UHDAS Shipboard ADCP Data

(Raising the Profile of Ocean Currents)

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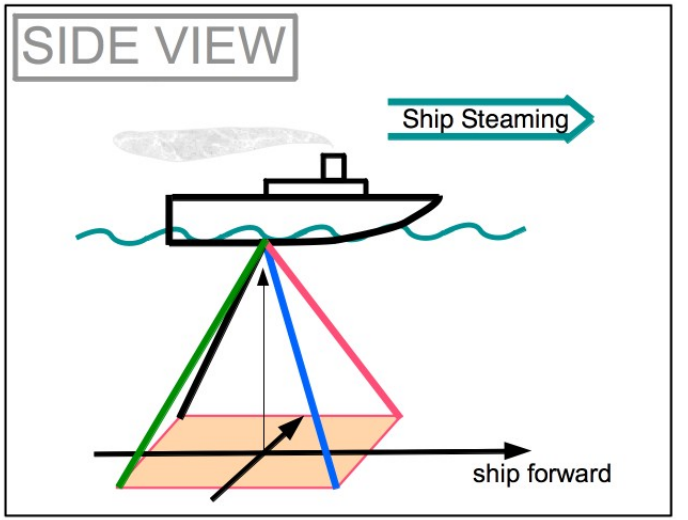
Outline

1) Introduction to shipboard ADCP and ocean currents
2) Description of UHDAS goals
3) Benefits of UHDAS (over commercial software)
4) UHDAS Data Archiving and Stewardship

(1) Shipboard ADCP and ocean currents

- **A**coustic **D**oppler **C**urrent **P**rofile
- Mounted on a ship hull
- One frequency per instrument
- Pings once every 1-2 seconds

