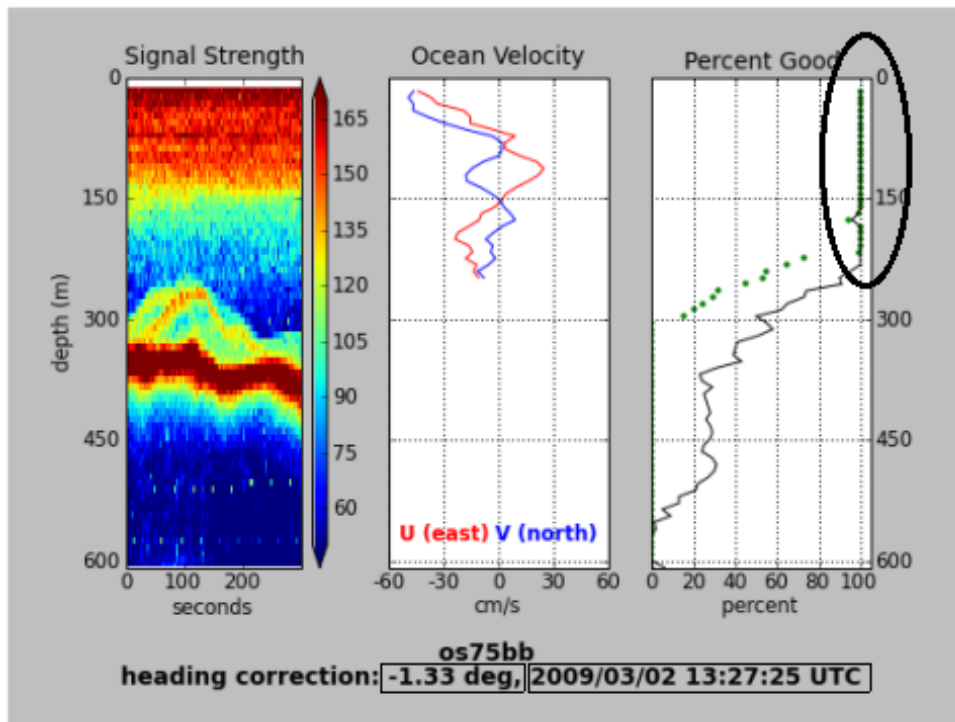
Data are considered "good" if the are
- better than 50PG
- out of range of
  bottom interference
  (bottom 15% for
  an instrument
  with 30deg beams)

Signal Strength   Ocean Velocity   Percent Good

U (east) V (north)

seconds   cm/s   percent

os75bb

heading correction: -1.33 deg, 2009/03/02 13:27:25 UTC

If an accurate heading device exists, and is working, the correction to the gyro is written here for every averaging interval. Values are typically a few degrees or less.

Timestamp should be within 10 minutes of the present

79: Monitoring (at sea)

