

R2R Advisory Panel:

ADCP+UHDAS

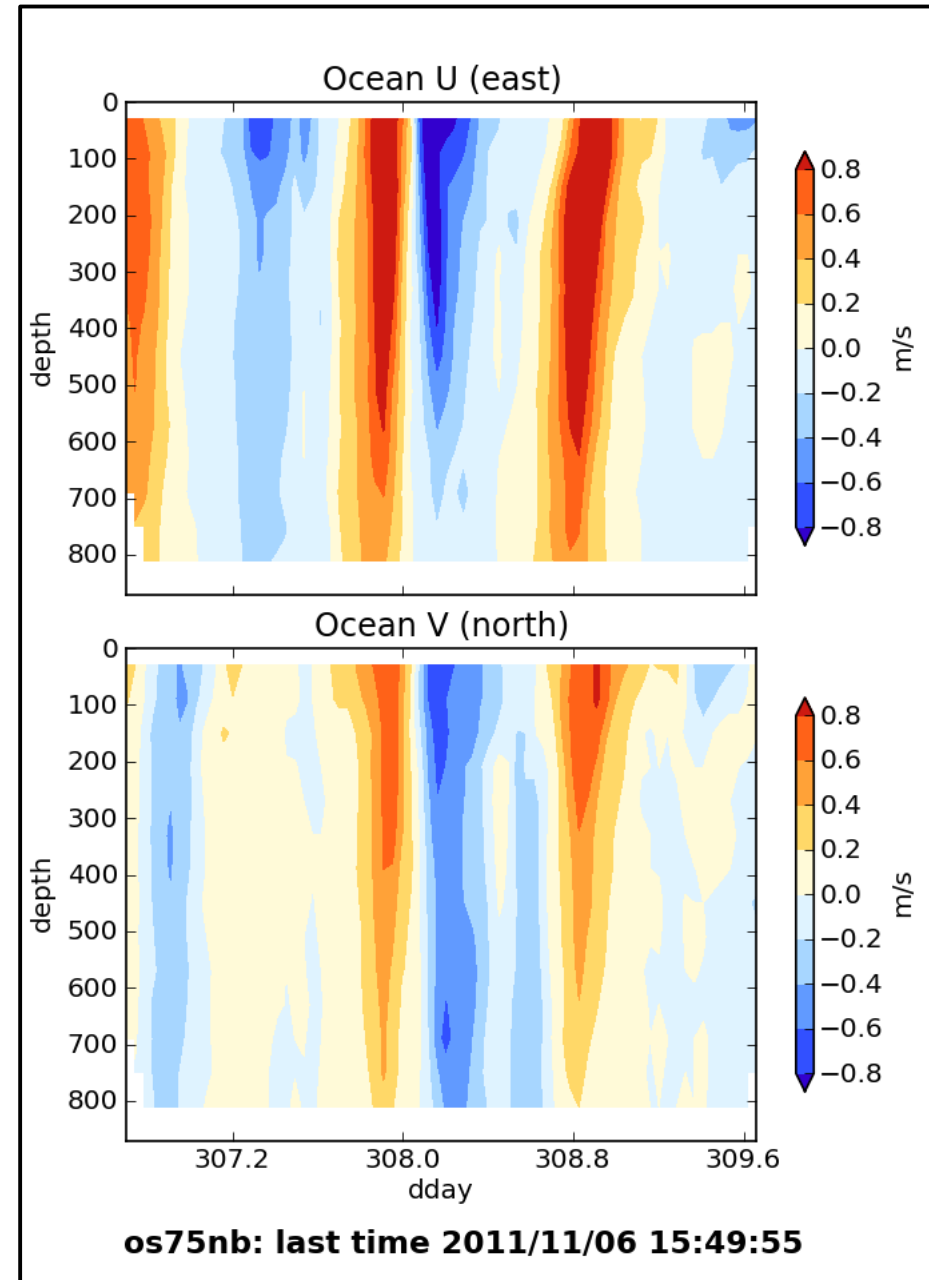
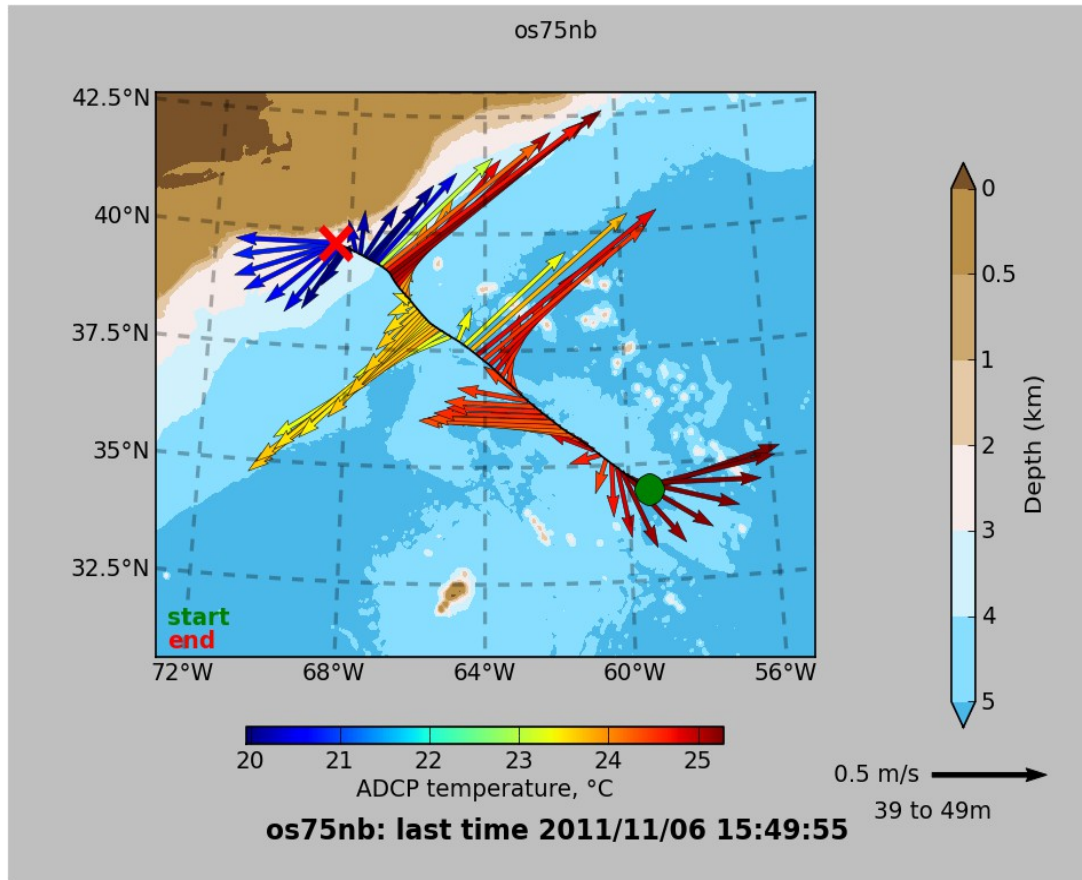
LDEO