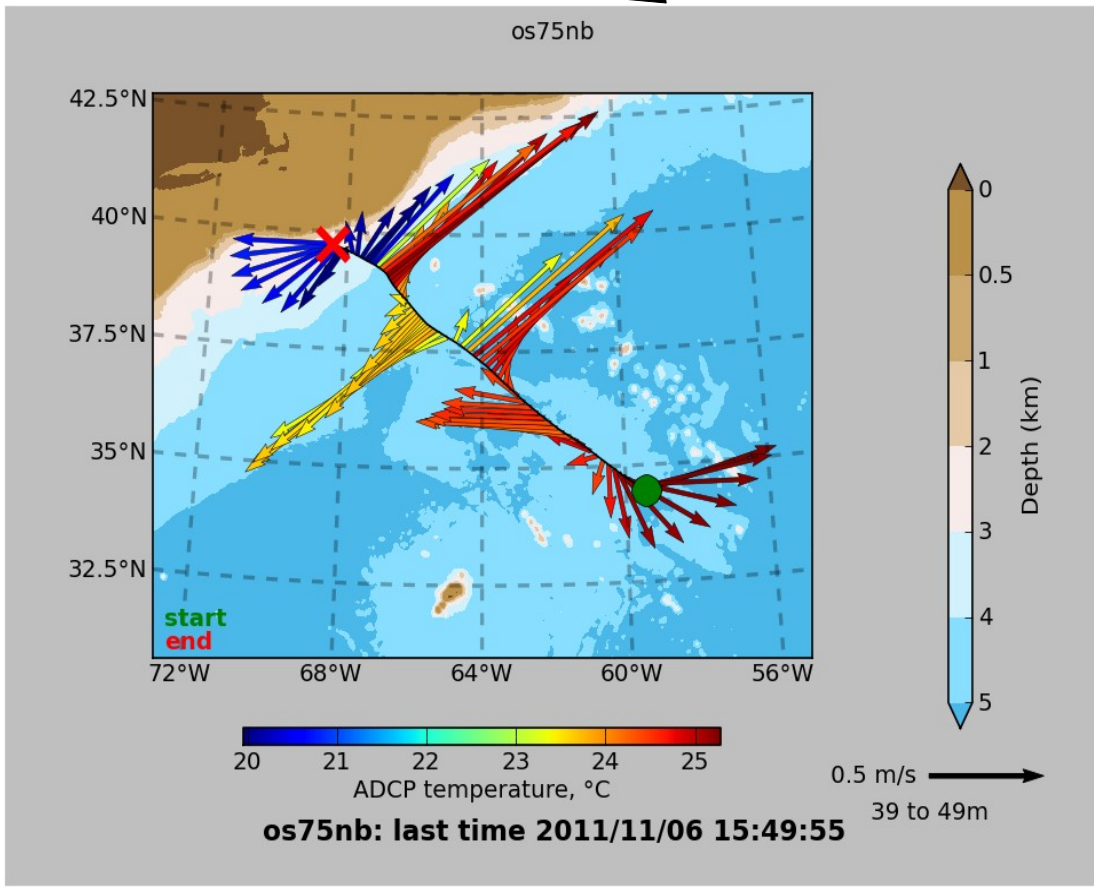


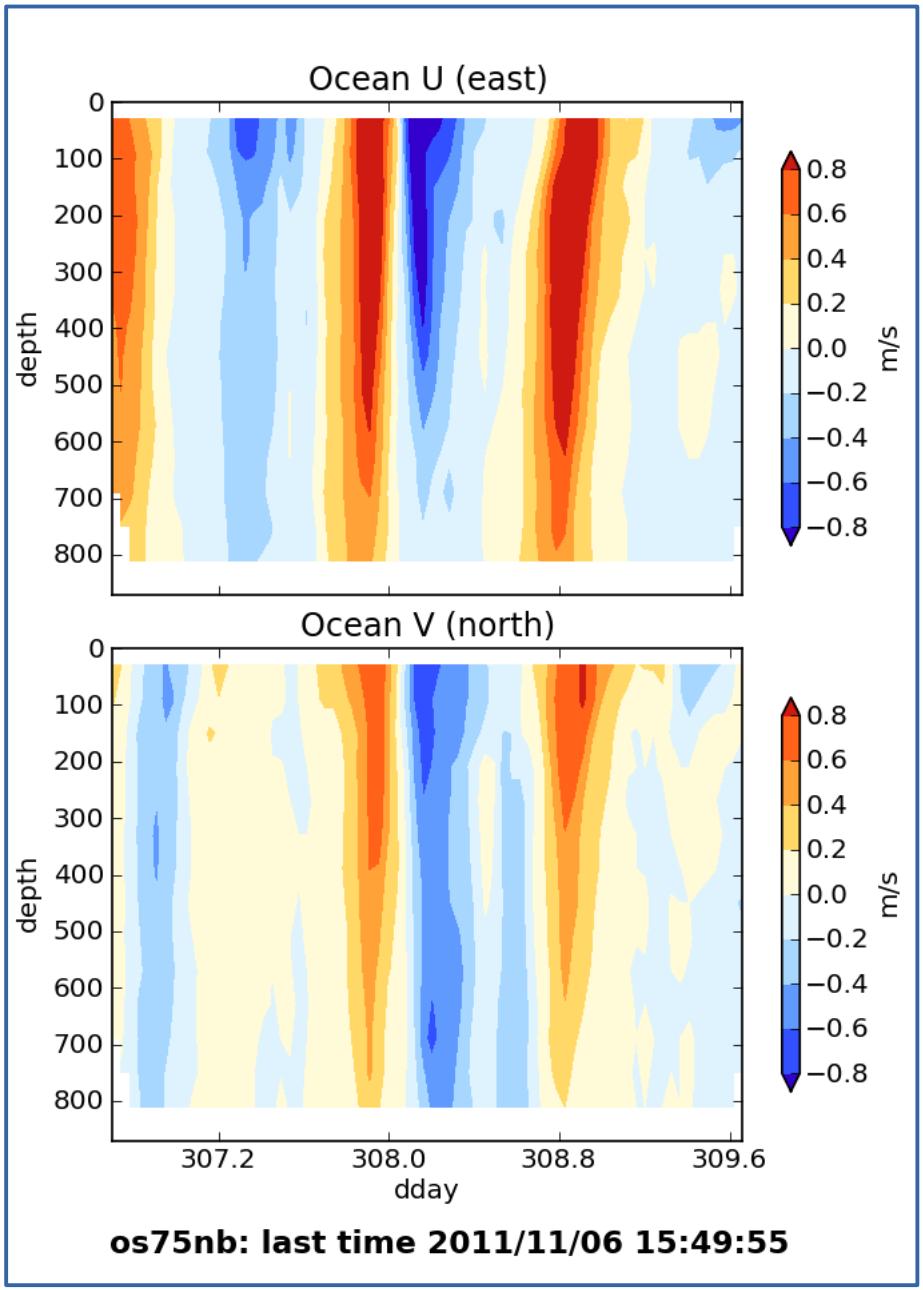
- Primary data of interest: ocean currents
    - requires GPS position and ship's heading
- Average measurements over several minutes
- Results in vertical profiles of ocean currents
    - example: 16m vertical resolution, 700m range