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

80: Monitoring (at sea)
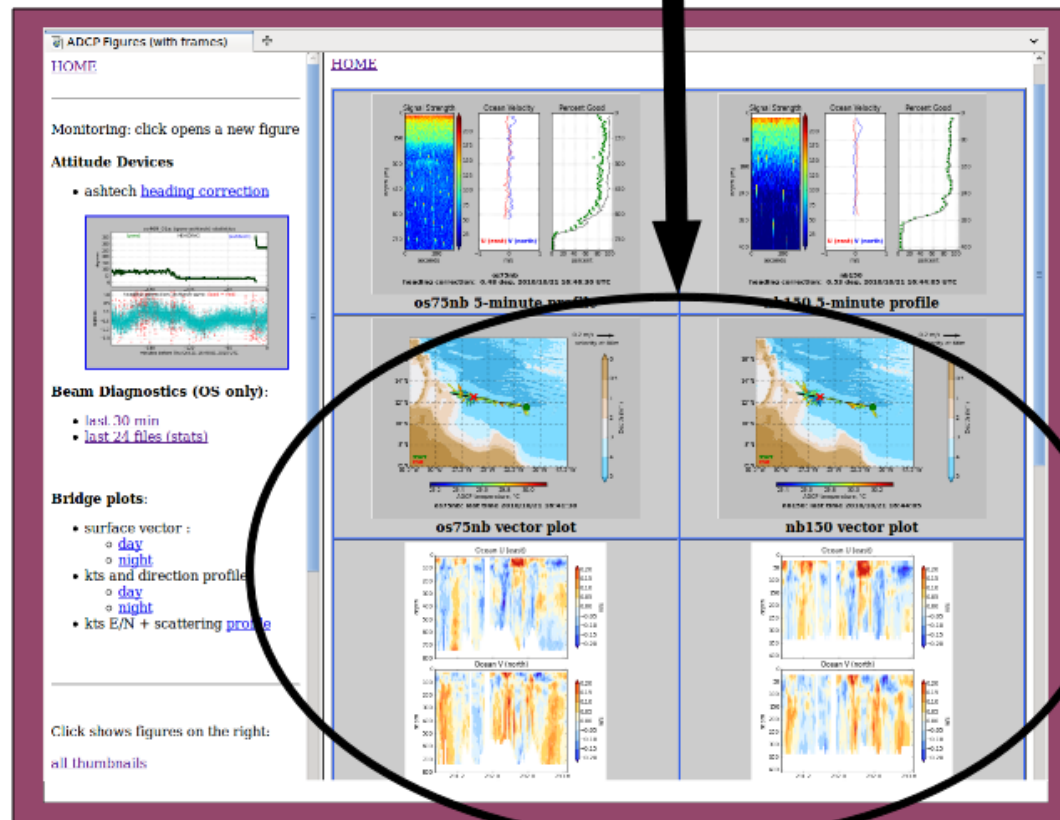
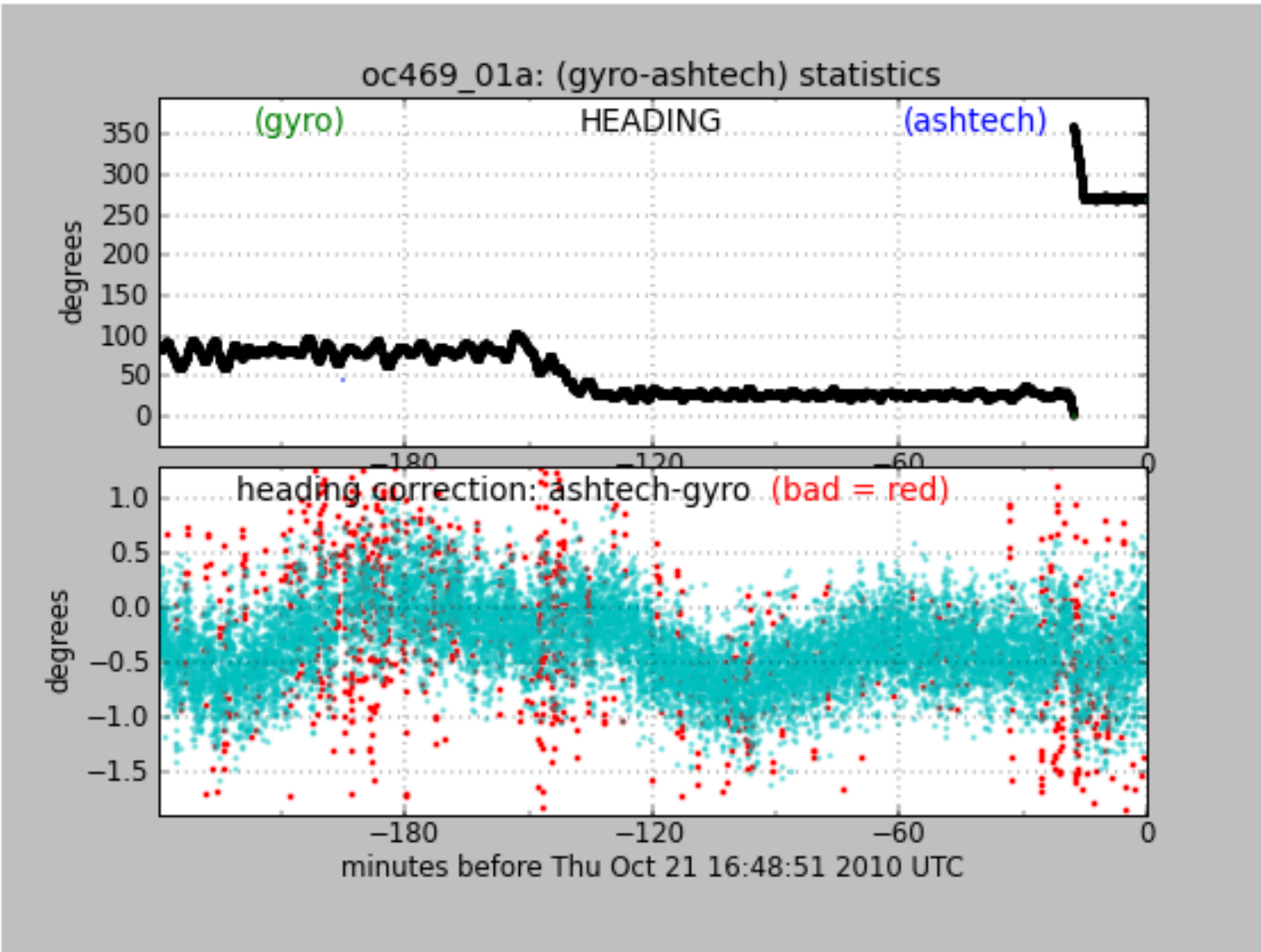# Monitoring the accurate heading device: Is it working?

