

UHDAS+CODAS Documentation for Science

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1 Overview of UHDAS + CODAS at sea

1.1 Introduction

UHDAS refers to a suite of programs and processes developed at the University of Hawaii that perform data acquisition, data processing, and monitoring, at sea. In addition, access to documentation and code are provided on the ship's network. We have tried to make a system that is useful and reliable, easy to operate, and which provides as close to a final dataset as is reasonably automatable while maintaining the fundamentals necessary to reprocess the data from scratch if necessary.

On the WWW, full documentation can be found here: <http://currents.soest.hawaii.edu> (click on "CODAS Suite").

At sea, the same documentation starts [here](#).

UHDAS has four components at sea:

- (1) [Data Acquisition](#)
- (2) [Processing](#)
- (3) [Monitoring](#)
- (4) [Access](#) (to data and figures)

1.2 (1) Data Acquisition component

Data acquisition programs are written in C, and the gui and supporting code are written in C and Python.

Data acquisition includes

- a dialog with each of the RDI ADCPs to set parameters and start pinging
- acquisition and timestamping of passive serial inputs
- data collected are
 - binary records (from ADCP ensemble)
 - NMEA strings (from serial inputs)
- NMEA data recorded usually comprise
 - GGA messages (gps) from two sources if possible
 - gyro heading
 - accurate heading (POSMV, Ashtech, Seapath, Mahrs, Phins,... if available)
- files roll over every two hours
- timestamps are zero-based decimal day (Jan 1, 12:00 UTC is 0.5, not 1.5)
- all but the most recent two ascii files are compressed to save space
- a parsed version of each NMEA string is added to a set of intermediate files to stage information for the processing component

1.3 (2) Processing component

Processing code is written in C, Python, and Matlab. Final processed output are written as Matlab files on a regular basis. Processing is done using a CODAS database (Common Ocean Data Access System) as storage and retrieval system. The suite of programs designed to extract from, manipulate, and write to the database is known as “CODAS ADCP Processing” and has been free, maintained, and in use since the late 1980’s.

In a batch mode, CODAS processing can be applied to single-ping data gathered by UHDAS (or the commercial RDI software “VmDAS”), or averaged data collected by VmDAS or the original DAS2.48 (used with Narrowband ADCPs in the late 1980’s and through the 1990’s).

At sea, a UHDAS installation acquires data and uses CODAS processing to calculate ocean velocities from ADCP measured velocities, position, and heading (gyro, corrected to a accurate heading if one is available). The following three levels of processing combined are called **CODAS Processing**:

(1) CODAS steps performed on single-ping data

- make sure every ADCP ping has a position and a heading
- gather the next T seconds of data (eg. 300 seconds)
- screen the ADCP data to eliminate bad values (eg. acoustic interference)
- average in earth coordinates
- write to the disk

(2) CODAS steps performed on averaged data

- load measured velocities into the database
- add navigation to the database

The following are steps automated on a ship with UHDAS, but can be done afterwards with human intervention

(3) CODAS Post-processing (on averaged data)

- correct the gyro heading to the accurate heading device (if there is one)
- apply scale factor if specified (eg. NB150)
- apply additional fixed rotation if specified
- edit out bad bins or profiles (eg. data below the bottom)

UHDAS Enhancements to CODAS Processing

UHDAS adds steps to the basic processing at sea by extracting (on a regular basis) processed, corrected, edited data for scientists to use during the cruise. These data and figures that are generated from them, are available on the ship's web.

- every 5 minutes
 - get the last 5 minutes of new data
 - rotate to earth coordinates using gyro as the primary heading device

- correct to the “accurate heading device” (if one exists)
- edit single-ping data (for this 5-minute chunk)
- average, write to disk (staging for addition to the codas database)
- save the 5-minute chunk of data as a matlab file (for plotting)
- every 30 minutes
 - the CODAS database is updated with the staged averages
 - scale factor and fixed rotation are applied if specified
 - the averages in the database are also edited (to look for bad bins or bad profiles, and the bottom)
 - **after the codas database is updated**
 - * the data are extracted and averaged (for plotting)
 - * the data are extracted with “every bin, every profile”
 - * data are stored as matlab files, accessible via ship’s web site or via windows shares [samba] or nfs.
 - * Vector and contour plots of the last 3 days of data are updated

1.4 (3) Monitoring component

Monitoring programs are written in Python and make use of Linux system calls.