ADCP data: acquisition and processing

Time, ADCP, Position, Attitude

primitive (raw) data

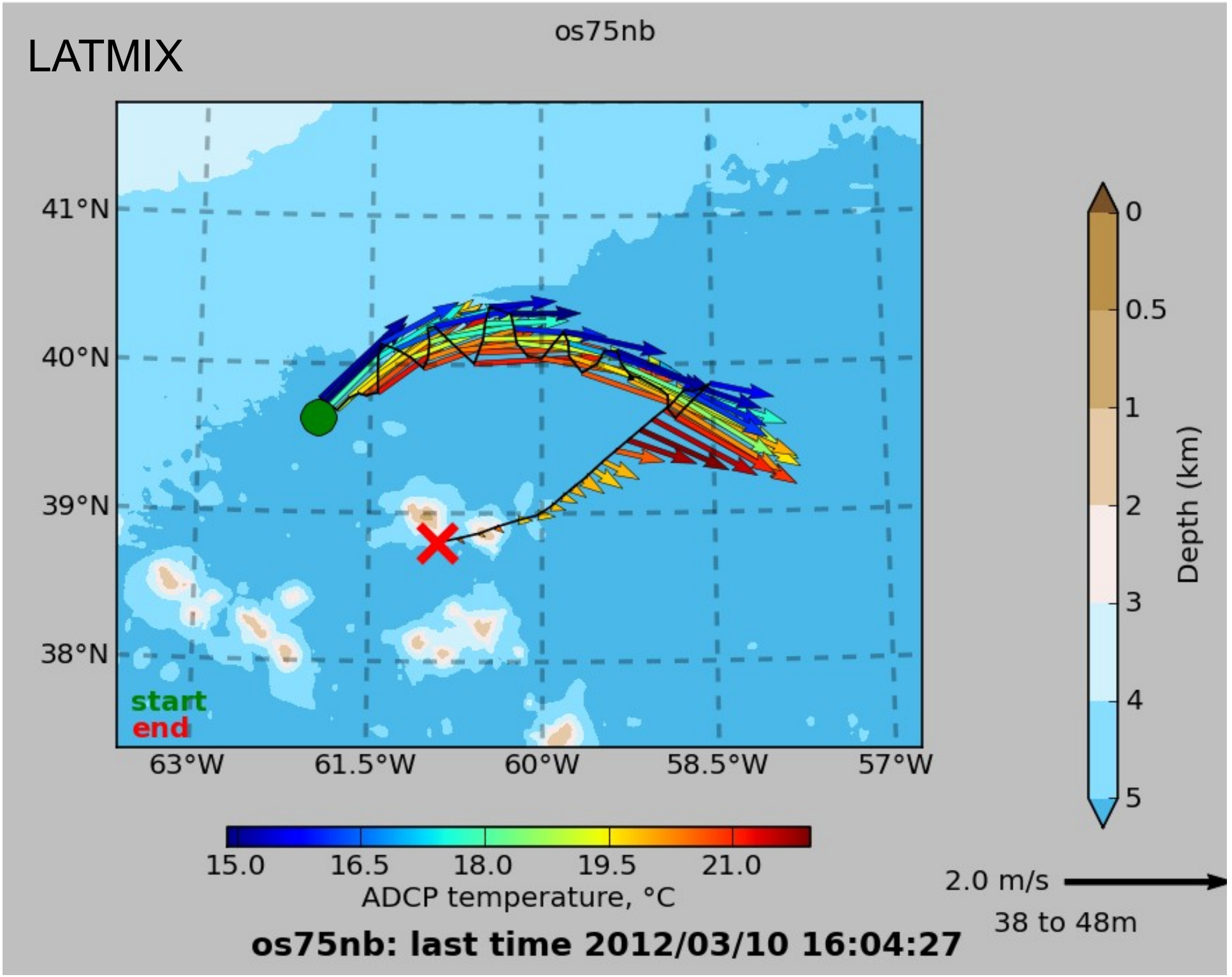




Who uses ocean currents from Shipboard ADCP?

