STARC

Ship-based Science Technical Support in the Arctic

An NSF award to enhance marine science and technical services provided to NSF-supported research cruises on U.S. Coast Guard cutters Healy, Polar Star and Polar Sea. Scripps Institution of Oceanography and Oregon State University are working together in a joint venture to provide basic services to the level provided by the University-National Oceanographic Laboratory System (UNOLS) for supporting academic research.
Healy – Science support

EM122 Multibeam
Knudsen Echosounder
ADCP 75/150khz system
GPS receivers
MET and Science seawater sensors
CTD equipment and sensors
XBT equipment
Gravity Meters
Lab equipment
Hazmat / Isotope procedures and compliance
ICEFLOE.NET administration
Healy – Drydock 2013

Work with the Coast Guard and Shipyards to ensure access to science related systems and equipment for repairs, maintenance and completion of outstanding science TCTO projects.

EM122 / Knudsen / Transducer repairs and maintenance
TSG / PCO2 relocation project
Computer Lab renovation project
Future Lab renovation project
Photo Lab renovation project
Routine sensor / equipment maintenance
Healy ADCP Status, 2010-2013

- ADCPs: 150kHz Ocean Surveyor, 75kHz Ocean Surveyor
  - both ADCPs are functioning
  - UHDAS installed prior to field season 2010 (VmdAS earlier)
  - processing: headings are excellent (two POSMVs, Ashtech, and MK39)
  - electrical noise causes bias and loss of range
    - repeated struggle to defeat electrical noise

Lessons:
- ADCP data are very susceptible to electrical noise
- electrical noise on Healy is ubiquitous but variable in space and time
- there are better and worse configurations (deck unit + transducer cable)
- a good transducer cable run and good power to deck unit are critical
- the only way to test is “in situ”: requires time during shakedown cruise, eg.
  - ship steaming at 12kts
  - acquiring data, looking at background noise + range
  - experimenting with different configurations on the fly (see next slide)

There is still demonstrated room for improvement (2011 was best)
ADCP 2010-2013: Attempts to decrease Electrical Noise

- higher background noise
- poor range
- biased

Background Noise Level

- quieter
- deeper range
- decreased biases

Deck units in IC/Gyro 2010
Deck units MICA (starboard, aft) 2012
Deck units moved to aft, port MICA 2011
Deck units in starboard MICA, transducer cables moved away from power lines 2013

less noise, better range

ADCP Range (m)
Example: Deep eddies in the Beaufort Sea can only be seen with sufficient range.

The diagram shows the ocean currents (u and v) over different years (2010, 2012, 2013, 2011) and depths (250m-300m, 320m-520m) in the Beaufort Sea. The color scale indicates the speed of the currents with values ranging from -0.30 m/s to 0.30 m/s.
LDEO UNDERWAY PCO2 SYSTEM FOR SURFACE WATER MEASUREMENTS
Tim Newberger (2004)

Seawater samples  Air samples

The ocean areas with pCO₂ values less than the atmospheric value of 390 micro-atm are a sink for atmospheric CO₂ (green-blue dots); the high pCO₂ (orange-red) areas are a source; and the yellow areas are near neutral with atmospheric CO₂. The Chukchi and Beaufort Sea areas are strong sink for atmospheric CO₂. The water depths are indicated with the grey scale.

Data from [http://www.ldeo.columbia.edu/CO2](http://www.ldeo.columbia.edu/CO2)
HMRG Seafloor Mosaic Display System

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Roger Davis
The software is normally started at the beginning of a session by a menu selection at which time a configuration tool provides access to a menu of standard pre-defined configuration options (which are preferably customizable enough to remain meaningful to the user) as well as a menu for loading configuration files which can be invoked separately by the user.

Software License Agreement

and with properly working one near or any other current Unix release as well.

and therefore of Apple and PC hardware running Unix or at least last year so Mac OS X and Windows/Linux releases may be able to develop upon and perform on various platforms. The software is developed and maintained on a platform and hardware running Unix or at least last year so Mac OS X and Windows/Linux releases may be able to develop upon and perform on various platforms.

Large display (e.g., 30", 2560x1600 pixels) is also highly recommended. Systems with hardware native to Mac OS X are recommended.

The software is developed for use with interactive multimedia systems and not for use with the software on a single computer system with hardware features typical of a single 2012 desktop computer system.

Supported Hardware Systems and Computer Requirements

The software was originally developed for use with HMR's own low-end systems including the M1, DSI-120 and IMM-30.

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The system was originally designed to access multi-protocol databases simply by reading the same system vendor's own logging tool.

shown in Figure 2A below.

In a typical forensic incident response mode, which allows a reasonable level of real-time control from the main control panel, as well as
information on individual data points or high-level, high-level events from the server (Figure 2B), and allows detailed
additional input data monitoring features are available with the systems' configuration settings.

Figure 2A. Main control panel of integrated data logger for Konfender/Trimmed QM-class systems.
Figure 2b. Inpul datagram comms maintained by the integrated EM-class logger.

