

# **UHDAS and CODAS:**

## **Raising the Profile of Ocean Currents**

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Dr. Julia Hummon, University of Hawaii ● INMARTECH meeting, Bergen Norway, Oct. 2016

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**ADCP:**

**Part 1**

**Acoustic Doppler Current Profiler**

**CODAS:**

(refers to ADCP processing software)

**UHDAS:**

**Part 2**

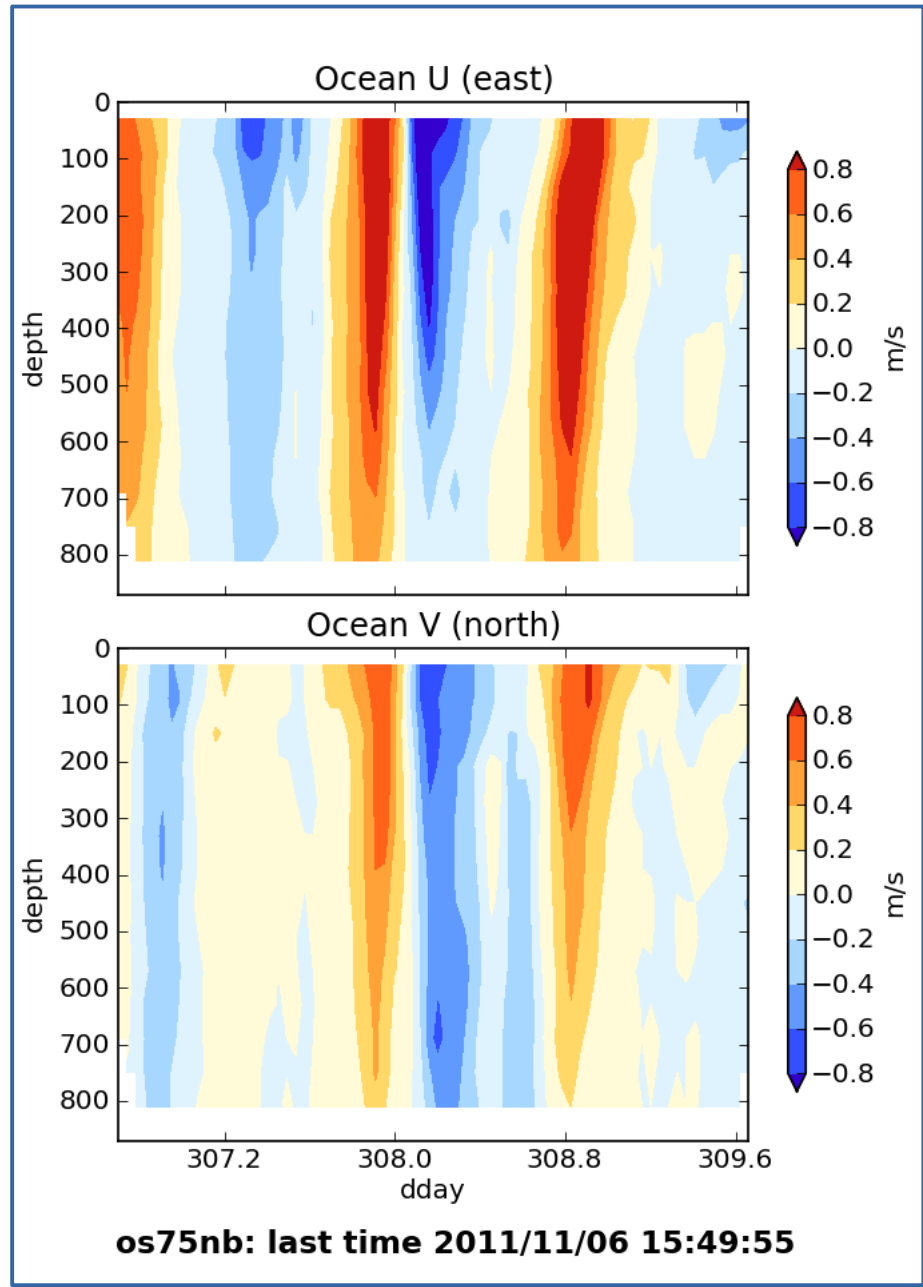
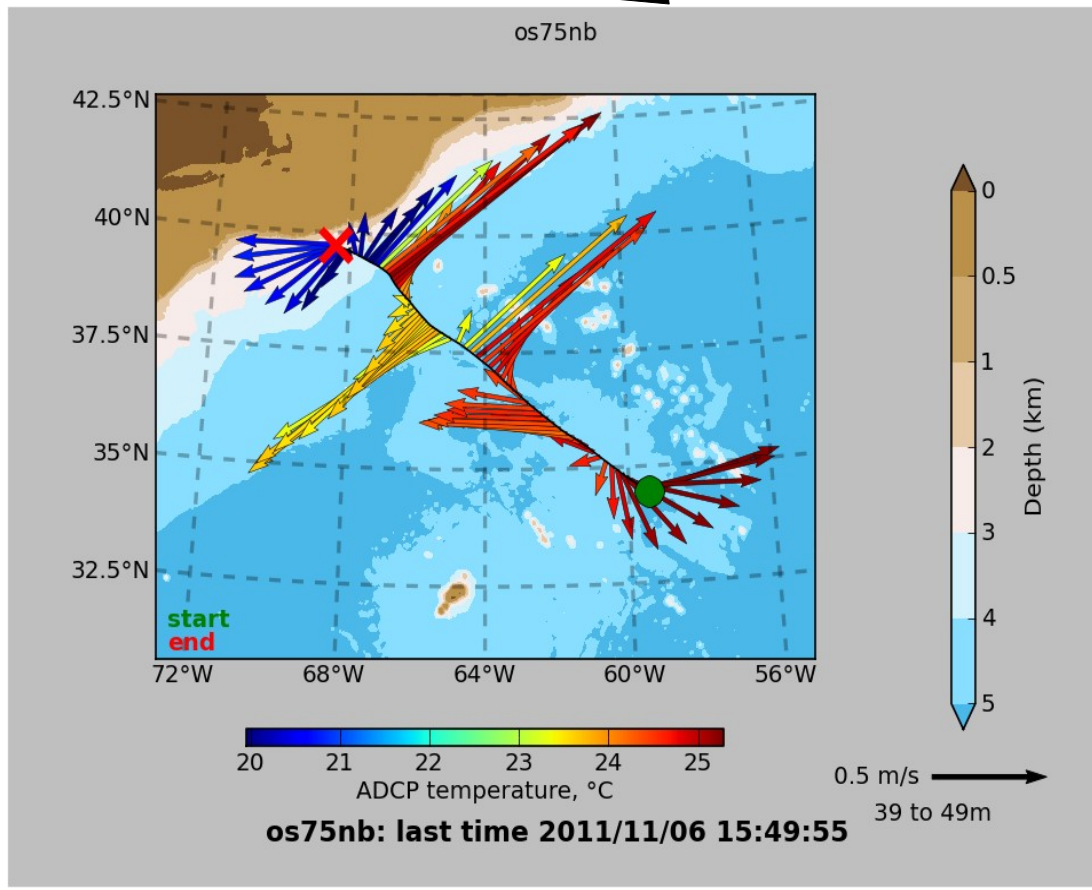
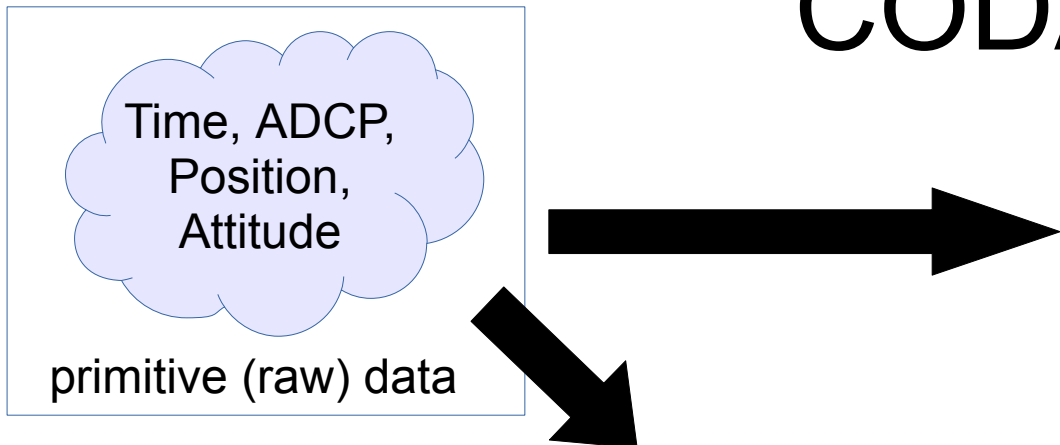
**University of Hawaii Data Acquisition System**