At Sea:

- near-realtime guidance for sampling
  - “are we inside or outside the eddy”
  - “did we cross the front yet?”
  - “where do we find the zooplankton?”
- preliminary calculations for science
  - characterize data based on flow regime
- operationally
  - aid in dynamic sampling strategy
  - predict trajectory of drifting objects
  - towing, over-the-side work, dive operations

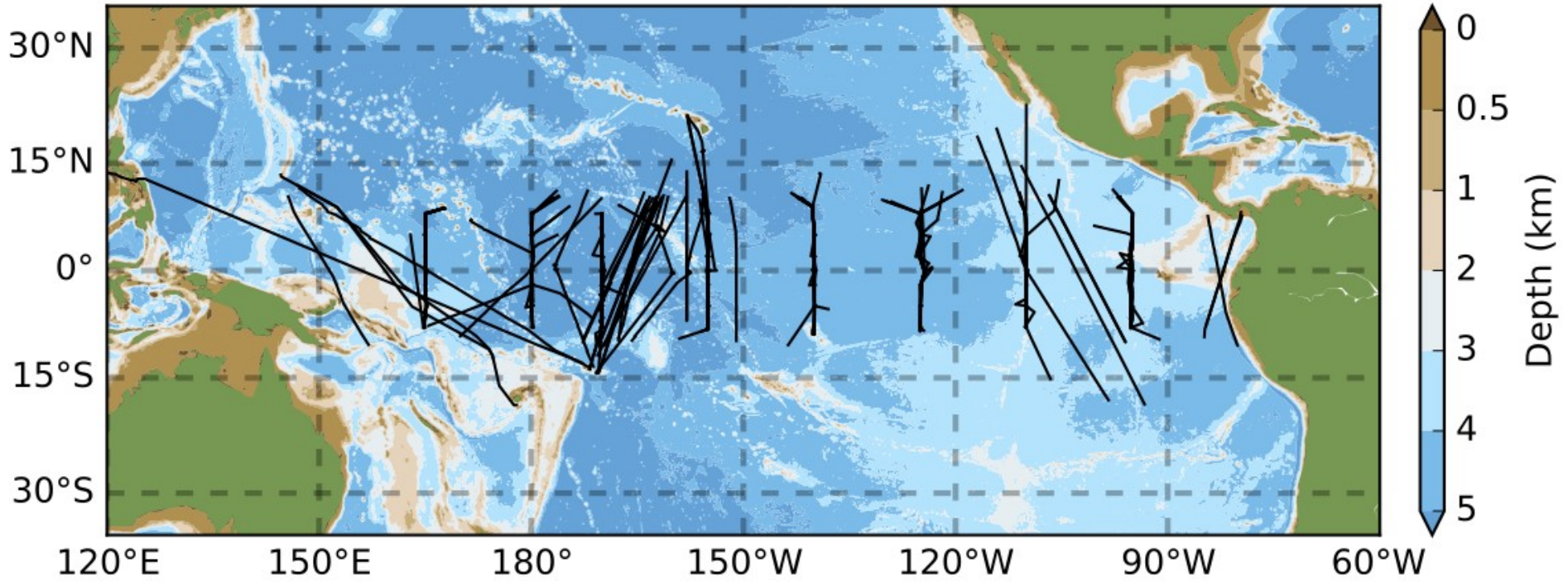

LATMIX
os75nb
41°N
40°N
39°N
38°N
start
end
63°W
61.5°W
60°W
58.5°W
57°W
0
0.5
1
2
3
4
5
Depth (km)
15.0
16.5
18.0
19.5
21.0
ADCP temperature, °C
2.0 m/s
38 to 48m
os75nb: last time 2012/03/10 16:04:27