Monitoring includes

- daily email sent to land with information about
 - processes running, disk space, error messages
 - data processing status
 - daily email includes a message about heading correction
 - the last 3 days of heavily averaged (vector plot)
- on land, when the email is received, crude vector and contour plots are made of the data snippet that was sent (see “figures” links for each ship on [this page](#))
- at sea, the following are available on the ship’s web:
 - most recent 5-minute profiles of all instruments that are pinging
 - the last 3 days of data shown as contour and vector plots

- the last half-day of gyro and “accurate heading”

More information about monitoring is [here](#)

1.5 (4) Access to data and figures

Two fundamental access mechanisms exist

(1) ship’s web (usually <http://currents>)

- figures ([direct link](#))
 - most recent ocean velocity profile for each instrument
 - 3-day tail with surface velocity vectors
 - 3-day tail contour plot (vs time, longitude, or latitude)
- data ([direct link](#))
 - all data so far, averaged in thick layers (eg 50m) over 1-hour, for vector plots
 - all data so far, averaged in thinner layers (eg 10m) over 15 minutes, for contour plots

(2) network shares (see [instructions](#))

- in the adcp home directory, **www/figures/png_archive** contains copies of the most recent 3-day figures made every day so far in the cruise
- in the data directory, **current_cruise/proc** contains processing directories for all instruments logging data.
 - the same data files that are available on the web (15-minute and 1-hour) are available in the **vector** and **contour** subdirectories.
 - a collection of files prefixed with **allbins_** contain many useful variables, stored at the highest resolution of the averaged data. The bin size matches the bin size of the instrument, and the data are averaged every 120s (wh300) or 300s (all other instruments). (instructions to read these data are [here](#))

- in the data directory, **current_cruise/raw** contains all the data logged by UHDAS, including the single-ping ADCP data. For more information about reading single-ping ADCP data, see [these instructions](#).

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2 CODAS conventions

1. All times are in UTC
2. The **decimal day** is a zero-based value. Noon January 1 UTC is 0.5, not 1.5. This is the best convention when dealing with data that may cross over a year boundary. (if your cruise does cross over a year boundary, the decimal days will just keep increasing past 365)
3. Data averaged over a period of time have an associated time and position. These represent the values at the end of the ensemble. Other scalars associated with a given ensemble (temperature, heading) are averaged.
4. Pitch and roll (if available) are recorded but not used in the data processing.

3 Shipboard web access to data and figures

UHDAS+CODAS documentation and figures at sea start on the UHDAS web site, usually <http://currents/adcp>

The automated system extracts data and makes figures that are available on the ship's network as:

- (1) processed velocity data

- [velocity data on the web](#)

These are (preliminary) processed data, regularly extracted and saved as matlab files. Vertical and time averaging are described on the same page. If this above link does not work, click on **Quick Links: Data** on the UHDAS home page.

- every bin, every profile

For each processing directory (instrument + pingtype), high-resolution data are extracted when the database is updated. These matlab files contain the highest vertical resolution available and the highest temporal resolution supported in the processing (usually 5 minutes).

Access to these files requires you to “map network drive” (on Windows) or “mount” the directory (unix). Instructions for this process start [here](#).

Procedure:

- mount the **data** directory
- look in **current_cruise/proc** for the processing directory of interest.
- the files are in **contour**
- load the files using “load_getmat.m”, [documented here](#).

(2) figures

- [live figures](#)

If the above link does not work, click on **Quick Links: Figures (live)** on the UHDAS home page.

- archived figures

Figures (contour and vector 3-day plots“ are archived (during the cruise) [here](#). The archive is copied to the processing directory at the end of the cruise.

If the above link does not work, click on **Quick Links: Figures (archive)** on the UHDAS home page.

4 Shipboard web access to more data and programs

All UHDAS ADCP programs exist on “currents“ and can be used by users to extract or load (using Matlab) their own files. Follow these links for more general information about

- [network shares](#)
- [matlab access to data.](#)
- [matlab tools for CODAS data.](#)

5 UHDAS Data Policy

Scientists are free to walk off the ship with copies of figures from the web site and the matlab files distributed there.

We do not in general post-process the data. Post-processing code is available on the WWW at <http://currents.soest.hawaii.edu>, and on the ship at <http://currents/adcp>.

Note

These data are not fully processed.

If you intend on any serious use of these data, you will have to put the finishing touches on the data.