# ADCP introduction

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- **A**coustic **D**oppler **C**urrent **P**rofiler (shipboard)
- 4-beams, Doppler shifted currents as ship moves
- To obtain ocean currents:
  - (1) transform beam coordinates into instrument coordinates
  - (2) rotate horizontal velocities into ship coordinates using transducer angle in the hull (EA command for VmDAS)
  - (3) rotate velocities on ship to North (using heading)
    - yields measured velocities in Earth coordinates
  - (4) remove ship's speed using positions
- [link to diagrams](#)

# CODAS Processing



# CODAS processing

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CODAS = Common Ocean Data Access System

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- GOALS:

- science-ready data when finished
- accessible to anyone/many
- balance: Big Automatic Script



Fine-tune the machinery if problems exist

# CODAS processing: 2 modes

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## (1) load averaged data into CODAS database

- 1980's PINGDATA
  - VmDAS: \*.LTA, \*.STA
- } (no single-ping editing)

## (2) process single-ping data

- beam-to-earth coordinates
- single-ping editing (acoustic interference, bottom)
- create averages; save to disk
- load averages into CODAS database



Next: “post-processing steps”

# CODAS post-processing:

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- View figures and logfiles
- Fix heading:
  - patch gappy but accurate heading correction (if relevant)
  - apply time-dependent heading correction
- Determine corrections/calibrations, then apply
  - remaining transducer offset
  - scale factor (if relevant)
  - transducer-GPS offset (in meters)
- Manually edit out bad data (“[gee-autoedit](#)” tutorial)
  - graphically select bins, profiles
  - using thresholds
- check calibrations
- make figures ([web page](#)); export data (matlab, netCDF)

# CODAS software tools:

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- **Tools for (averaged) data in CODAS to:**
- view CODAS database (currents, backscatter)
- use plotting programs to help
  - assess quality of heading and position devices
  - plot cruise tracks, make web page with plots
- export netCDF file (averaged data: all bins, profiles)

# CODAS software tools:

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- **Tools for or raw (single-ping) ADCP data:**
- visualization of beam values
  - RSSI (signal return)
  - beam velocity
- estimate EA (transducer angle)
- conversion of NMEA strings to “rbin” data files
  - N1R, N2R, N3R (from VmDAS)
  - UHDAS raw serial data
- tools to plot rbin data:
  - plot POSMV quality
  - plot navigation over topography
  - plot one (or compare two) rbin data streams



# **UHDAS and CODAS: Raising the Profile of Ocean Currents**

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## **Outline:**

### **ADCP:**

Acoustic Doppler Current Profiler

### **CODAS:**

(refers to ADCP processing software)

### **UHDAS:**

**Part 2**

University of Hawaii Data Acquisition System

# UHDAS: What are our goals?

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- Enhance the utility and visibility of ADCP data
- Provide viable ocean currents at sea:
  - Data should be useful for science and operations
  - Data should be as close to "final" as possible (for an automated system)
  - Require minimal post-processing for science
- Reprocessing on multiple operating systems (Linux, Mac, Windows) – see **CODAS**

# UHDAS: What are our <sup>people</sup> goals?

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- Happy Scientists (good data)
  - Happy Techs (operationally useful, easy)
  - Happy Managers
    - data managers (predictable)
    - ship operations (monitored, useful displays)
    - funding (happy scientists, techs, ship ops)
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**Summary: Everyone is happy**

**Everyone is excited about ADCP data**

# What does UHDAS do?

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## **Performs these tasks:**

- Data acquisition (TRDI ADCPs)
- Data processing (create ocean currents--CODAS)
- Generates data products for science
- Creates tools and components for monitoring
  - monitoring (plots) at sea
  - monitoring (daily email) on shore

# UHDAS Components: Acquisition

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- runs on linux (Xubuntu 14.04 at present)
- acquisition:
  - communication with ADCPs
  - serial acquisition with timestamps
- reliable, robust, duplicate feeds
  - multiple GPS feeds
  - one computer, multiple ADCPs
  - reliable heading, and accurate heading
- simple graphical interface for settings/stop/start
  - **Green=Good**, **Red=Rubbish**

# UHDAS Components: Processing, Plots, and Data

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- incremental single-ping processing:
  - stage averages; display 5-minute profile on web site
- load averages, create vector and contour plots
- other plots (on shipboard web site)
  - bridge plot (knots and direction at “surface)
  - profile of vectors (at various depths)
  - heading correction plot (use accurate heading QC)
  - beam velocities
- data (on shipboard web site)
  - matlab (various), netCDF (and **CODAS** database)

# UHDAS Monitoring

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## At Sea (shipboard website):

- plots for science and bridge
- averaged data for science
- raw data (for uber-user to reprocess at sea)
- [example](#) web site

## On Land (daily email):

- daily email with ascii status message
- 100K tarball with data snippet, diagnostic info
- [table](#) of email status

# Benefits of UHDAS

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## Real-time accessible data for

- Science at sea, eg:
  - larval recruitment and dispersion
  - context for other measurements
  - drifters
- Operations
  - ROV deployment
  - CTD wire angle
  - mooring deployment



# Benefits of UHDAS

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- Reliable, simple interface for Techs
- Remote monitoring by ADCP guru (via daily email)
- Long-term usefulness:
  - Open source software
  - Existing path to NODC (via R2R, for USA/NSF data)
- Open communication with scientists and techs

# UHDAS Installation Note

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**UHDAS** is not a program, but a complex set of code and system configurations.

Setting up a new UHDAS installation requires Linux system administration skills, an understanding of UHDAS, and detailed knowledge of the particular suite of instruments and network environment on the ship.

# UHDAS+CODAS documentation

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- what is **documented**
  - CODAS processing (with tutorials); long history
  - installation of CODAS software
  - UHDAS: at sea (web site, data, plots)
  - UHDAS: for techs – how to run it
- **presentations** only (but not documentation):
  - how UHDAS works
- not documented
  - UHDAS installation (Xubuntu, \*.deb, \*.tar.gz, CODAS)
  - UHDAS configuration (serial, ntp, mail, processing)