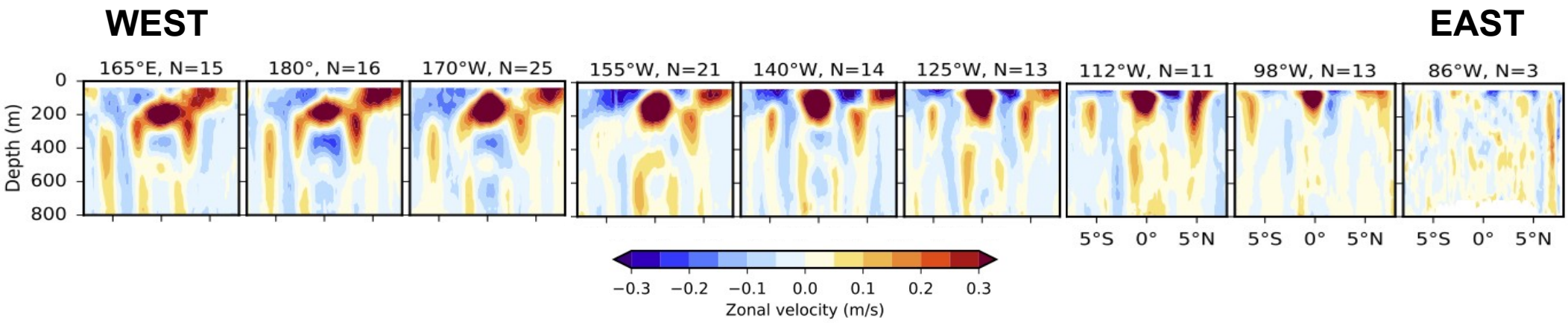
Who uses ocean currents from Shipboard ADCP?

Post-Cruise Analysis:

- Look in detail (calculations or context) for one cruise
  - apply calibrations, edit; reprocess if problems are found
- Climatology/Time-series using multiple cruises
  - requires multiple datasets that are already finalized
  - project-based example:
    - instrumented Volunteer Observing Ship (eg. Oleander)
    - Drake Passage crossings to Antarctica (L.M.Gould)
  - opportunistic example:
    - Pacific Equatorial currents (many ships, eg TAO buoy service)

Pacific Equatorial Ocean:
East/West Currents averaged in Longitude bands





(2) What does UHDAS do?

Performs these tasks:

- Data acquisition
- Data processing (create ocean currents)
- Generates data products (multiple formats)
- Generates tools and components for monitoring (at sea and on shore)

What are our goals?

- Data should be as close to "final" as possible (for an automated system)
- Data should be useful for science and operations at sea
- Require minimal post-processing for science
- Enhance the utility and visibility of ADCP data
- Open Source code, clear documentation
- Reprocessing on multiple operating systems (Linux, Mac, Windows)

(3) Benefits of UHDAS

- Reliable, simple interface for operator at sea
- Remote monitoring by ADCP guru:
    - ensure good configurations, reasonable settings
    - catch problems early
- Long-term usefulness:
    - Open source software
    - Existing path to NCEI
- Open communication with scientists and techs

Typical UHDAS dataset sizes

- Full at-sea directory (eg. month-long cruise) **5Gb**
- Subset necessary to completely reprocess **4Gb**
- Final averaged data product for scientists **25Mb**

ADCP data submission from a cruise

plots: diagnostic, science
logs: evaluation, calibration
data: ocean currents

} nuggets for science use/evaluation

(4) Archiving, Serving, Stewardship

PAST and PRESENT

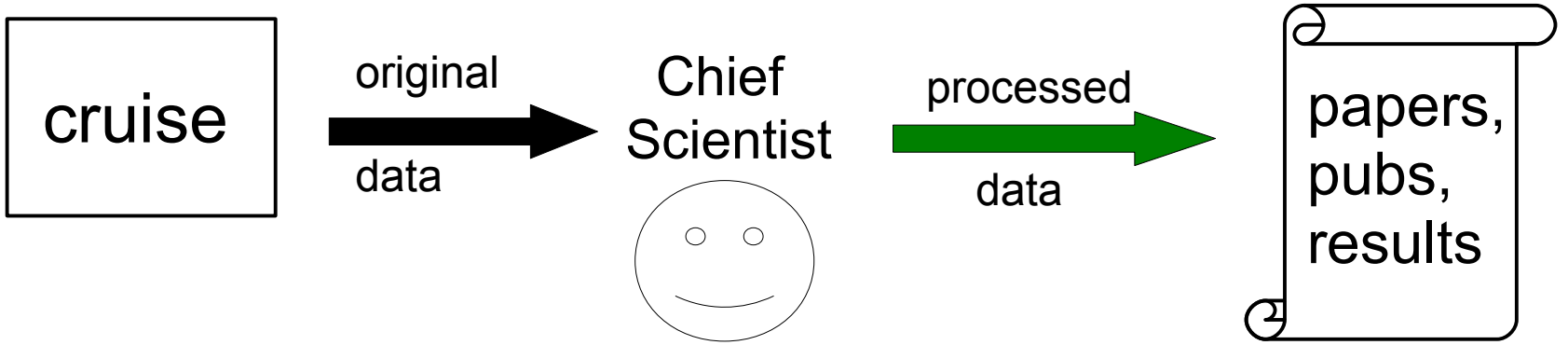
- diagram of information flow
- JASADCP – long-term archive for finalized shipboard ADCP data