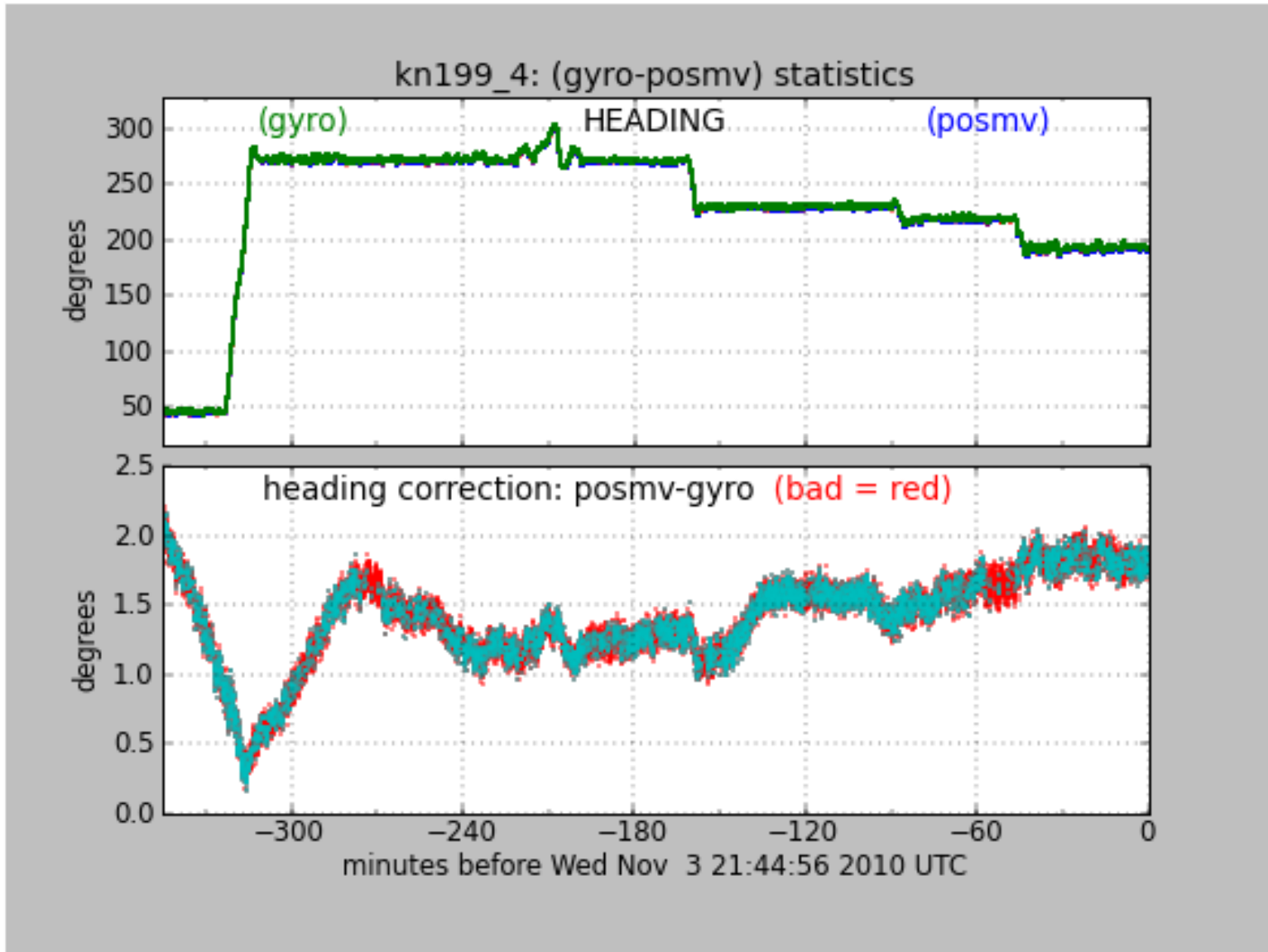Accurate but possibly intermittent attitude device: figure updates every 5 minutes.

