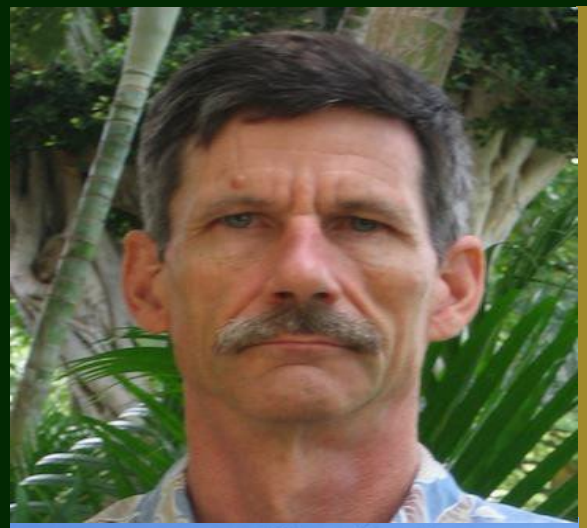
UNOLS RVTEC MEETING

Next Up

UHDAS – Jules Hummon

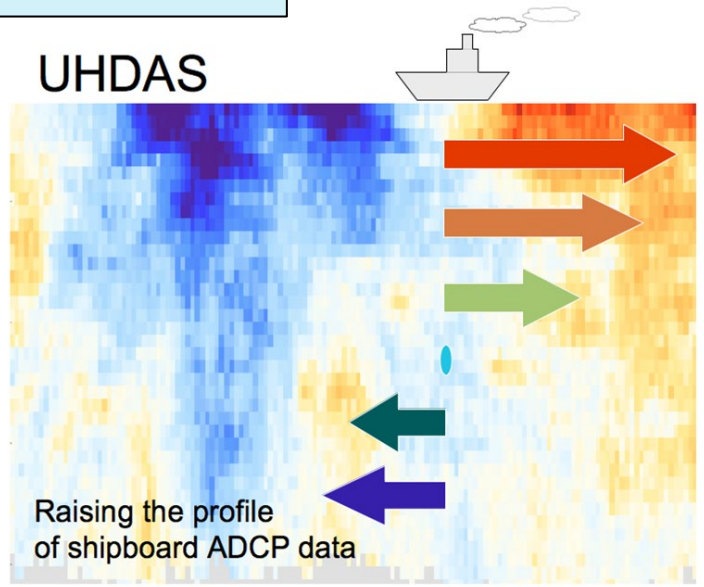
UHDAS ERIC TOBY ANTONIO



JOSEPH DREW JULES **ADCP**

RVTEC Nov, 2022 - Seattle, WA

Jules Hummon
University of Hawaii



Instrument = "**ADCP**":

- **A**coustic **D**oppler **C**urrent **P**rofiler
- Use the Doppler return from 4 beams
- (+heading and position) to calculate a profile of ocean currents

Acquisition System = "**UHDAS**":