<table>
<thead>
<tr>
<th>Time</th>
<th>Value</th>
<th>Time</th>
<th>Value</th>
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<th>Value</th>
</tr>
</thead>
</table>

Water Column
Surface Sound Speed
Position
Depth
Raw Range and Angle
Processing Unit Status
Heading
Clock
Position
Attitude
Extra Parameters
Sound Speed Profile
Runtime Parameters
Installation Start

Latest Timestamp
Total Count
Current File Open

EM120 Input Datagram Details [km0322]
The DMS Sensor Module Displays Intensity

The DMS sensor module displays intensity in the next section of this document. This section describes the display of the sensor module's intensity values in a graphical format. The intensity values are represented using color-coded bars, where each bar corresponds to a specific intensity level. The intensity levels range from 0 to 10, represented by different shades of blue.

The intensity levels are color-coded as follows:
- Light blue: 0-1
- Dark blue: 2-3
- Very dark blue: 4-5
- Deep blue: 6-7
- Very deep blue: 8-9
- Dark blue: 10

The intensity values are displayed as a horizontal bar graph, with the intensity level on the y-axis and the sensor module locations on the x-axis.

The sensor module consists of multiple circular sensors, each represented by a circular marker. The intensity values are displayed above each marker, indicating the intensity level for that specific sensor.

The intensity values are also displayed in text format, located at the bottom of the graph, providing a clear indication of the intensity levels for each sensor module.

The diagram above shows a sample of the intensity display for a single sensor module. The intensity values are displayed using a color-coded bar graph, where each bar corresponds to a specific intensity level. The intensity levels range from 0 to 10, represented by different shades of blue.

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dataset shown here is the Hawaii multibeam synthesis dataset, a combination of numerous earlier multibeam survey datasets from the region compiled and maintained by FMSG.

Figure 3A. Navigation window at 1:50,000 scale.
The Navigation window, and the display can be quickly panned left, right, up or down via the keyboard arrow keys.

Also be accessed very quickly outside of the display panel interface via the acceleration widgets ranged along the top edge of the browser. Certain display attributes which users change often (e.g., scale, color palette, color key depth interface, etc.) can be shown in Figure 3B. Various display settings affecting the navigation window are highly customizable via a dialog panel as shown in Figure 3B. Navigation window at 1:200000 scale.
Figure 4. Navigation window display attributes dialog.
The following Figure 6 shows the same view as Figure 5 above with a number of different techniques. The system's grid display interface allows the display/suppression of individual sections and their stacking order to be controlled in order to separate sections and segment the survey into individual units spanning between 5 and 60 minutes each. The system's grid display interface can be used to show a sequence of independent section files, segmenting and stacking different views of the same area.

Figure 6: Mosaic view window.
been placed just to the left of the survey’s existing sidescan imagery and the user is now requested the presentation of an
additional track together with their desired spacing and overlap, as shown in Figure 7b. The initial neighborhood here has
A user designing a typical back-and-forth survey would normally rest on an initial trackline and then specify a quantity of
tracks planar with other software.

This is a variety of ways to display the neighborhood of interest shown in Figure 7d, where the original grids are shown on the
windows. Thus, the ability to display the neighborhood of interest while also showing the original grids is a powerful feature.

The display interface, besides rendering the current swath data from the survey, also has an extensive set of track planning

![Figure 6: Sidescan mosaic view window with modified swath section stacking order](image)

Figure 6: Sidescan mosaic view window with modified swath section stacking order.

...northwest to southeast in Figure 6. The center of the sidescan imagery in Figure 5d have been moved between the longer
primary tracklines running from...
FIGURE 7B: Single initial trackline with track appended dialog.

Additional parallel tracklines to left.
Other techniques allow a set of existing tracklines to be re-spaced, lengthened or shortened, as shown in Figure 8. Here, the user is in the process of simultaneously adjusting the inter-track spacing of all tracks, holding the initial right-most track fixed and shifting all of the other tracks to the right while maintaining equal spacing between all tracks.

Figure 7B. Multiple parallel tracklines.
A collection of informational functions allows the local span of any subset of contiguous waypoints to be measured to aid in

the estimation of local survey time as shown in Figure 9.

Additional floor features allow individual waypoints to be added or deleted, sets of contiguous tracks to be shifted and/or

Figure 8. Adjustment of inner-track spacing.
respectively, drawn in blue and green. Profile plots are displayed in a separate profile window with the live survey data and the background grid data. Profile plots are drawn on a mosaic window or on a mosaic window near the center of the mosaic window. The beginning and end of a scan line are indicated by a profile window. Figure 10 shows a profile created by the selection of two arbitrary locations within a non-destructive window or a survey plan. Resulting in a profile around the track of a survey plan between the chosen navigation window and any mosaic window. A multi-section profile can be generated by the selection of any two adjacent depth vs. horizontal distance plots along the line connecting two arbitrary locations selected by the user within the mosaic window or any mosaic window near the center of the mosaic window. Figure 9: Survey plan information summary.
Availabilty and Contact Information

The user community is welcome to contact the authors to request for new features or to submit additional data for inclusion in future versions of the software.

The software is developed by the Earth Science Division of the NASA Goddard Space Flight Center and is distributed under the GNU General Public License. For more information, please visit https://www.earthdata.nasa.gov.

Figure 10. Depth vs. Horizontal Distance Profile.
Proposed Improvement with Rotation - 1