81: Monitoring (at sea)
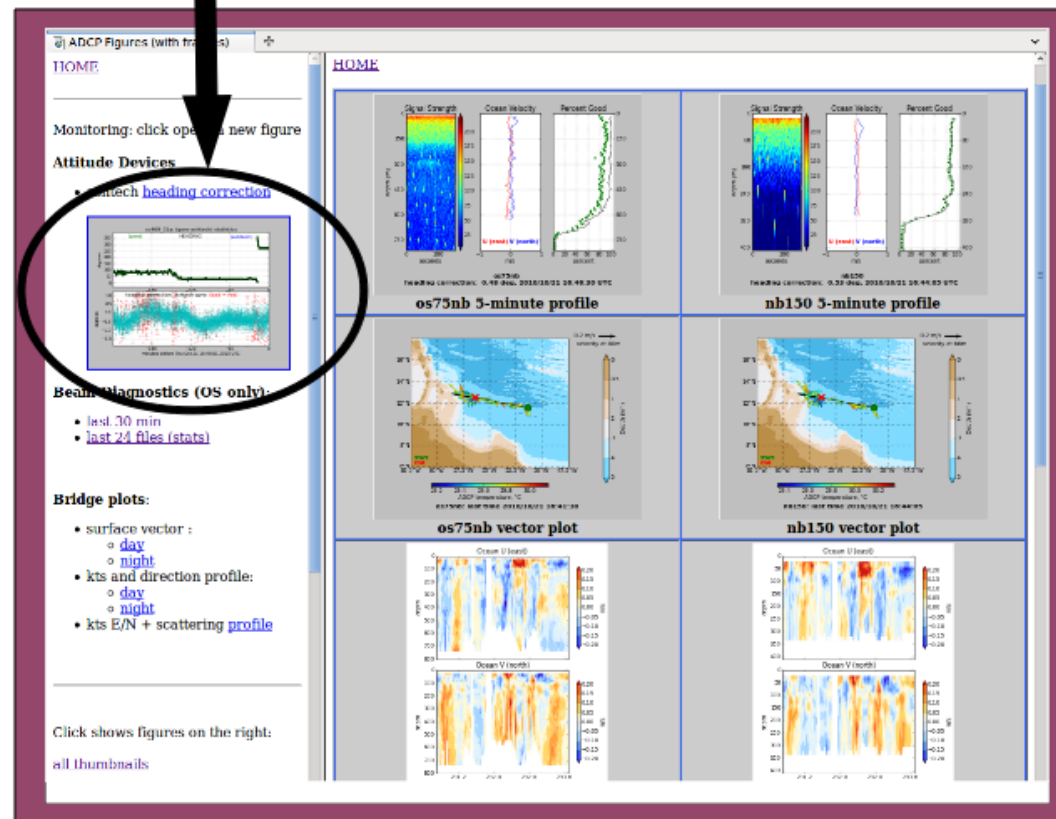
Attitude Health

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

Ashtech

83: Monitoring (at sea)

POSMV

84: Monitoring (at sea)