Nov 23, 2018

The Goal: science-ready ocean currents

Time, ADCP,
Position,
Attitude

primitive (raw) data



ADCP: Getting Ocean Velocity

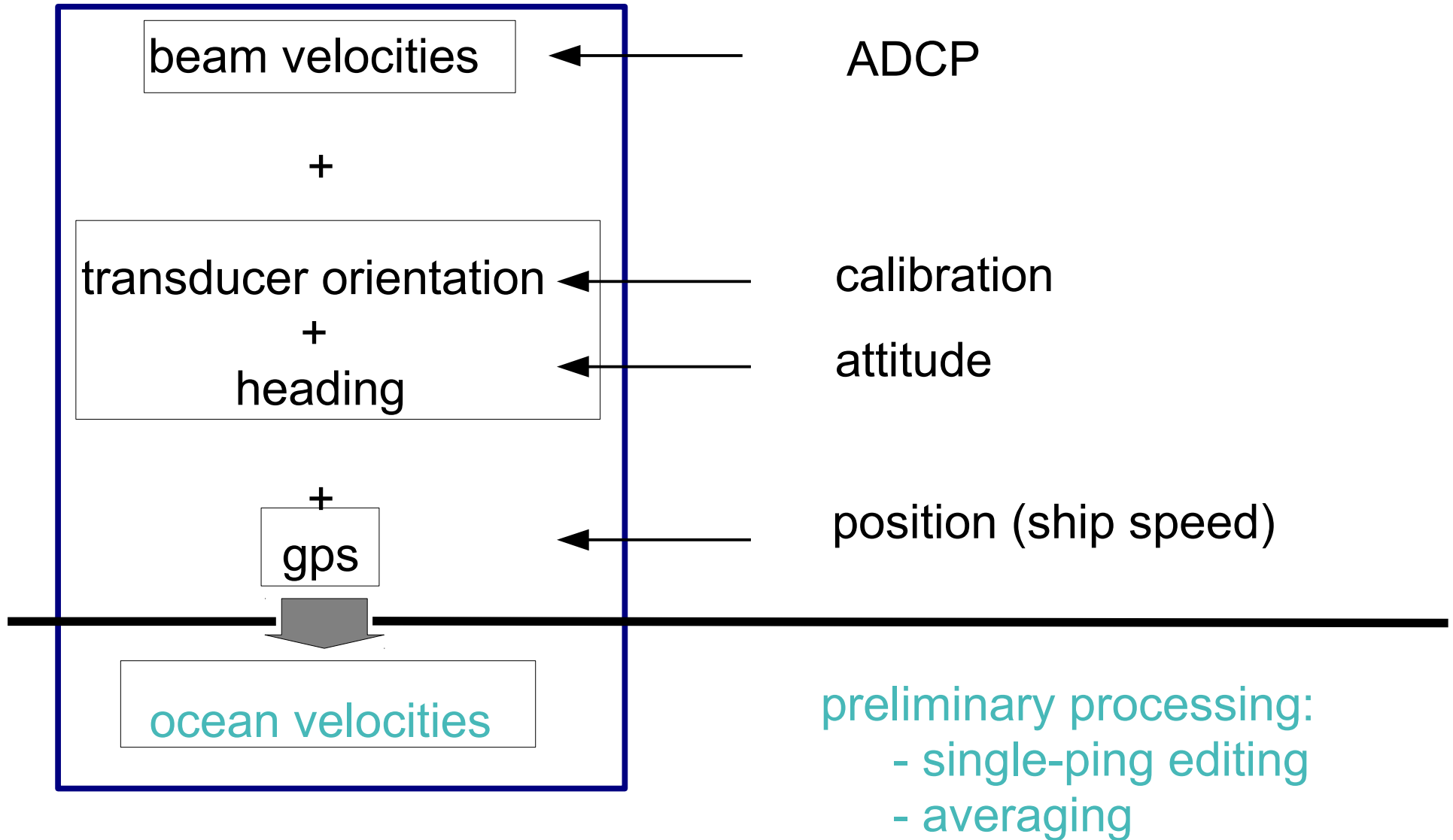
Acoustic (it pings along beams at a frequency)

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)

ADCP: Data components



UHDAS:

University of Hawaii Data Acquisition System

- **Acquisition:** reliable, robust; duplicate feeds
- **Monitoring:** catch problems early, fix, keep watching
- **Processing:** automated at-sea processing
 - goal: minimal additional processing needed for science-ready data
 - processing code is open source; runs on multiple platforms (OSX, Linux, Windows)
- **Data Products:** [at-sea web site](#), figures and data
 - data products are in Matlab, netCDF, CODAS database
 - figures are stored for later use

Monitoring

- 38 ships (20 UNOLS, 11 NOAA, 7 other)
- each sends a daily email with
 - text email summary of many key failure points
 - digest of additional information about
 - health of data acquisition system
 - status of logging and processing, computer health
 - last few data entries from each ascii serial instrument
 - heavily averaged processed data snippet
 - last few data entries from each ADCP

These are automatically plotted

UHDAS ship table

What can go wrong:

- problems with ADCP instrument
- data acquisition:
 - computer: timestamps are bad
 - serial (or UDP) NMEA feeds glitchy or fail
 - quality of ancillary data is poor
- preliminary processing:
 - a bug, or timestamp problems