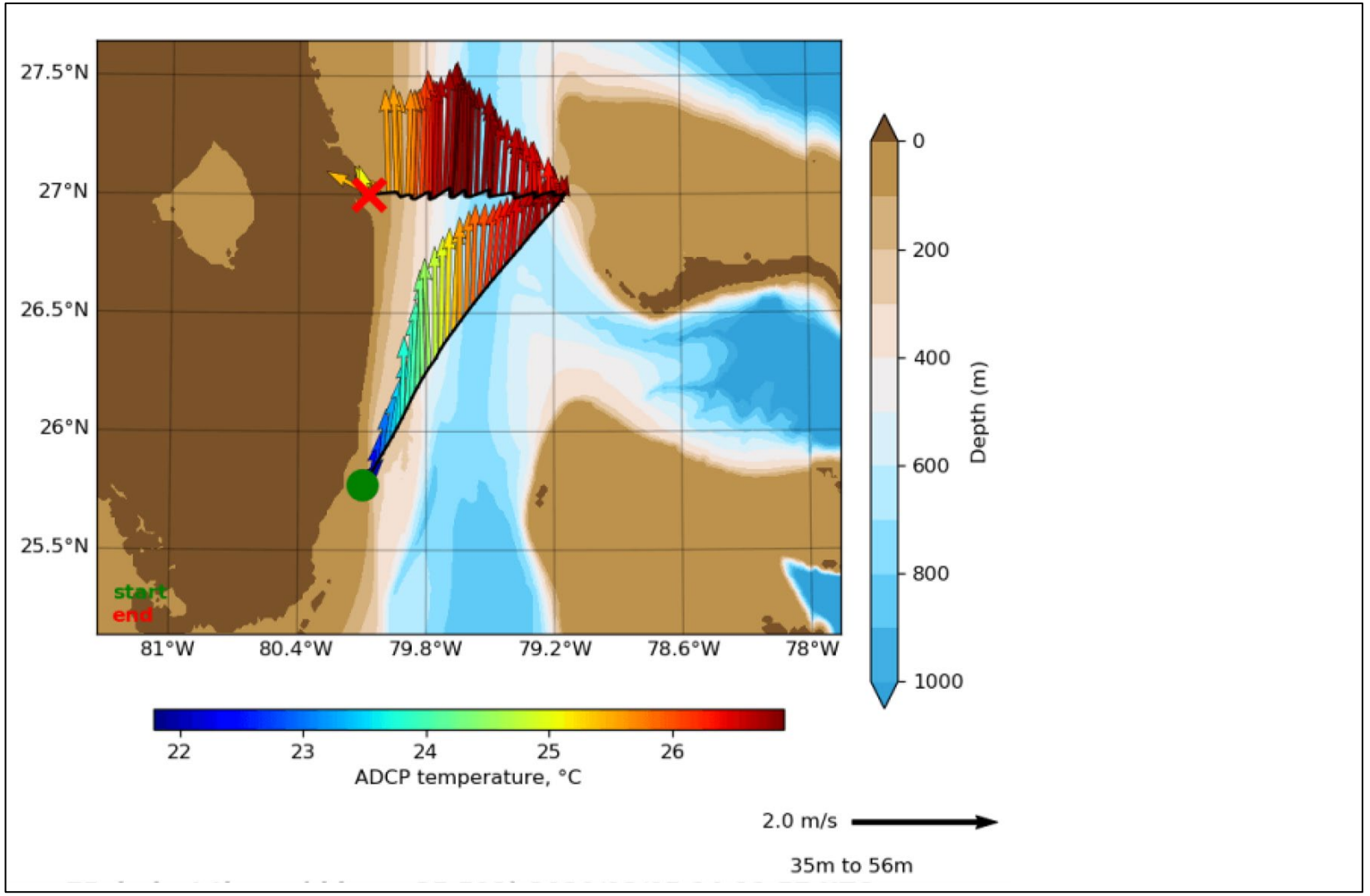
University of **H**awaii **D**ata **A**cquisition **S**ystem

UHDAS Goals:

- reliable near real-time ocean currents at sea
- long-term utility of original and processed data

UHDAS+ADCP: What does it do?

Time,
ADCP
Position
Attitude



primitive data

ocean velocities

UHDAS+ADCP: what does it do?

- **Acquisition**: collect the data well
  - reliable, robust, duplicate feeds (ADCP, GPS, accurate heading)
- **Monitoring:** Keep it working well
  - daily scrutiny by UHDAS Team and people on shore (email)
  - at-sea web site has diagnostic plots
- **Processing:** provide access to data and plots at sea
  - Balance real-time output and post-cruise recovery
  - data access and figures in at-sea web site
  - Open Source code and documentation
- **Stewardship:**
  - improve QA, accessibility, visibility, understanding
  - rely on R2R and NCEI for conduit and archiving

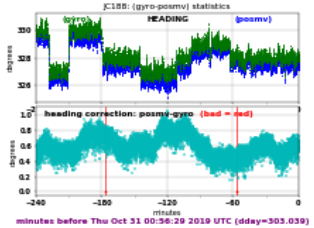
At-sea web site overview

HOME

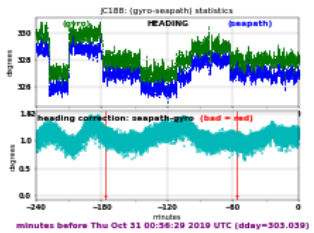
Monitoring: click opens a new figure

Attitude Devices

- posmv-gyro comparison (thumbnail)



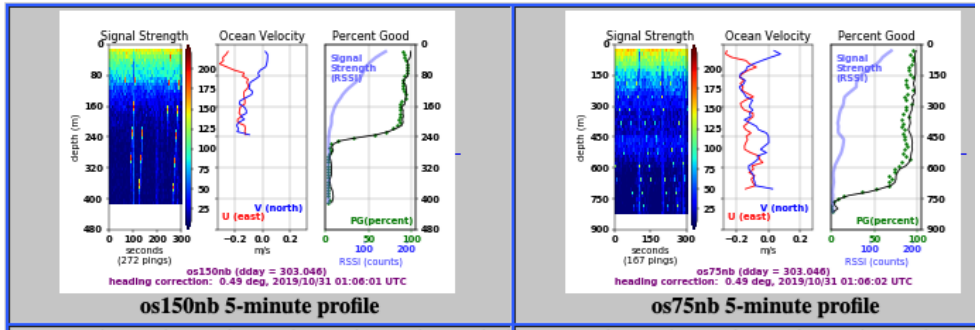
- seapath-gyro comparison (thumbnail)



Bridge plots:

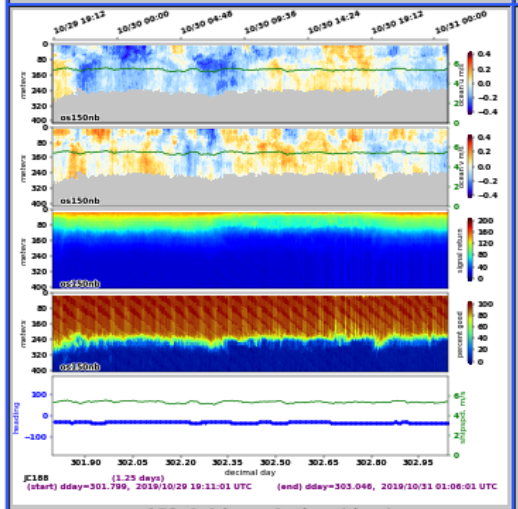
- surface vector :
  - day
  - night
- kts and direction profile:
  - day
  - night
- kts E/N + scattering profile

ADCP Thumbnails

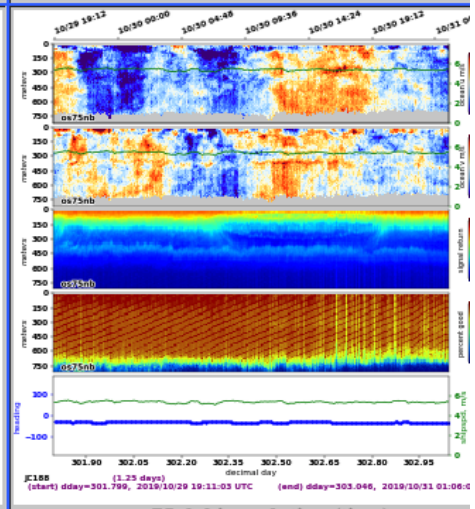


os150nb 5-minute profile

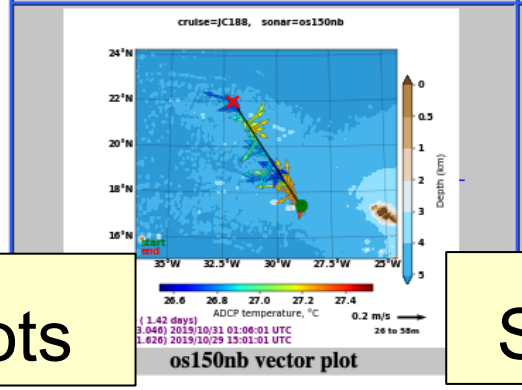
os75nb 5-minute profile



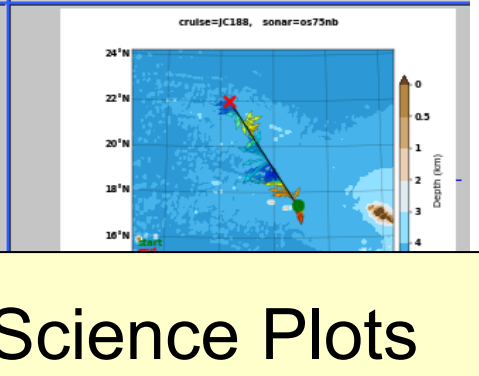
os150nb hi-resolution (time)

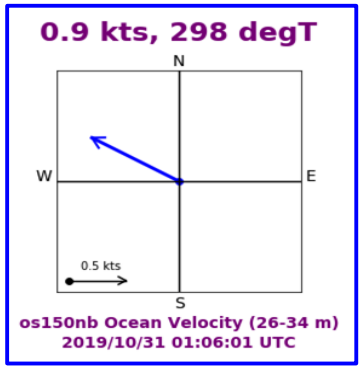


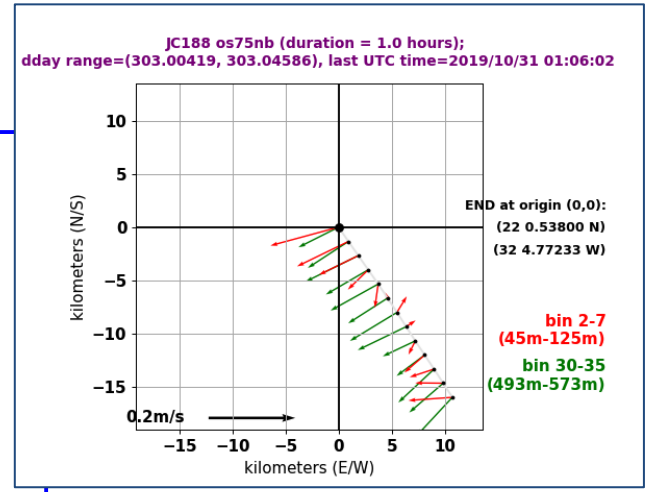
os75nb hi-resolution (time)