Phins

85: Monitoring (at sea)
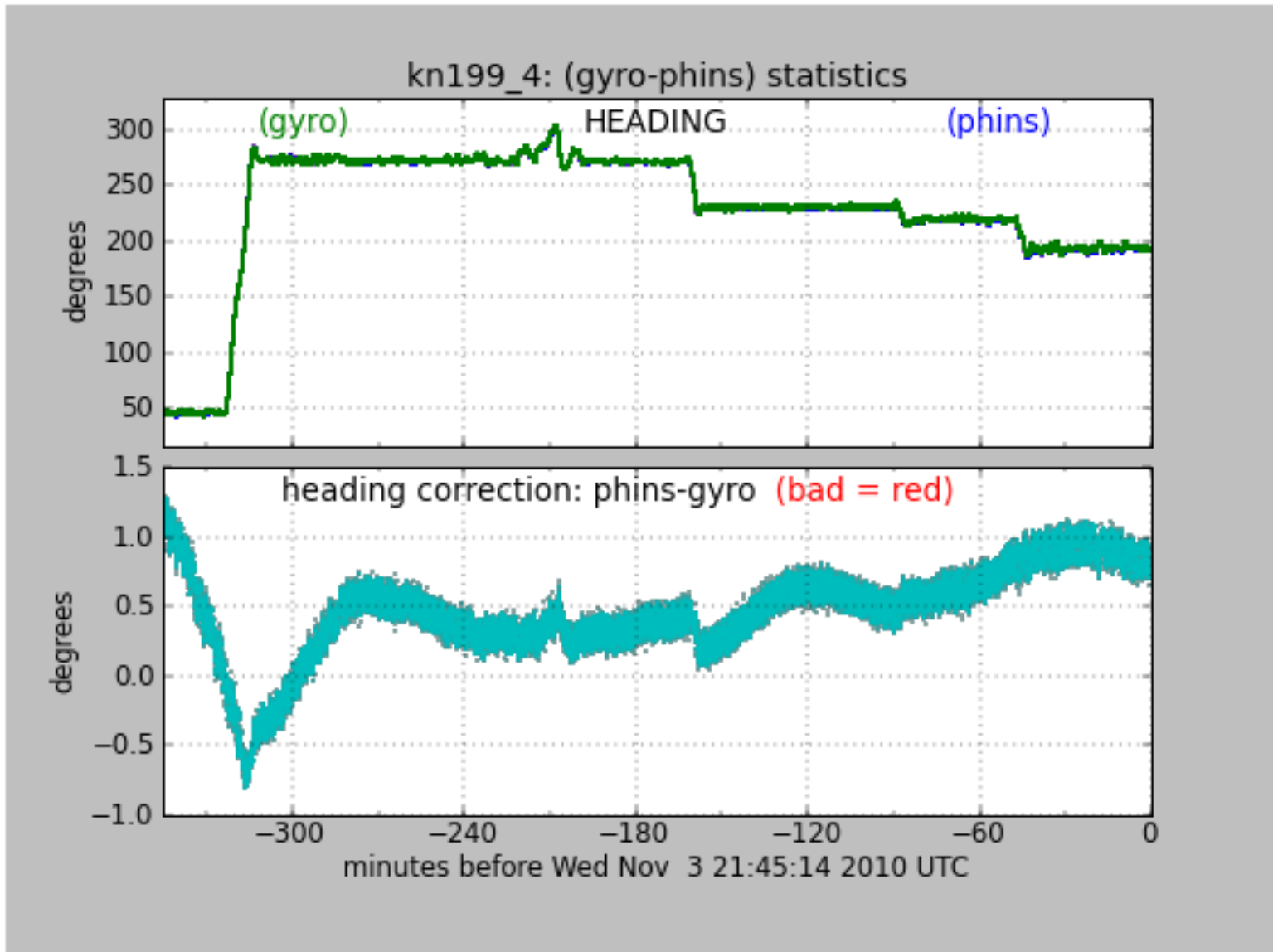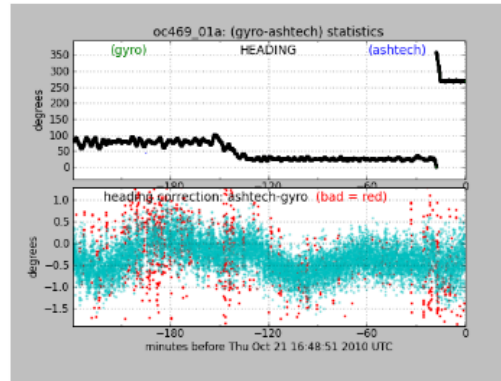
Accurate heading device: examples