Response to a Monitoring “Red Flag”:

Send email to the tech at sea:

(1) small problem; stop/start logging

- causes a little glitch, no long-term harm to dataset

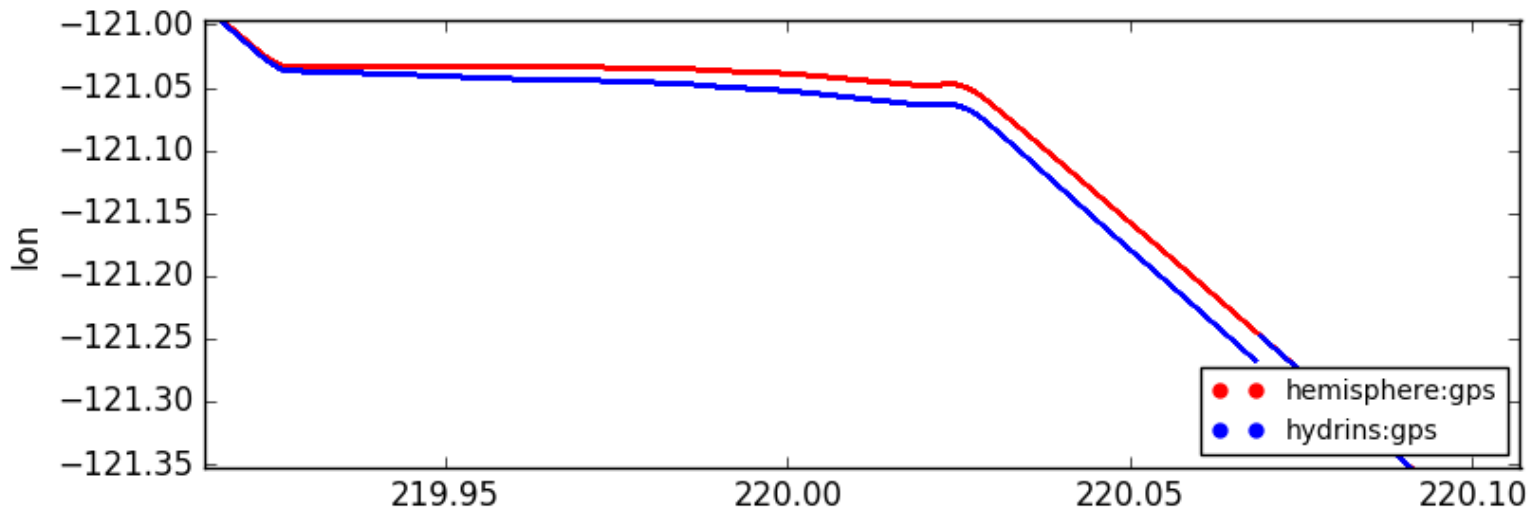
(2) we remedy a larger problem; usually requires starting a new cruise segment

- causes problems with some automated backup schemes (eg. **km1001**, **km1001a**, **km1001b...**)
- probably noteworthy for QA later