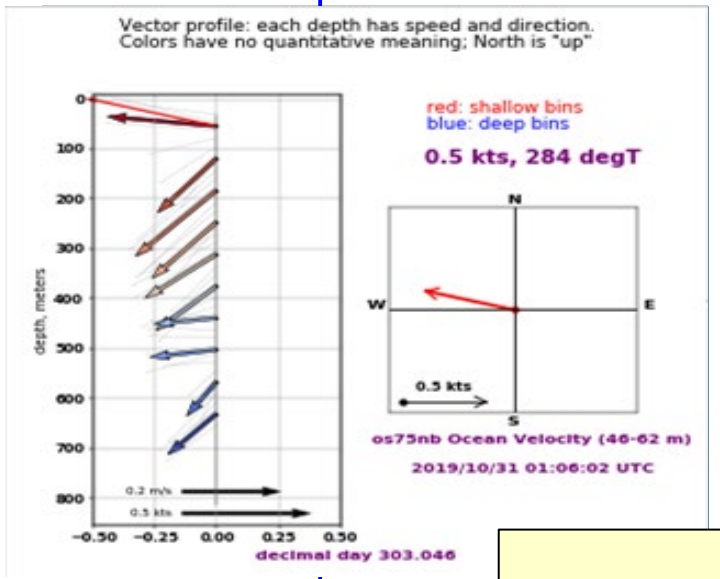


os150nb vector plot









Diagnostic Plots

Science Plots

Operations

UNOLS ships

letters	ship name	figures	last email	cruise name	status	daily report	daily email	OS	last update
ae	Atlantic Explorer	figs	6hr	Pierside_PostAE2016	logging	dir	email	18.04	2020-Apr-23
ar	Neil Armstrong	figs	6hr	ar47	(not logging)	dir	email	18.04	2020-May-30
at	Atlantis	figs	210d	(not set)		dir	email	16.04	2018-Aug-02
bh	Blue Heron	figs	6hr	(not set)		dir	email	18.04	2020-Aug-01
en	Endeavor	figs	6hr	(not set)		dir	email	18.04	2020-May-30
hly	Healy	figs	43d	(not set)		dir	email	18.04	2020-May-30
hs	Hugh Sharp	figs	6hr	(not set)		dir	email	18.04	2020-May-30
km	Kilo Moana	figs	6hr	km2012	logging	dir	email	18.04	2020-May-25
lg	L.M.Gould	figs	6hr	(not set)		dir	email	18.04	2018-Dec-23
mgl	M.G.Langseth	figs	6hr	(not set)		dir	email	16.04	2017-Aug-15
np	N.B.Palmer	figs	1d 6hr	nbp2010a	logging	dir	email	18.04	2018-Dec-19
oc	Oceanus	figs	6hr	(not set)		dir	email	18.04	2020-Apr-23
pe	Pelican	figs	6hr	PE21_06_Fugro_ADCP	(not logging)	dir	email	18.04	2020-Aug-01
rr	Roger Revelle	figs	0hr	RR2002a	(not logging)	dir	email	18.04	2020-Aug-01
skq	Sikuliaq	figs	6hr	SKQ202014S	logging	dir	email	18.04	2020-May-02
sp	R.G.Sproul	figs	3hr	(not set)		dir	email	14.04	2015-Mar-25
sr	Sally Ride	figs	6hr	(not set)		dir	email	18.04	2020-Aug-01
sv	Savannah	figs	6hr	(not set)		dir	email	18.04	2020-May-30
tt	Thomas G. Thompson	figs	17d	TN384	logging	dir	email	18.04	2020-Apr-25
ws	Walton Smith	figs	6hr	(not set)		dir	email	18.04	2020-Aug-01

NOAA ships

letters	ship name	figures	last email	cruise name	status	daily report	daily email	OS	last update
dy	Oscar Dyson	figs	6hr	(not set)		dir	email	18.04	2020-Aug-01
ex	Okeanos Explorer	figs	205d	EX-Transit-2020-03-23	logging	dir	email	18.04	2020-Jan-14
fh	Ferdinand Hassler	figs	6hr	(not set)		dir	email	14.04	2017-Jan-17
gu	Gordon Gunter	figs	35d	(not set)		dir	email	18.04	2020-May-30
hb	Henry Bigelow	figs	6hr	(not set)		dir	email	18.04	2020-Aug-01
nf	Nancy Foster	figs	3d	(not set)		dir	email	18.04	2020-May-30
pc	Pisces	figs	6hr	PC2020_atpier_october	logging	dir	email	18.04	2020-Aug-01
rb	Ron Brown	figs	6hr	RB2006	logging	dir	email	18.04	2020-Aug-01
rl	Reuben Lasker	figs	6hr	(not set)		dir	email	18.04	2020-Aug-01
se	Oscar Elton Sette	figs	6hr	(not set)		dir	email	18.04	2020-Aug-01
sh	Bell Shimada	figs	6hr	(not set)		dir	email	18.04	2020-Aug-01