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, stddev N =  27
    min   = -0.25, max = 0.61
    mean = 0.15, stddev = 0.22
```
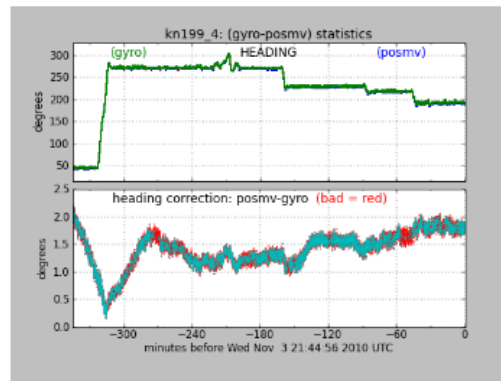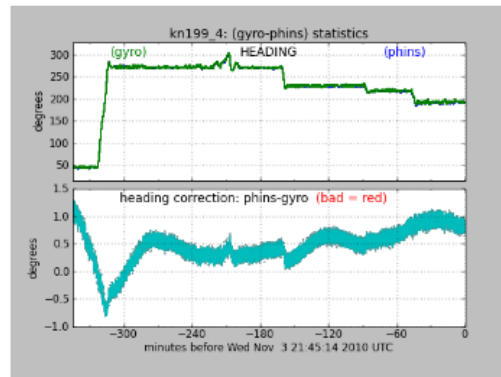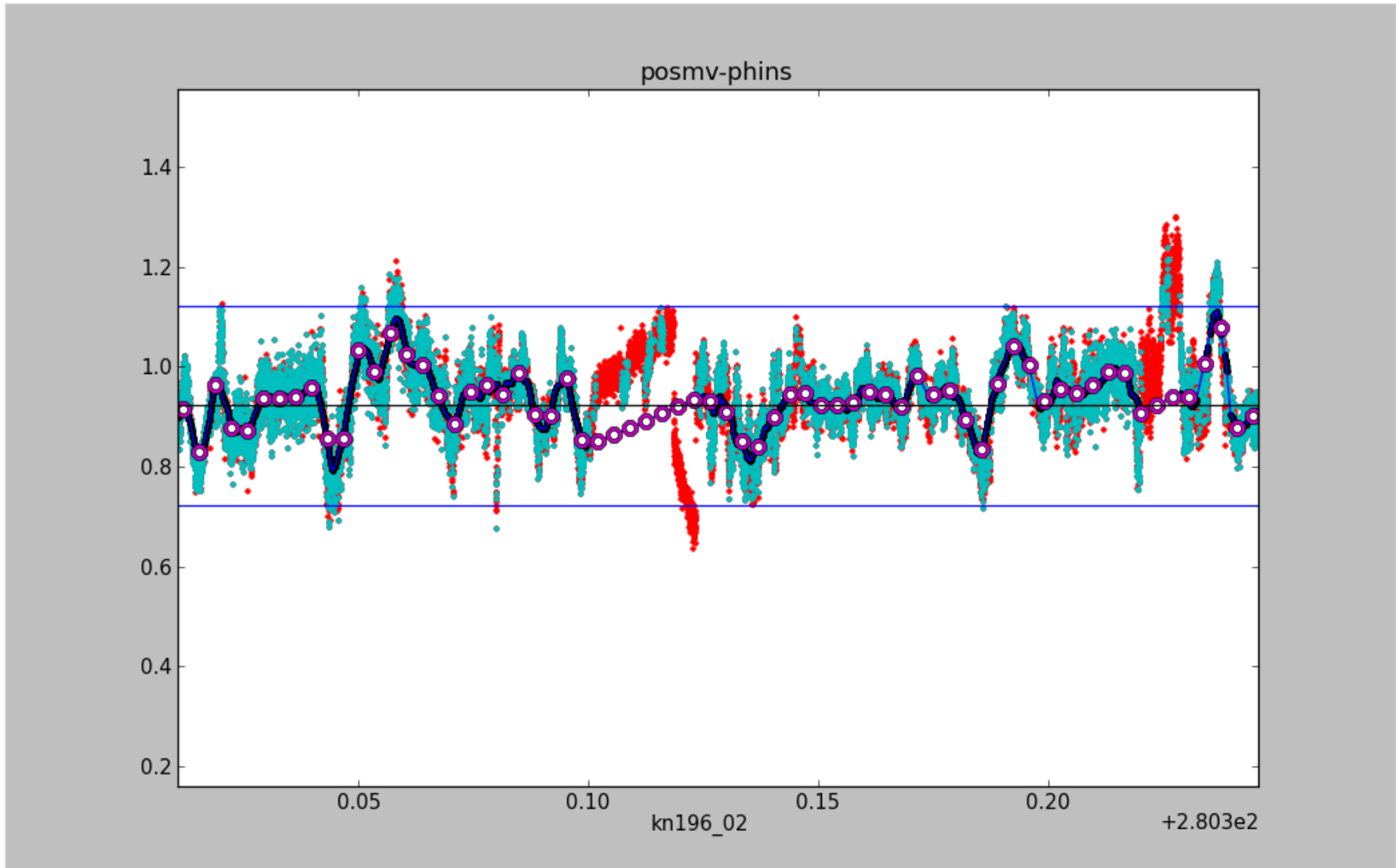
```
=========================
------ posmv statistics ------
=========================
posmv-gyro statistics (pycurrents)
ddrange: 305.8333642 to 306.8577969
(2010/11/02 20:00:03 to 2010/11/03 20:35:14)
number of good points: 182 out of 294 (62%)
min dh = 0.37,    max dh = 1.85
mean dh = 0.80
stddev dh = 0.35
heading correction quality:
mean N in ensemble = 120
stddev 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
stddev dh = 0.38
heading correction quality:
mean N in ensemble = 301
stddev N in ensemble = 0
(one ensemble looks like 300 seconds)
```

86: Monitoring (at sea)

POSMV in trouble

87: Monitoring (at sea)

Monitoring At Sea: data Acquisition

88: Monitoring (at sea)

UHDAS: Monitoring from shore

Link to on-shore monitoring: UHDAS ships

- text email
- figures
- diagnostic files

Monitoring: From Shore

- **from the text email**:
  - CODAS Processing
  - health of components (Ashtech)
- **from the diagnostic files**:
  - data acquisition
  - processing
  - troubleshooting

Daily report (diagnostic files)

File name	Explanation	monitoring category
status_str.txt DAS_main.txt	daily text email DAS actions	summary cruise state
tails.txt	NMEA messages, rbin file times, sizes gbin file times, sizes	serial logging status
commands_os75.txt commands_wh300.txt	current OS75 settings current WH300 settings	bin size, bottomtrack
cals.txt	watertrack, bottom track calibration	calibration
*_gyro_pystats.txt	quality of accurate heading device	is device OK? reset it?
Advanced monitoring tools		
os75bb_stats.txt os75nb_stats.txt	os75bb beam health os75nb beam health	ADCP bceam diagnostics
processes.txt disk_details.txt disk_files.txt disk_summary.txt	processes running du -sk /home/data/* log, flags, uhdas_tmp df, changes	processes, disk usage, logfile sizes
rbintimes.txt stderr.txt logwarnings.txt ntp.txt dmesg.txt loerrs.txt	timestamps serial port status processing warnings computer time system errors system errors	trouble- shooting tools

91: Monitoring (from shore)

```
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/
```

92: Monitoring (from shore)

```
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?