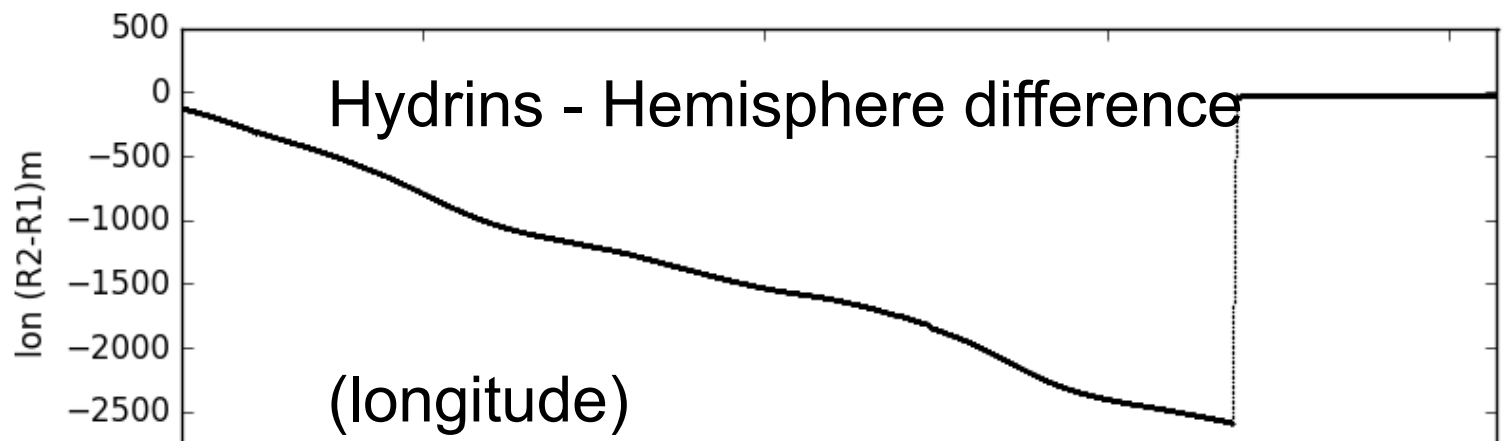
Improvements in monitoring

- current:
 - quality of accurate heading device
 - horizontal offset of ADCPs and GPS^(*)
- future:
 - relative positions of ADCPs and all GPS feeds
 - better assessment of GPS quality