other UHDAS ships

letters	ship name	figures	last email	cruise name	status	daily report	daily email	OS	last update
fk	Falkor	figs	6hr	(not set)		dir	email	18.04	2020-May-25
inv	Investigator	figs	6hr	in2020_v06	logging	dir	email	18.04	2020-May-30
kb	Kristine Bonnevie	figs	6hr	KB2020620	logging	dir	email	14.04	2017-Mar-09
nor	Norrona	figs	6hr	(not set)		dir	email	16.04	2018-Jul-05
olr	Oleander	figs	6d	(not set)		dir	email	18.04	2020-May-30
ps	Point Sur	figs	6hr	(not set)		dir	email	18.04	2020-May-30
ukdy	Discovery	figs	8hr	DY120	logging	dir	email	18.04	2020-Aug-01
ukjc	James Cook	figs	8hr	JC209	(not logging)	dir	email	18.04	2020-Aug-01

NSF funds the UNOLS ships

NOAA funds the NOAA ships

Various institutions or projects fund the “other” ships

UHDAS Systems Installed (2022)

- **17 UNOLS ships**: Atlantic Explorer, Neil Armstrong, Atlantis, Blue Heron, Endeavor, Hugh Sharp, Kilo Moana, Langseth, Pelican, R.Revelle, Sally Ride, Savannah, Sikuliaq, R.G.Sproul, Rachel Carson, T.G.Thompson, F.G.Walton Smith, -Oceanus, +Taani
- **3 polar ships**: Healy, L.M.Gould, N.B.Palmer
- **11** (+/-) **NOAA ships**: Okeanos Explorer, F.Hassler, G.Gunter, H.Bigelow, N.Foster, Pisces, R.Brown, R.Lasker, Sette, B.Shimada, Dyson, +T.Jefferson
- **6** (+) **International research ships:** Falkor (too), Pt Sur, Investigator, Kristine Bonnevie, Discovery, James Cook, G.O.Sars, Johan Hjort
- **3** (+/-) **Volunteer Observing Ship**: Oleander, Bulk Xaymaca, Norrona, (RCCL Adventure of the Seas, RCCL Celebrity Flora)

2022: UHDAS recap

- Usually Operating System upgrades are done in person, must do it without travel.
  - Complete operating system upgrade of 24 UNOLS computers on (13 ships)
    - fedex computers to Hawaii, upgrade, ship back
    - remote install using ship's tech support
    - remote upgrade using “do-release-upgrade”
  - total number of remote login “service calls” requiring a change: 165
  - New in 2022:
    - UHDAS Best Practices page in documentation
    - daily netCDF files (to reduce data transmission requirements)
    - temperature diagnostics plot (rolling out)
    - gga time diagnostics plot (rolling out)
    - POSMV thrashing times (identify)

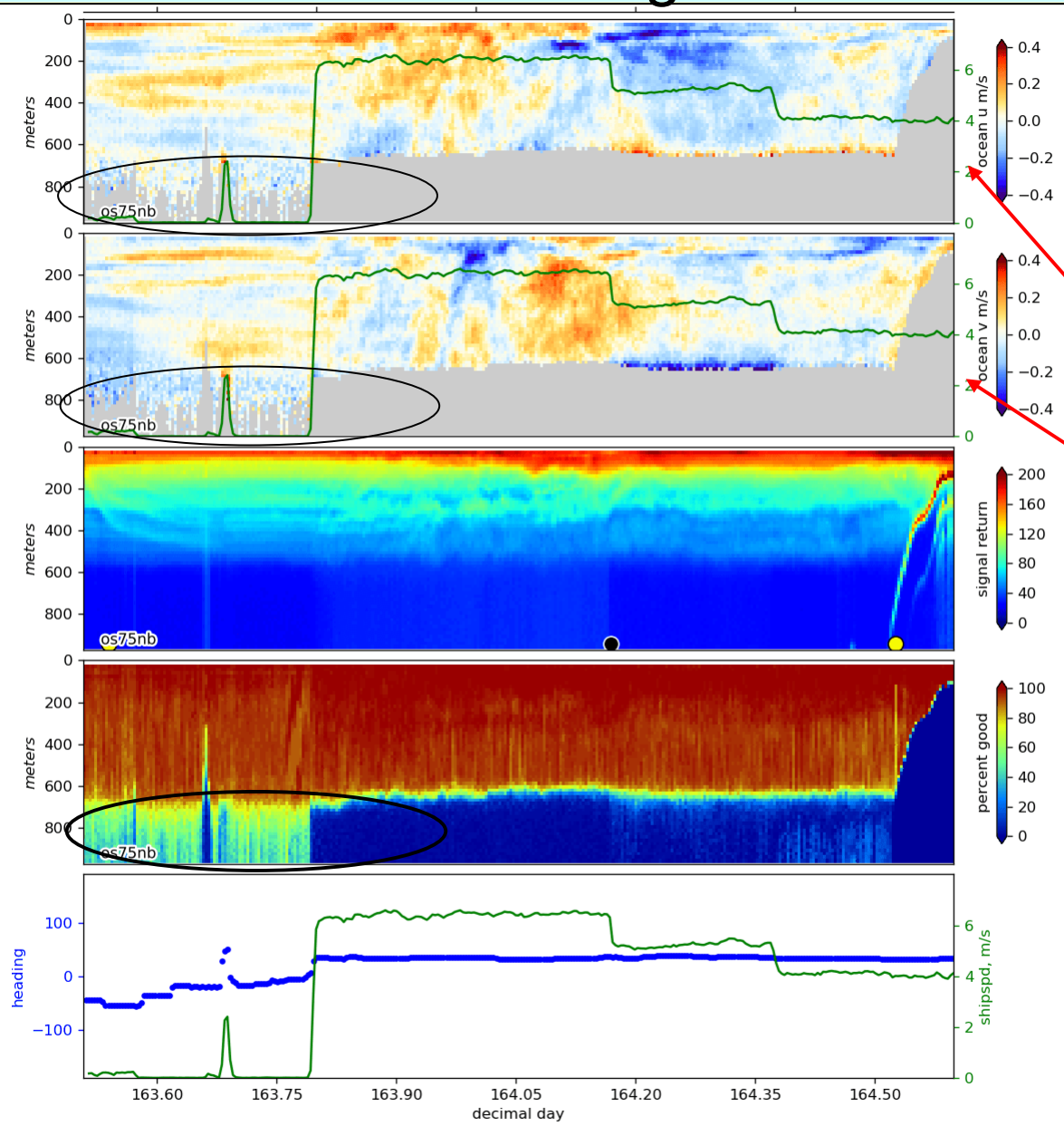
2022: Instrument Quality (ADCPs)