93: Monitoring (from shore)

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

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

Expect one of these
(1) ** is logging **   serial acquisition is active
(2) ** not logging **   cruise started but not logging
(3) no cruise set   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

94: Monitoring (from shore)

```
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 DAS_while_logging.log 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;

95: Monitoring (from shore)

```
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

97: Monitoring (from shore)

```
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/
```

check the figures in the link

98: Monitoring (from shore)

Steps to check daily email:
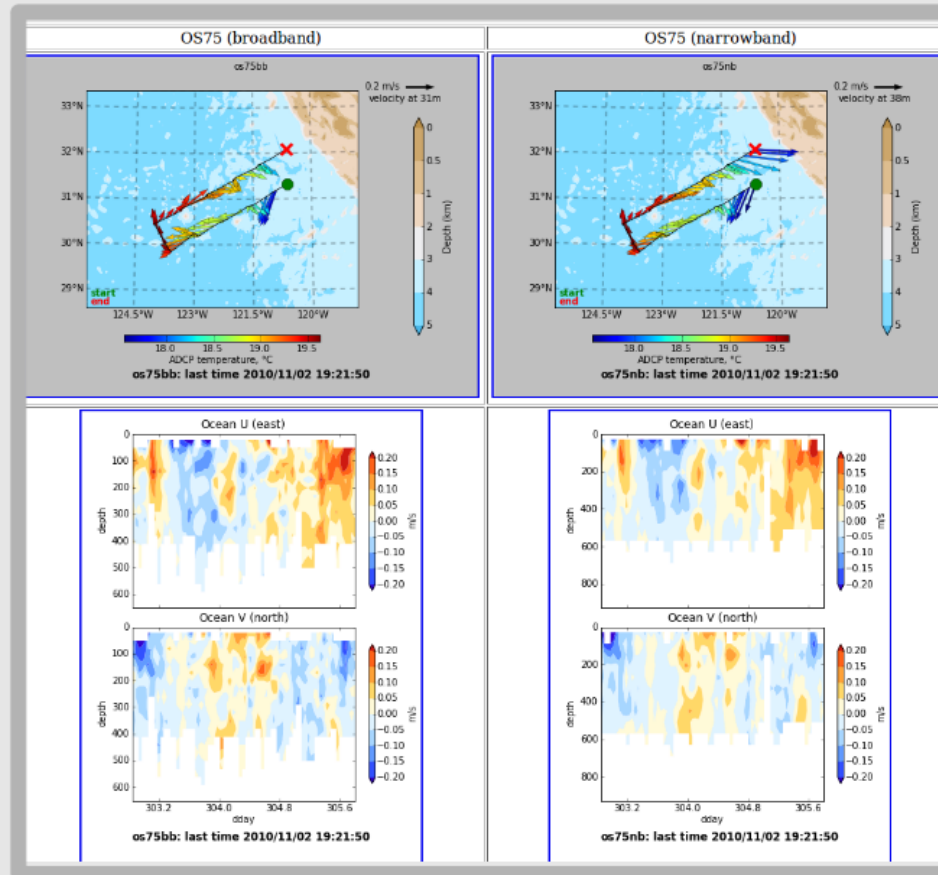
Observations:
(1) two ping types (OS75 interleaved mode)
(2) data from different types are consistent
(3) data are physically reasonable
    - no big gaps
    - no big outliers
    - no deep strong currents
    - depth ranges are reasonable
Check: (text email)
    BOTTOM TRACK should be **OFF**

9: Monitoring (from shore)

Examples of three email warnings

- Restart logging (only)

- Start a new cruise leg

- Reset the Ashtech

101: Monitoring (from shore)

UHDAS email message : start a new cruise leg

UHDAS status

RED FLAG: database times older than 40 minutes: Processing has stopped.

```
2009/09/07 20:40:01
currents 2.6.24-24-generic

Current cruise: ka 09 03      ** is logging **
Database time ranges:
      os75nb 2009/08/25  01:17:18 to 2009/09/07  11:08:03  (572 min. ago)
```

Action:
- stop logging
- end cruise
- start a new cruise leg (add a letter to the present cruise, eg "ka_09_03a"
- start logging

CHECK whether the 5-minute profile plot appears.
If yes, everything is good.
If no, (email for help?)
  - check whether GPS and gyro feeds present (both are required)
  - check whether the matlab license manager is running

102: Monitoring (from shore)

Procedure:

(1) check tails.txt
to see what the
NMEA messages
are saying

(2) check this link
to see what
that means

(3) email tech on ship
to ask if they
see the problem,
and please reset
the ashtech...