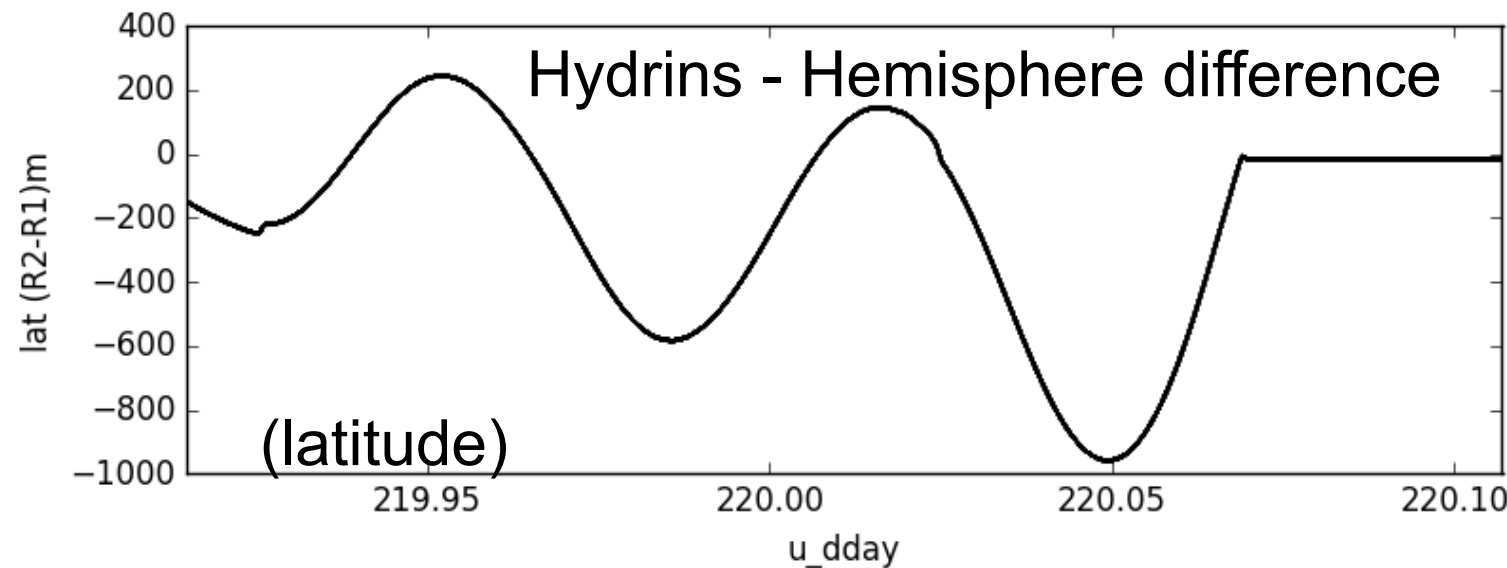
(*) the GPS used for processing



Monitor all ancillary