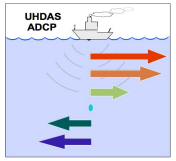


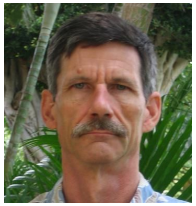
Enhancing ADCP Data Quality and Accessibility through Sensor Best Practices, Shipboard Bandwidth Advancements, and Open Source Collaborations

(1) Andrew Frambach, UHDAS
(2) David Vadnais, UHDAS

Background - UHDAS

the **U**niversity of **H**awaii **D**ata **A**cquisition **S**ystem (...for ADCPs)

- **Data acquisition -** communicates with the ADCP and collects data;
- **Data processing -** converts raw data into a usable product after processing and quality controls;
- **Data display -** provides automated, near real-time, on-ship ADCP data analysis and displays;
- **Data delivery -** one of the topics of this presentation.
- Our team:
  - installs, maintains and develops software to acquire ADCP and ancillary sensor data;
  - daily monitoring of ADCP and ancillary sensor quality;
  - hired by NOAA in 2014 to provide support for 12 ships.
- UHDAS operates alongside, but independent of SCS.






Background - ADCPs

Acoustic - ADCPs are sensors that use sound to measure the aquatic environment by transmitting acoustic signals and listening for the returns (echoes) of the reflected transmissions.

Doppler - A reflected sound wave shifts in phase one way or another depending on the velocity of the target.

Current - The Earth-relative current of the water (speed and direction) is calculated from the combined Doppler velocity returns of 4 orthogonal beams, and then subtracting out the the speed and direction of the ship.

Profiler - The vertical profile of water current from the bottom of the ship down to some nominal depth is created by slicing the return into bins of depth (time of return) and then averaging those bins over a 5 minute sampling period.

RDI:

Workhorse

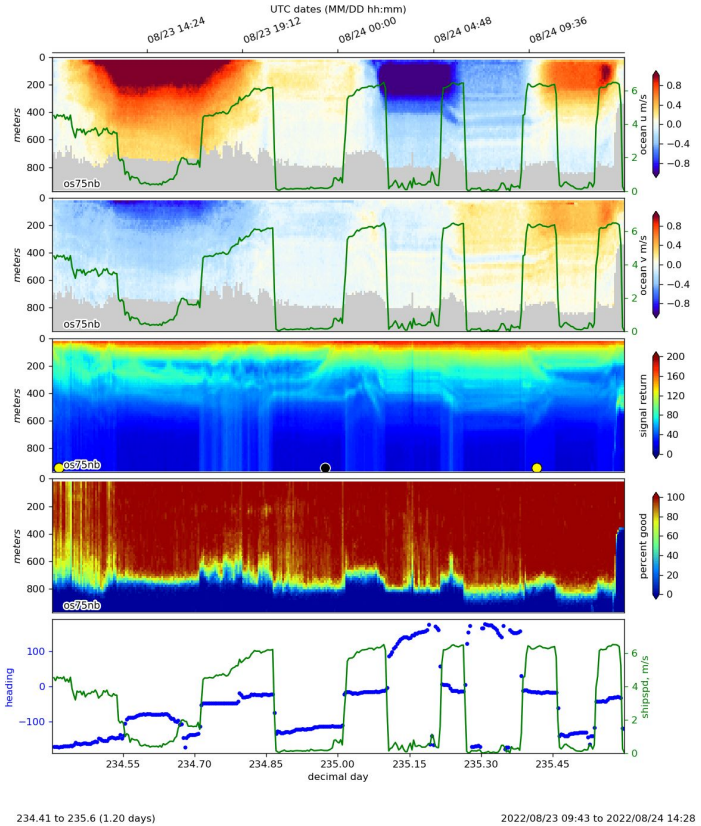
Ocean Surveyor

Kongsberg:

EC150

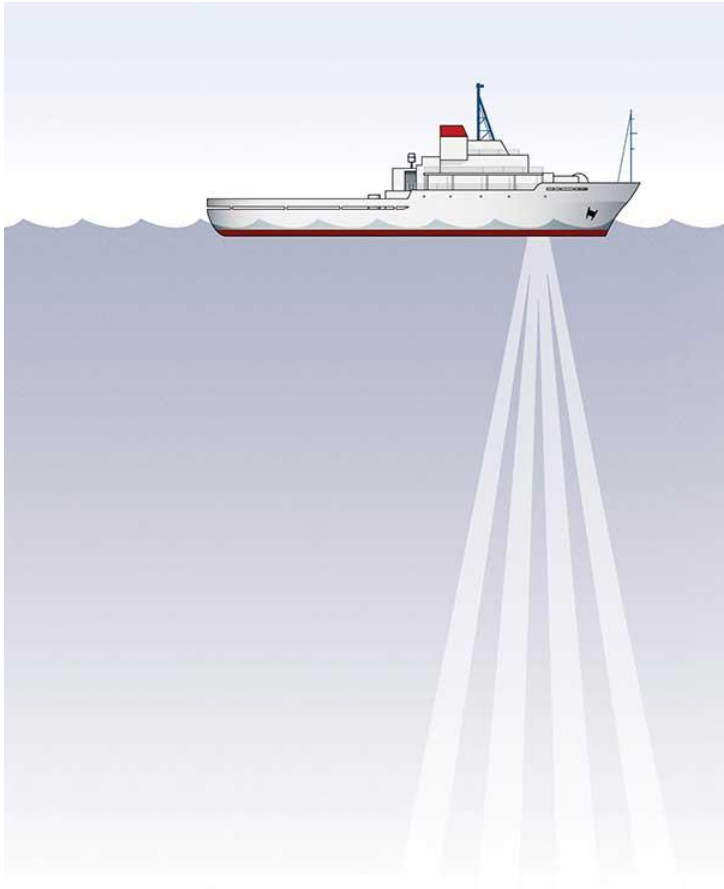
ADCP Datasets - a quick overview

- **Can be multiple instruments -** shipboard ADCP systems come in multiple frequencies and multiple bandwidths - there are often 1 to 2 systems installed on a ship.
- **Not just ADCP data is collected and preserved -** Measuring velocities of currents in the ocean from a moving platform requires accurate position and heading measurements to achieve scientific needs, aiming for 1 cm/s ocean velocity error.
- Datasets also contain calibration data (water track, bottom track points, dxdy stats)
- Data is collected at a rate of about 1 GB per week
- There is usually one dataset collected per cruise, but NOT ALWAYS.



ADCP Best Practices - at sea

- **Record ancillary data -** even when not pinging ADCPs… it helps us recognize problems with devices when they occur.
- **Ocean Surveyors -** can ping in two modes, *narrowband* and *broadband*.
    - **NB -** more robust, ½ x resolution of BB, better range
    - **BB -** less robust, 2 x resolution of NB, worse range
    - Usually better to pick one over the other, since they steal pings from each other.
- **How many sonars do you really need? -** the more sonars you run, the smaller number of pings each sonar gets (if triggering), or the more sound interference there is in the water (if not triggering). Ping what you need to accomplish the scientific goals of the mission.
- **Bottom-track mode -** used only for calibrations, and never in deep water.
- **Daily monitoring -** remotely by UHDAS personnel.
- **Consistent cruise naming -** for better organization.

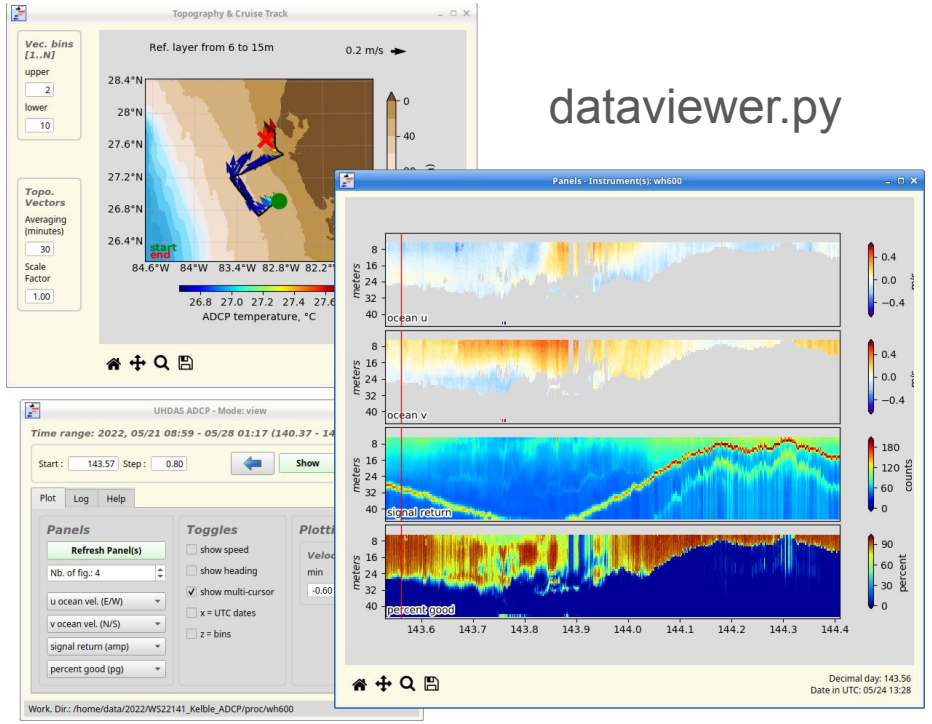


ADCP Best Practices - post-cruise processing

- **CODAS -** a downloadable free and open source software (FOSS) package that contains both:
  1. core ADCP processing algorithms
  2. GUI and command line tools for post-processing ADCP data.