- temperature fluctuations may indicate failure
  - L.M.Gould os38, Atlantis os75
- electrical noise (also indicated by temperature)
  - Ron Brown (os75 - fixed in drydock by moving chassis)
  - Thompson (os75 - will be fixed during inport)
  - L.M.Gould (os38 - moved chassis)
  - Sikuliaq os38
- strange biases
  - Sikuliaq wh300
- failures

Electrical noise in averaged ADCP data

on-station “velocities” below the instrument's normal range

Percent Good is marginal (but not zero) below normal range



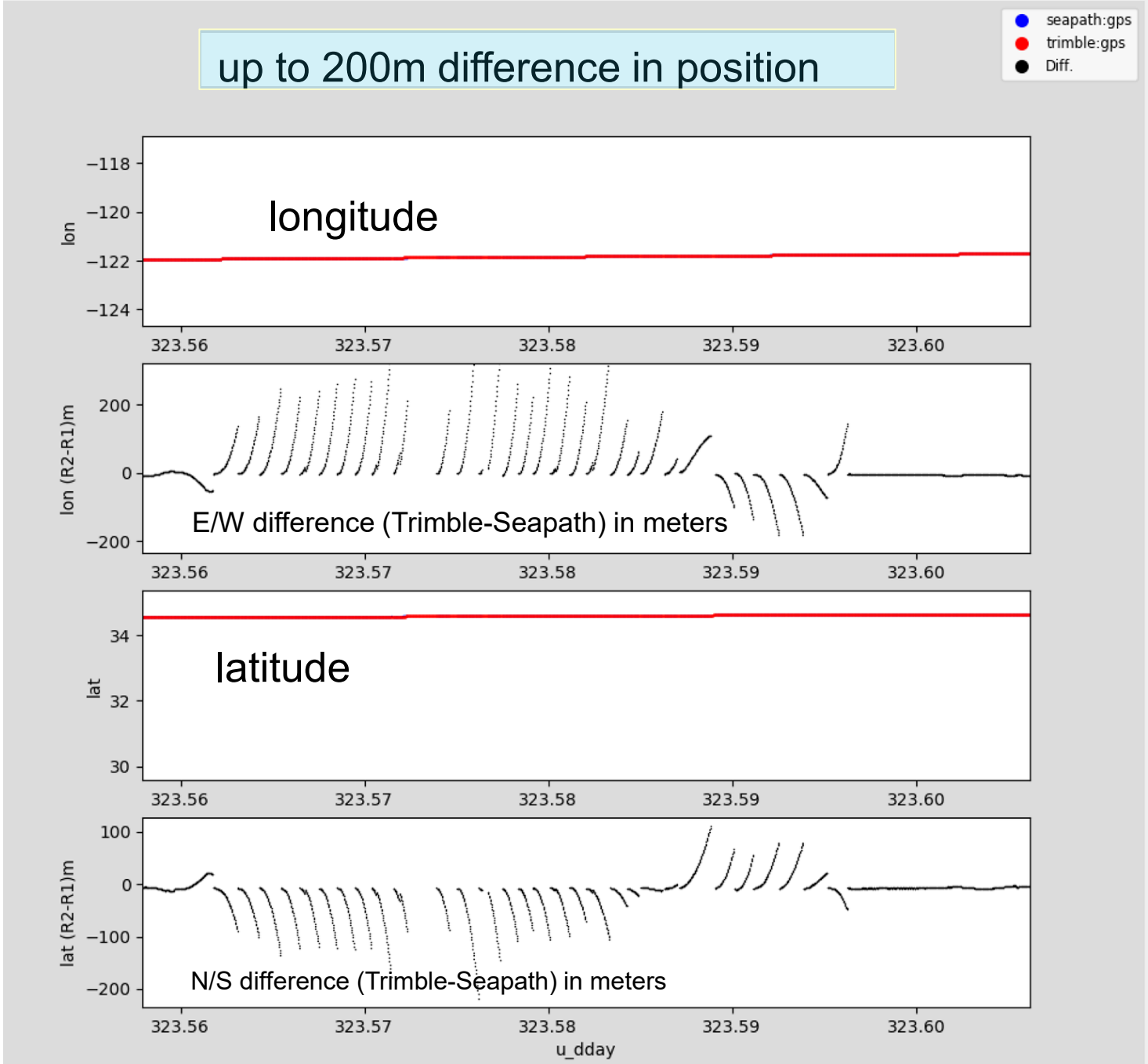
underway at slower speeds: strong bias at the bottom of the velocities