data for quality

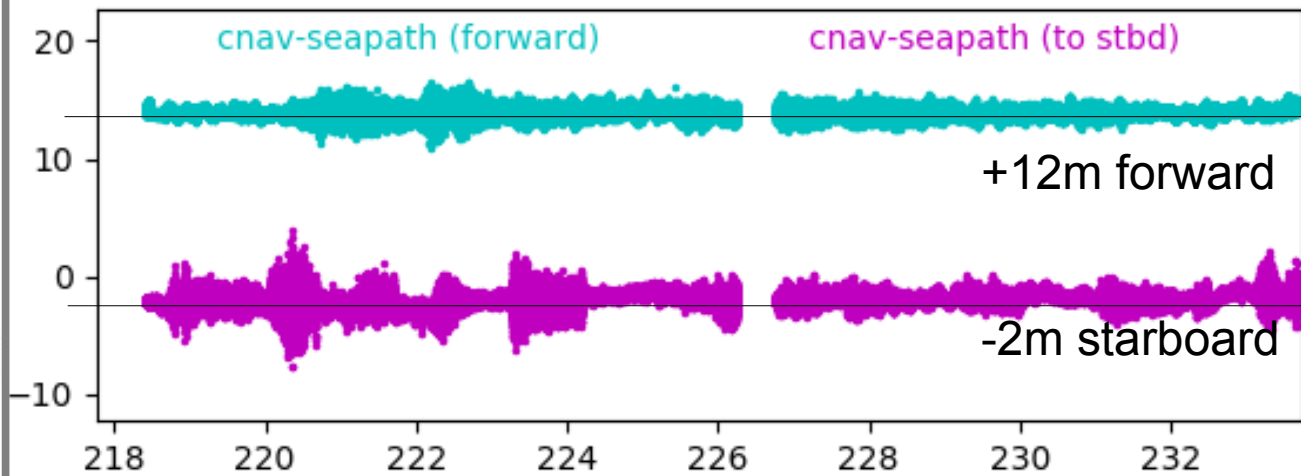
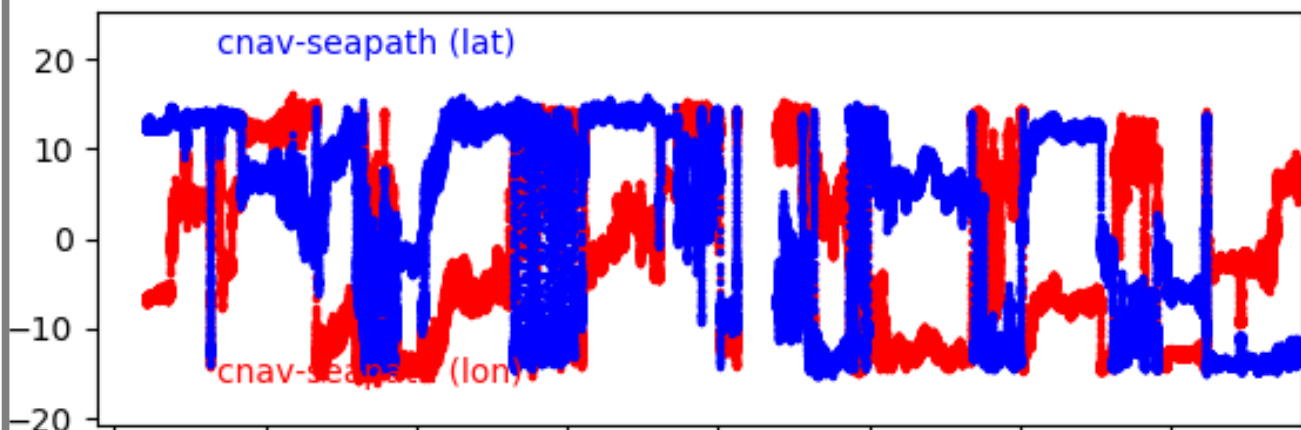