PRESENT and FUTURE

- UHDAS, R2R, and NEIC
  - historical data to JASADCP
  - mine historical data for low-hanging fruit, other uses

Flow of information

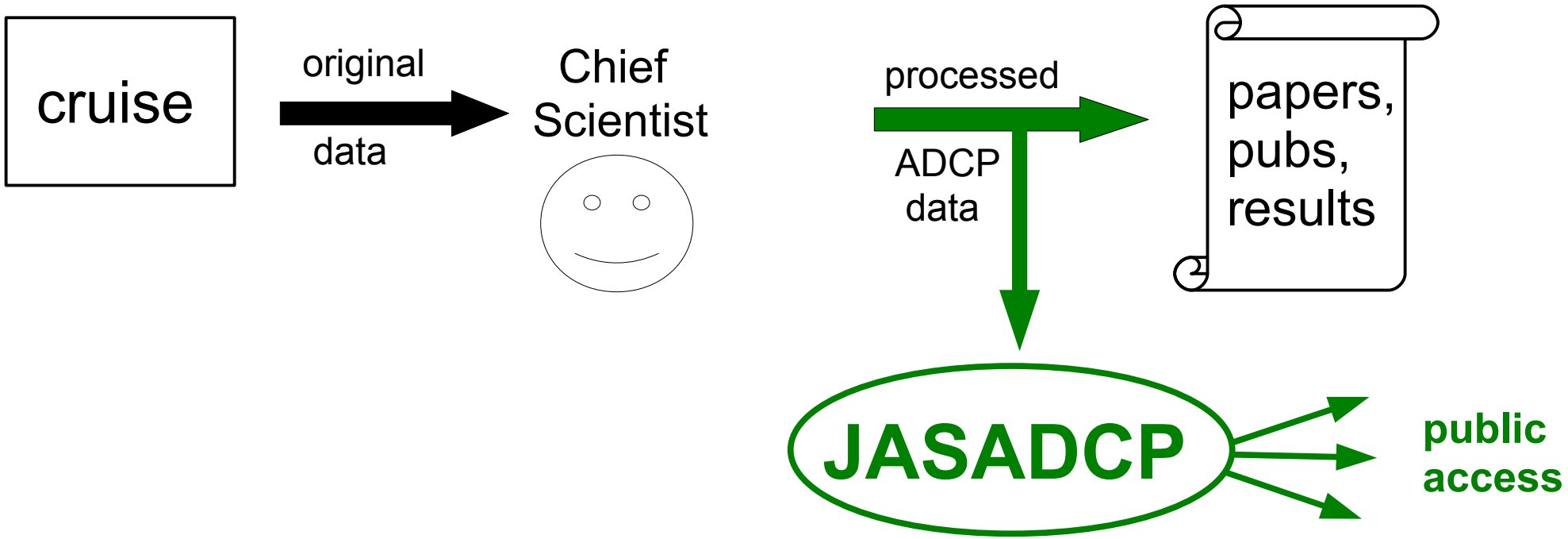
Old Model



Other people
- can read about the results
- cannot use the data (or must get it from Chief Scientist)

Flow of information

Past and Present



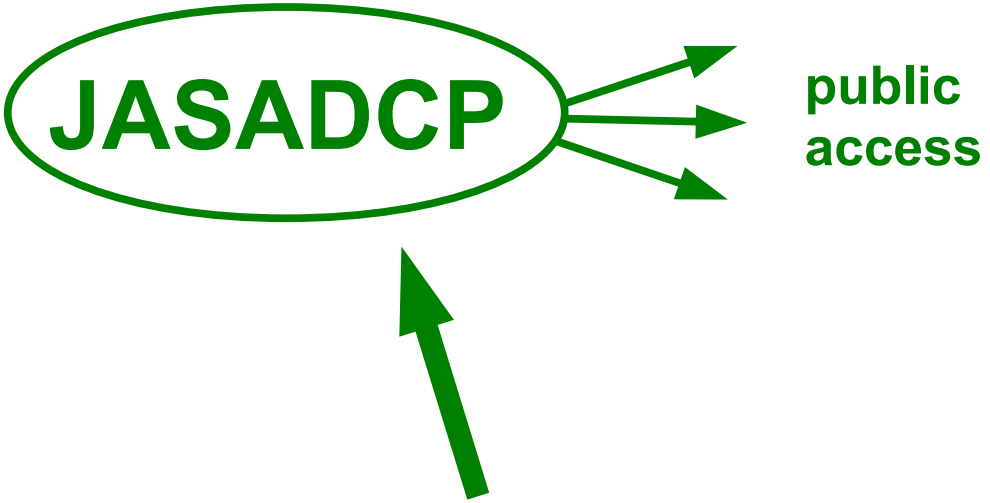
created 1992: **J**oint **A**rchive for **S**hipboard **ADCP**