UHDAS email message : reset Ashtech

UHDAS status

```
2009/07/15 20:40:02
rigel 2.6.24-23-generic

Current cruise: W0907A_Trehu      ** is logging **
Database time ranges:
        wh300 2009/07/14  18:40:57 to 2009/07/15  20:36:54  (4 min. ago)
       os75bb 2009/07/14  18:44:03 to 2009/07/15  20:39:10  (1 min. ago)
       os75nb 2009/07/14  18:44:08 to 2009/07/15  20:39:10  (1 min. ago)

---- heading correction ----
ashtech_gyrodh.asc

ddrange: 194.8682782 to 195.8578616
(2009/07/14 20:50:19 to 2009/07/15 20:35:19)

number of good points: 174 out of 286 (61%)
heading correction statistics:
min dh  =  -2.72,  max dh  =  -0.93
mean dh    =   -0.87
stddev dh =   0.28
```

RED FLAG:
Ashtech much less
than 100% good

Action: reset the Ashtech; ensure that it comes back

103: Monitoring (from shore)

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

subdirectory	contents	importance	back up for...
raw	all raw data	critical	○ archiving ○ scientists who ask for it
rbin	intermediate files	nice to have	anyone who gets **raw**
gbin	intermediate files	nice to have	anyone who gets **raw**
proc	○ final processing ○ codas database ○ underway figure archive ○ matlab files	final product	science CDs after cruise

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

Useful UHDAS Diagnostic files

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)

UHDAS diagnostic file: cals.txt

keep an eye on calibration

Good ADCP Calibration numbers

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

RVTEC 2010 – UHDAS/ADCP

Part ɪ: ADCP

- Getting Ocean Velocity
- ADCP Processing with CODAS
- What can go wrong

Part ɪɪ: UHDAS

- What it does
- Where things are written
- Monitoring, Interpretation
- What can be changed, tested

UHDAS: what can be changed (not much)

with the UHDAS tool:

- bb, nb mode (OS75, OS150)
- bottom tracking on/off
- bin size (and blank)

if required (carefully edit `sensor_cfg.py`)

- serial port, baud rate

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

UHDAS: what they'll ask for

"I think the answer is '**no**' but ask Jules"

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

Configuration Files (expert)

- `procsetup_onship.py`

  - transducer angle

  - averaging interval

  - timers (5min, 30min)

  - bin range for bridge plots and vector plot

  - email

- `sensor_cfg.py`

  - ports

  - baud rates

  - messages

Block diagram of
sensor_cfg.py

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

sensor_cfg.py

```
## header comments
```

```
ignore_ADCPs = []
ignore_other_sensors = []
```
editable – ignore ADCP or other sensor

```
shipabbrev = "km"
```
ship designation

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

```
common_opts = '-f %s -F -m 1 -H 2 ' % (shipabbrev,)
nb_opts =    '-rlE -c -I'
oswh_opts = '-rlE -c -O -I'
```
switches for ser_asc and ser_bin (logging)

```
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

```
speedlog_config = {}
```
speedlog out (busted)

```
ADCPs = ...
sensors = ...
```
redefine according to "ignore"

sensor_cfg.py : ADCP setup

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

```
adcp1_setupdict = {
    'instrument'  :   'wh300',
    'setup'       :   'rdi_setup',
    'terminal'    :   'oswh_term',
    'defaultcmd'  :   'wh300_default.cmd',
    'commands'    :   ('EA04500',),
    'datatypes'   :   ('wh300',),
    '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).

**It is CRITICAL to get the EA command in the right ballpark.
A bad specification can irrevocably damage the data**

113: Configuration

sensor_cfg.py: serial logging setup

```python
sensors =[
        adcp1_logdict,
        adcp2_logdict,              settings for ser_bin
        serial1_logdict,
        serial2_logdict,
        serial3_logdict,           settings for ser_asc
        serial4_logdict,
        serial5_logdict,
        serial6_logdict,
        ]
```

Two editable fields:

```python
adcp1_logdict = {
    'instrument'   :   'os38',
    'device'       :   'ttyR3',       serial port
    'baud'         :   38400,         baud rate
    'format'       :   'binary',
    'subdir'       :   'os38',
    'ext'          :   'raw',
    'opt'          :   oswh_opts
    }
```

Two editable fields:

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

These are related to processing... TAKE CARE

114: Configuration

UHDAS/CODAS RVTEC Presentation: Links to the documentation

Part I: ADCP

- Getting Ocean Velocity
- ADCP Processing with CODAS
- What can go wrong

Part II: UHDAS

- What it does
- Where things are written
- Monitoring (at sea, from shore)
- What can be changed, tested