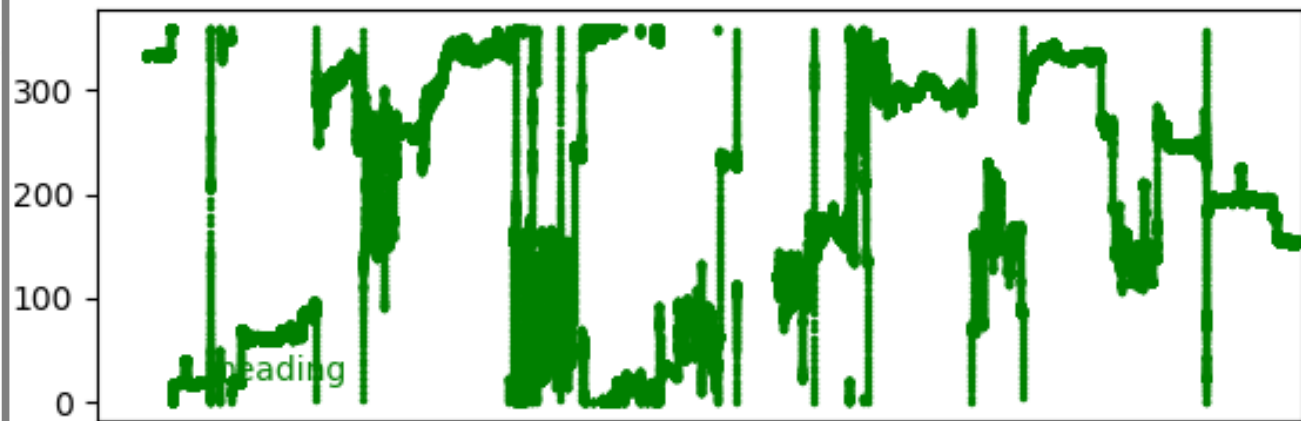
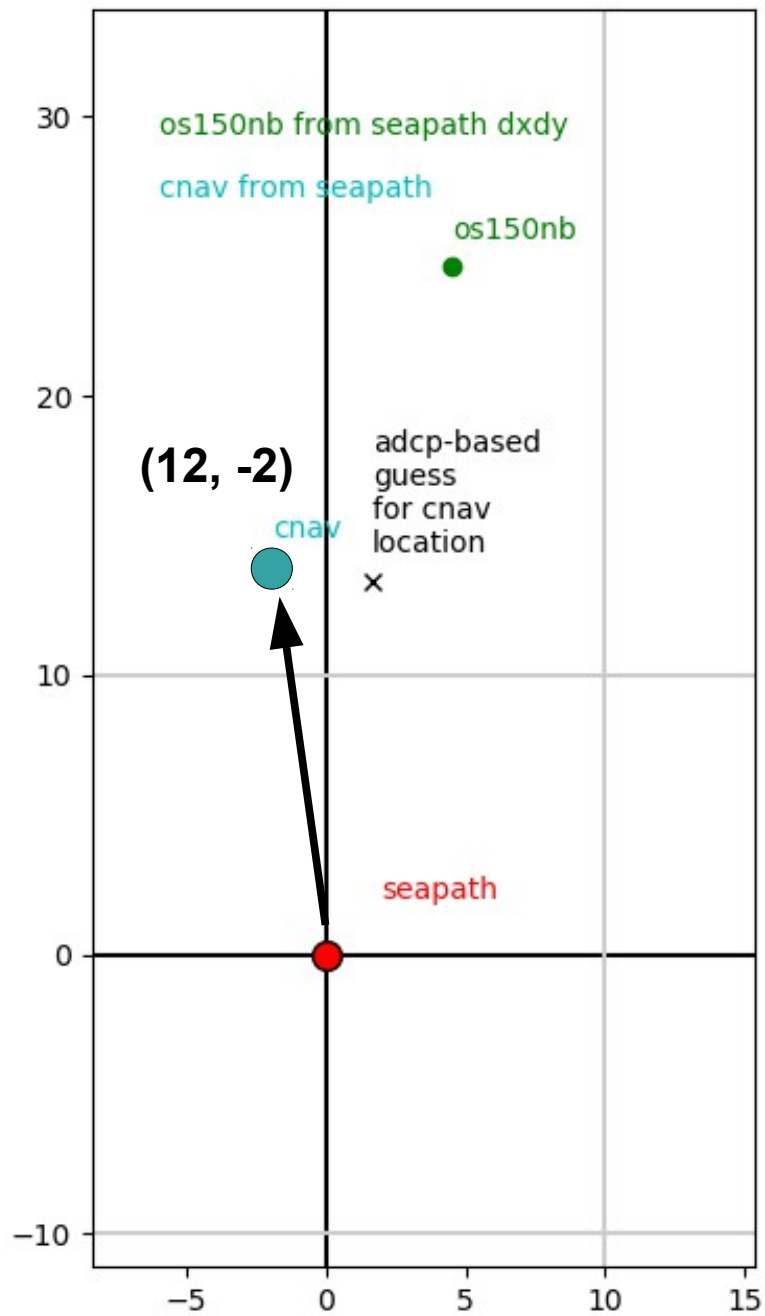