- centralized dissemination center processed (finalized) shipboard ADCP data
- anyone can access standardized, science-ready data

Joint **A**rchive for **S**hipboard **ADCP**

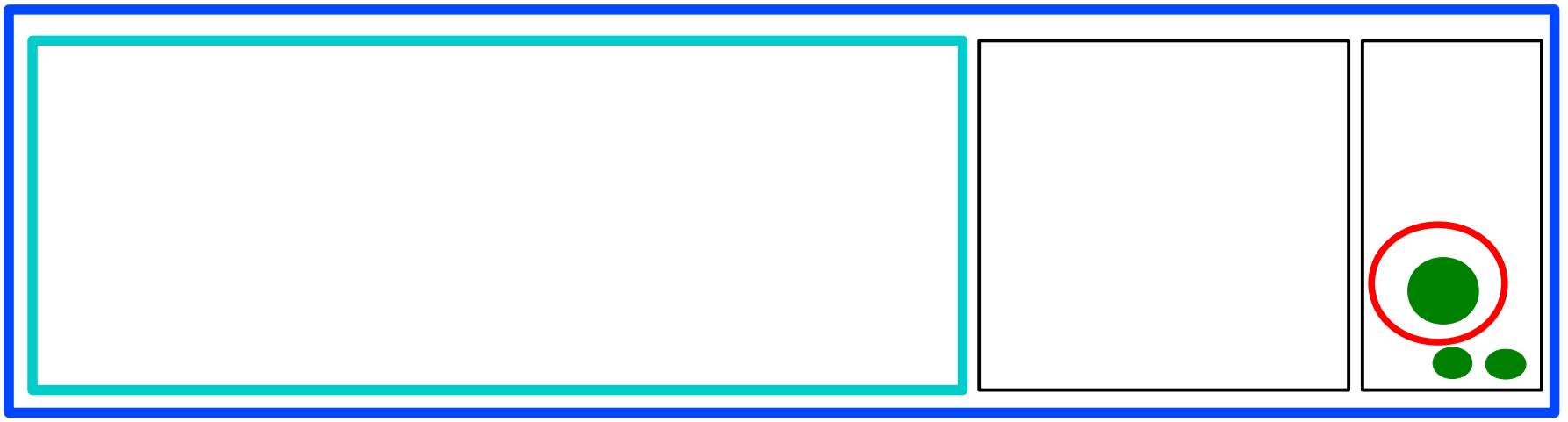
- accepts science-ready ocean current data
  - over 800 cruises (multiple instruments on some ships)
  - from multiple countries, multiple acquisition systems
  - this represents only a small fraction of historical data
- regularly used by scientists from 1992 - present
- (needs a facelift)