163.51 to 164.6 (1.09 days)

2022/06/13 12:16 to 2022/06/14 14:26

2022 Instrument Quality (not ADCPs)

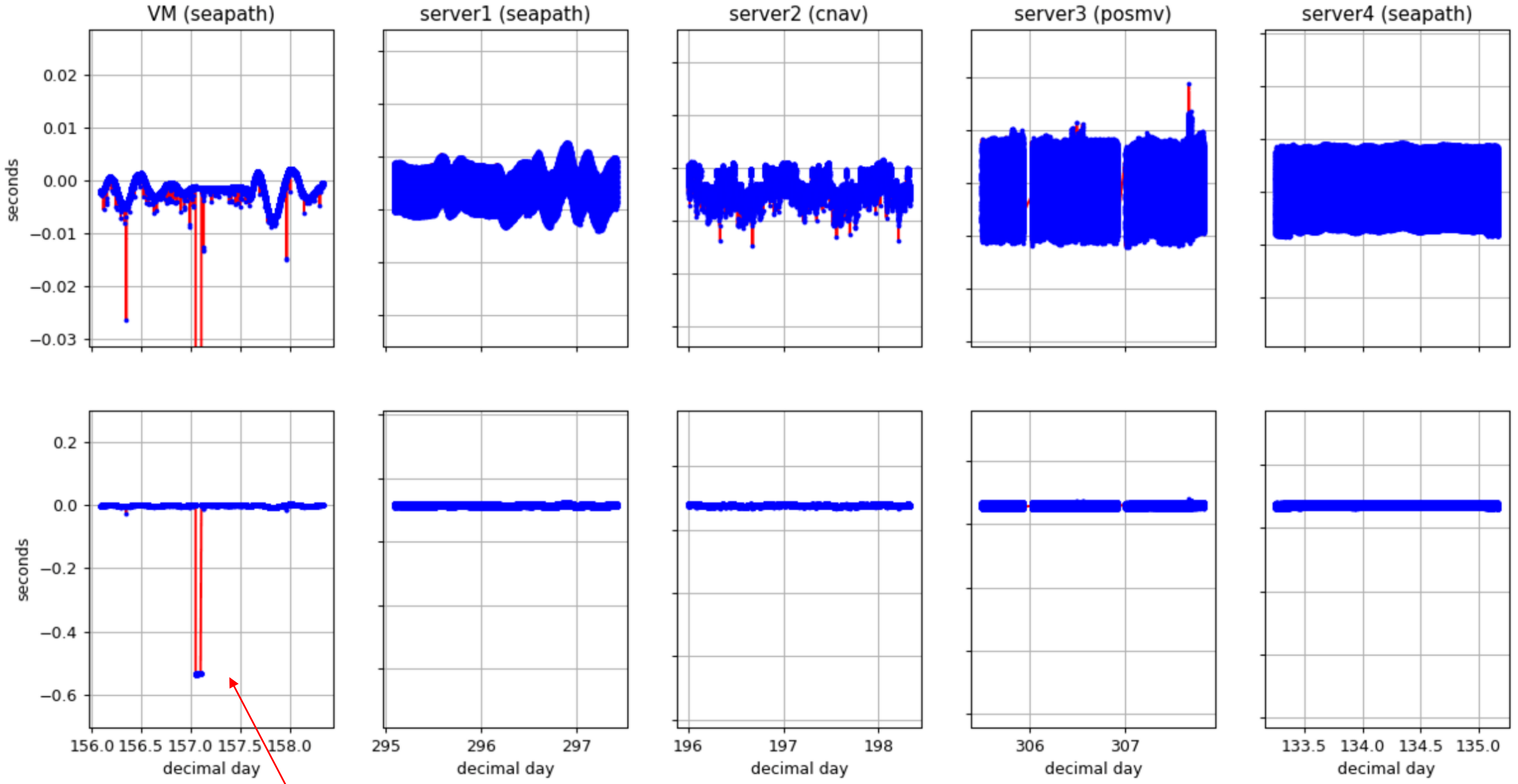
- POSMV
  - thrashing (log and send POSPAC data to Applanix, beta firmware, and now it's back)
- Seapath
  - Position: quality indicator= 6: “free inertial” (dead reckoning)
  - heading: reduced quality
- ABXTWO
  - end of life - replacement is untested, (BX982=closest relative, not great)
- Timeservers
  - VM - how to treat time?
  - ABXTWO - technically 'can serve ntp', but not very good
- Network issues
  - UDP storms (network loop) 3+ ships
  - multiple UDP streams to the same port (3+ ships)
  - network-based serial conversion (eg. moxa) and network glitches (3+)