1000m



1000m

SKQ201712S



Archiving

- At-sea datasets go to R2R

- R2R can submit them to NCEI
 - ADCP data from NCEI is submitted “as is” and should not be used for science without some kind of quality assessment.

- A scientist who verifies calibration and edits the data can submit to Joint Archive for Shipboard ADCP data ([JASADCP](#))
 - At present, that requires some level of ADCP expertise, and additional software (free, requires work) to clean up the dataset.

Global Ocean Current Database

- [new NOAA web site](#)
- pick lon-lat-time boundaries to get ocean currents
- good:
 - can choose JASADCP only for ocean currents
 - R2R submission listing = direct inventory
- bad:
 - output is a large collection of independent profiles

Data mining: How good is the dataset?

Two different aspects:

- (1) How much work is required to make the final data the best possible with existing tools
- (2) What is the data quality after that work?

Cruise Rating: Potential Final Quality

Level of work (expertise) to finalize:

- (1) OK to start using “as is”; minimal work needed for submission to JASADCP
- (2) post-processing required but steps are easy
- (3) must reprocess from scratch; then like #1 or #2
- (4) must reprocess from scratch; expertise is required

Final data quality – Letter grade:

- A: best possible**
- B: someone may use it**
- C: do not use it**

UHDAS “reports” directory

- historically: UHDAS directory has these:
raw, rbin, gbin, proc (processed data + products)
- **reports** directory (example [N.Armstrong ar0106](#))
 - index.html to organize
 - consolidate information for Cruise Rating
 - it will be discoverable at NCEI starting with N.Armstrong
- Improvements:
 - sonar summary
 - (working on) timeseries gps comparisons, locations

What is missing?

- strengthen the **reports** directory:
 - improve it
 - run it on existing cruises
 - document how to use it
- develop a meta-reports (ship) table:
 - leverage groups of cruises for
 - calibrations
 - Cruise Rating
- need a way to attach “comments” to a live cruise, for later, while we know what went wrong

addition slides
not shown

Cruise Rating: Potential Final Quality

Must be able to automate these kinds of questions:

- Did the accurate heading device work? sometimes?
- Did an instrument change locations?
- Are there time gaps in acquisition? Was it run only occasionally?
- Is coverage poor due to bad weather, poor scattering, or ice?
- Are there biases due to bad weather, electrical noise, something else?

Cruise Rating: work required

Must be able to automate these kinds of questions:

- How good is calibration?
 - always: transducer angle
 - modern: also need offset between GPS and transducer
- Did the accurate heading device work?
 - if not, how hard is it fix?
- Are the timestamps OK?
- How much editing is needed?
 - complicated topography or really shallow
 - bad weather can cause biases

Cruise Rating: work required

- (1)** OK to use “as is”; minimal work needed for submission to JASADCP
- (2)** post-processing required but steps are easy
- (3)** must reprocess from scratch; then like #1 or #2
- (4)** must reprocess from scratch and specialized knowledge and/or programming is required

Cruise Rating: Potential Final Quality

Letter grade:

- **A: best possible** (accurate heading device worked, good calibrations used, no reason to expect biases)
- **B: someone might use it** (not best quality, but still can use it, with caveats about errors in ocean currents). This is a large category. eg:
 - not an accurate heading device
 - biases due to bad weather
- **C: don't use it** (electrical noise created biases, it was run too little, instrument was sync'd with a low ping rate)