It is possible to post-process the data at sea, given a computer (Windows, Mac, Linux) with python and Matlab installed, and with sufficient interest. Please contact us to see whether there are updates or notices regarding the status of the processing or your particular dataset.

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6 Access to UHDAS data and programs over the net

All of the raw data, the preliminary processed Codas databases, and the Codas programs distribution can be accessed via filesystems that are exported read-only from "currents". You should be able to mount the filesystems from any machine on the ship's network via NFS or SAMBA (which allows Windows machines to map network drives).

For NFS, the following exports are made (read only) to the ship's network

| mount point | description |
|-------------------------|--|
| currents:/home/adcp | (the adcp working directory) |
| currents:/home/data | (contains raw data, processing directories, and intermediate files) |
| currents:/home/currents | (the subdirectory 'programs' contains all our software, used for logging processing, and plotting) |

For Windows (or Samba mounts), network shares on currents are:

| Network Share | description |
|----------------------|--|
| adcp_home | (the adcp working directory) |
| data | (contains raw data, processing directories, and intermediate files) |
| programs | (contains all our software, used for logging processing, and plotting) |

Additional details for [PC](#), [Mac](#), and [linux](#).

7 Data Access for Windows Users

Use **Map Network Drive** for access to ADCP data:

click on

```

My Network Places
Entire Network
  Search for Computers
    (fill in): Computer name:
      currents
    doubleclick on the computer icon for "currents"

```

To map network drive:

```
right-click on "adcp_home" folder
  select Q:
  Finish
right-click on "data" folder
  select R:
  Finish
right-click on "programs" folder
  select S:
  Finish
```

There may be some circumstances when this does not work or you just want a temporary connection. If so, just type the following in the "location" bar of "My Computer":

```
\\currents
```

(or under the Start Menu, select "Run" and type the same thing)

In both cases you should end up with an explorer window that has the three shared directories:

- adcp_home
- data
- programs

7.1 Using Windows Binaries

To use the Windows binaries, change your path to include the Windows binaries from "currents":

1. go to Control Panel: System: Advanced : Environment Variables
2. add the path to the binaries, eg S:\codas3\bin\win32 or \\currents\programs\codas3\bin\win32

7.2 Accessing Data

To get files directly from the processing directories,

1. go into `\\currents\data`
2. identify your cruise; go into that folder
3. go into the folder called **proc**
4. choose the instrument name you want (eg. **os75nb**)
5. find the files you are interested in (eg. `contour/allbins_*`)

8 Data Access for Mac Users

In Finder, click on

```
Go
Connect to Server...

(Fill in "Server Address"):
  smb://currents/data
click "Connect"
click "OK" (no password)
```

Do the same for two more addresses:

```
smb://currents/adcp_home
smb://currents/programs
```

Now these are mounted under

- `/Volumes/programs`
- `/Volumes/adcp_home`
- `/Volumes/data`

To use the OSX binaries, change your path to include the binaries from "currents": add this to your path:

```
/Volumes/programs/codas3/bin/osxppc # for ppc macs  
/Volumes/programs/codas3/bin/osxintel # for intel macs
```

9 Data Access for Linux users

There are several ways to access the data

- (1) turn on "autofs"

On some linux systems, if autofs is installed, and */etc/auto.master* has a line like the one below

```
/net    /etc/auto.net
```

Make sure it is uncommented (no # at the beginning) and restart autofs.

The path to the UH directories will be

```
/net/currents/home/data      # for UHDAS data  
/net/currents/home/programs  # for UH programs  
/net/currents/home/adcp      # for the /home/adcp directory
```

- (2) If you prefer hard mounts, you can do something like this (make sure the mount point exists, in this case */mnt/xxx*)

```
sudo mount -t nfs currents:/home/data /mnt/adcp_data  
sudo mount -  
t nfs currents:/home/currents/programs /mnt/adcp_programs  
sudo mount -t nfs currents:/home/adcp /mnt/adcp_home
```

(3) or if you know how to do samba mounts, in theory they are accessible and are shared as

```
smb://currents/adcp_data  
smb://currents/programs  
smb://currents/adcp_home
```

Now these are mounted under

- /Volumes/programs
- /Volumes/adcp_home
- /Volumes/data

To use 32-bit linux binaries change your path to include the binaries from "currents": add this to your path:

```
/mnt/adcp_programs/codas3/bin/lx
```

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