JASDCP and UHDAS



Finalize processing then submit to JASADCP

UHDAS data directory from a cruise



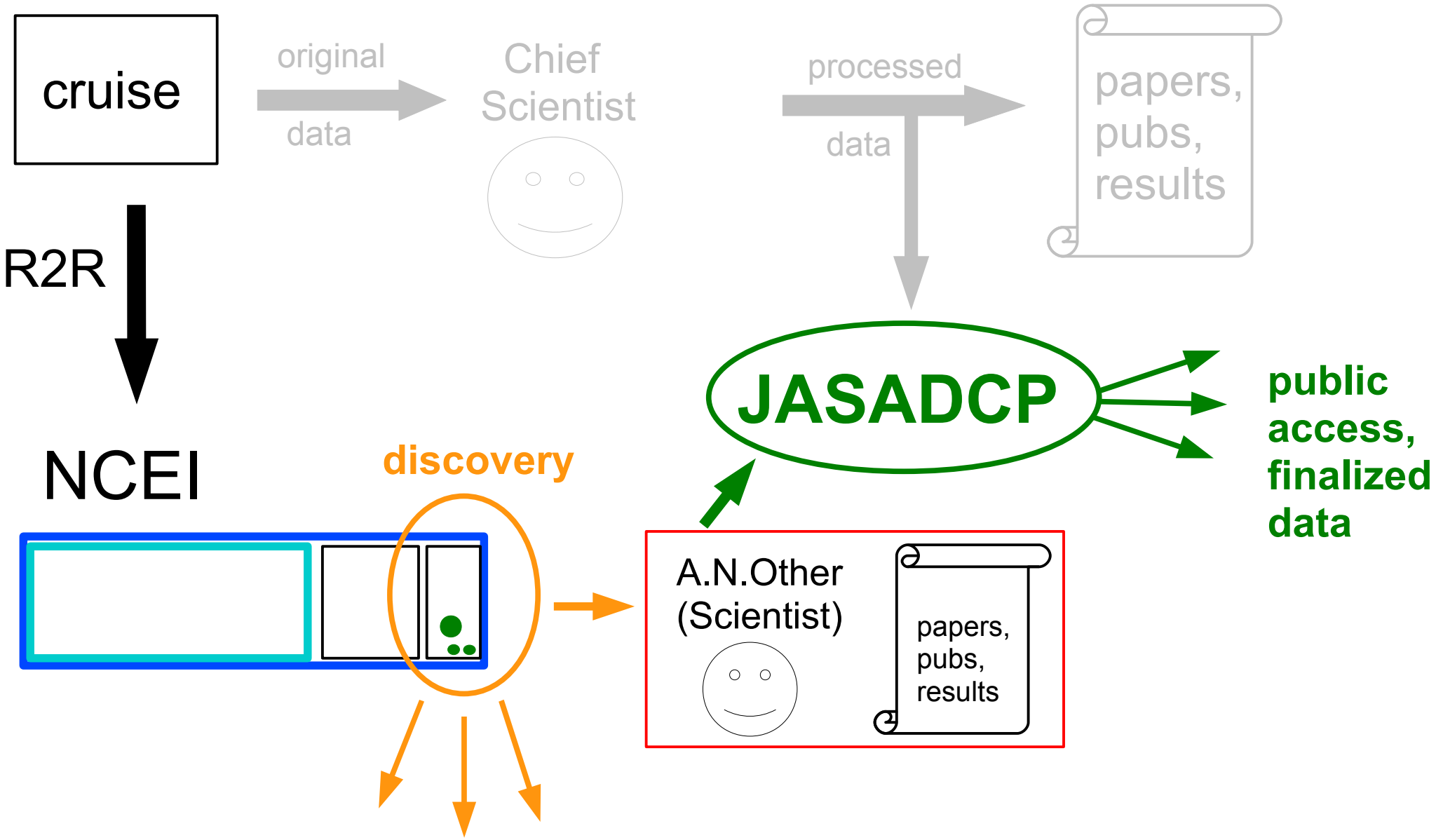
NCEI: archiving UHDAS datasets

- UNOLS cruises
  - ship submits to R2R (http://www.rvdata.us/catalog)
  - R2R adds value, pushes to archive to NCEI
- NCEI creates data accession
- cruises can be found: search for “UHDAS”
  - 305 cruises at http://data.nodc.noaa.gov
  - 155 https://catalog.data.gov
- UHDAS group: work with NOAA to
  - get UHDAS ADCP data from NOAA ships into NCEI
  - improve discovery and use of archived datasets

Present and Future:

- two paths to finalized public data

- more opportunities for original data to be used



UHDAS ADCP Summary: Ocean Currents

- running on almost all UNOLS ships (NSF science)
- being installed on the NOAA fleet
  - (FY2016 is year 2 of the deployment process)
- at sea: collects data, runs automated processing, creates products for science and monitoring
- after a cruise: UNOLS ship → R2R → NCEI

- Future: improve visibility, discovery, and utility of UHDAS ADCP data at NCEI

Real-time accessible data Examples

At-sea web page:

http://currents.soest.hawaii.edu/uhdas_fromships/kilomoana_atseaweb/index.html

Table of live ships reporting:

http://currents.soest.hawaii.edu/uhdas_fromships.html

Documentation:

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