Seapath position
- quality = 6: “free inertial” (dead reckoning)

- dubious quality

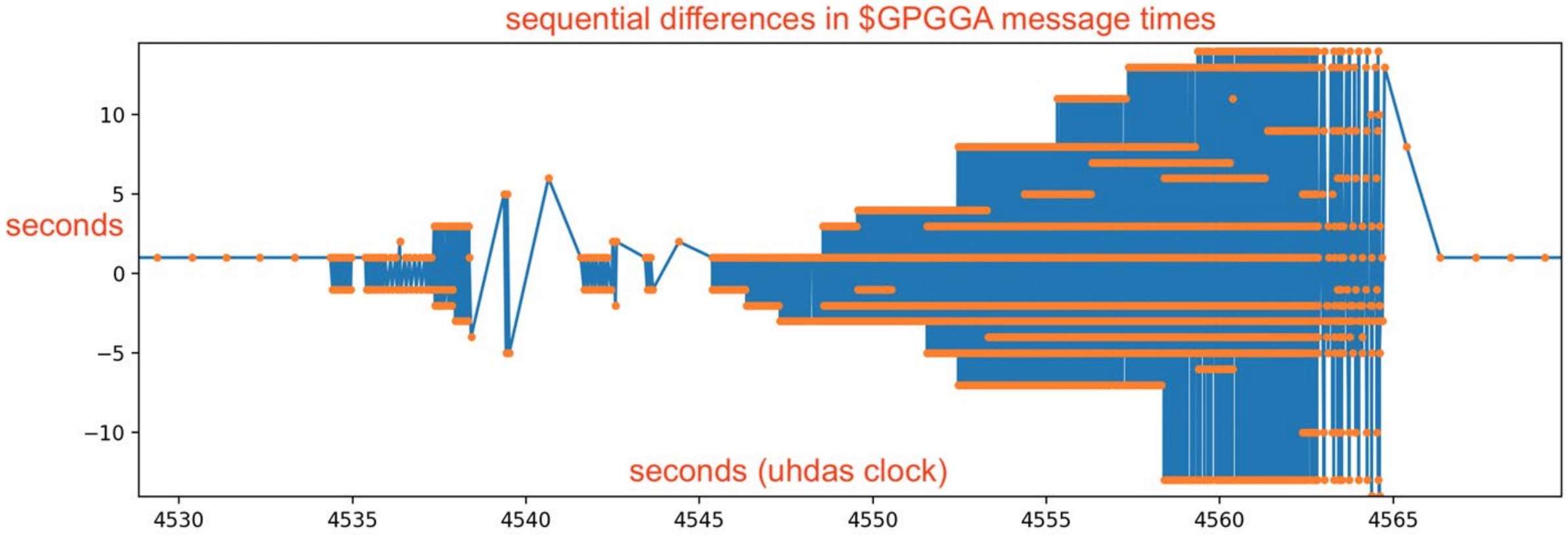
- must disregard for ADCP processing



steps of 0.1-0.6 seconds every

UDP Problems: UDP Storm”

- network loop causes UDP messages to bounce around
- in a few seconds those few GGA messages are send in shuffled order
- easily 5000 (shuffled, duplicate) messages can arrive in that few seconds



Coming up in 2022/2023

- testing Kongsberg EC150 (Sally Ride, “Falkor (too)”) - requires coordination
- test RDI Pinnacle45 (Armstrong, early Jan 2023)
- switch to the next Operating System (22.04), test
  - start upgrading computers
- Hire 1-2 more people
- Continue documentation improvements, software development, helping