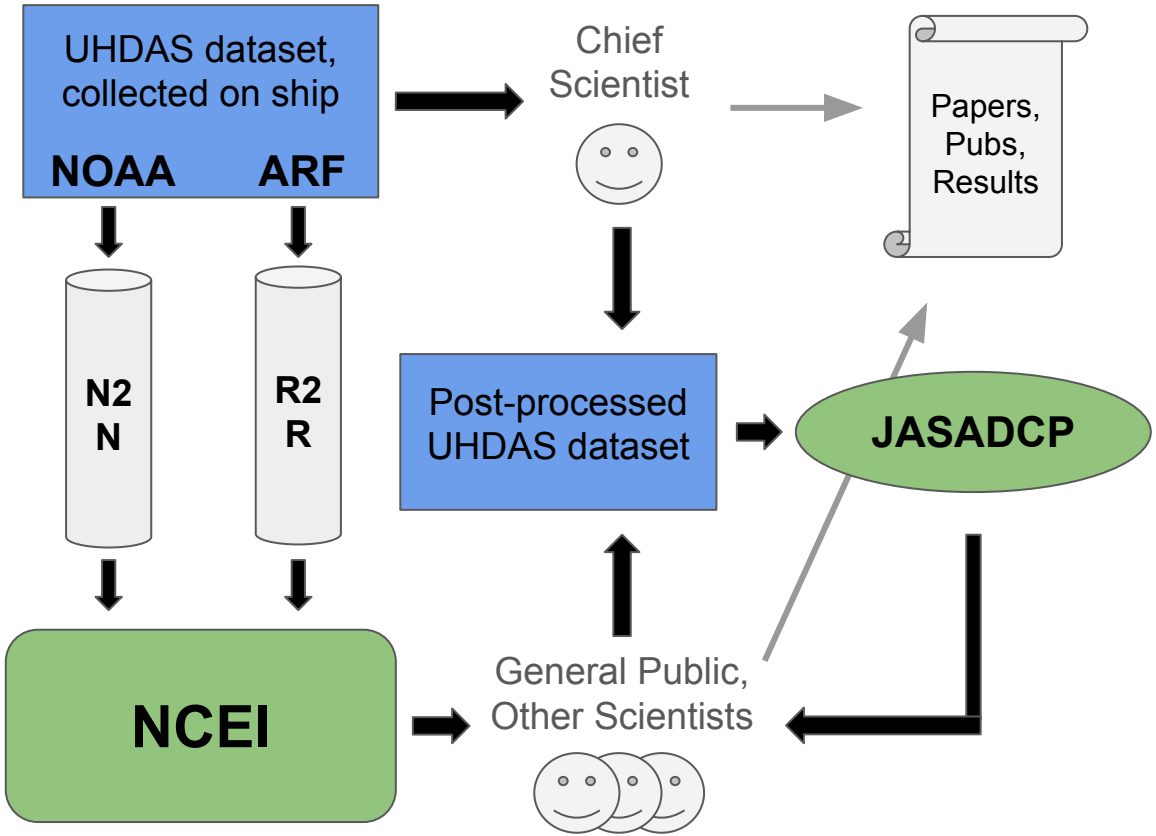
https://currents.soest.hawaii.edu/docs/adcp_doc/index.html

- **Post-processing best practices:**
  - **Precision calibration** - calibrate ADCP rotation in the hull to less that 0.1 degrees, ADCP/GPS physical location offset to within 1 meter.
  - **Heading gap fill -** interpolate across gaps in heading with patch_hcorr.py
  - **Switch out devices -** switch out GPS or heading devices and then re-process to fix periods of bad or missing data.



dataviewer.py

Where can ADCP Data be found



- **Pipelines**
  1. **N2N** (NOAA ship 2 NCEI archive) handles the routine underway data collected by NOAA ships. This data is automatically processed at sea before being transferred.
  2. **R2R** (Rolling Deck 2 Repository) is the pipeline for the academic research fleet (ARF) to NCEI.
- **Repositories**
  1. **NCEI** (National Center for Environmental Information) where NOAA and ARF data are archived.
  2. **JASADCP** (Joint Archive for Shipboard ADCP) a collection of post-cruise processed shipboard ADCP data.

N2N - the NOAA ship to NCEI archive pipeline

The Goal: Make ADCP data available to the public

Past and Present:

ADCP data are collected on the ship

ODA Pull

OMAO Cloud

NCEI Pull

ADCP data are available to the public

Future:

Globus

NOAA Ships

NCEI

Data Delivery and FOSS Goals

What tools should we develop?

How would the NOAA community like us to make our datasets more accessible?

Please send us feedback at uhdas@hawaii.edu