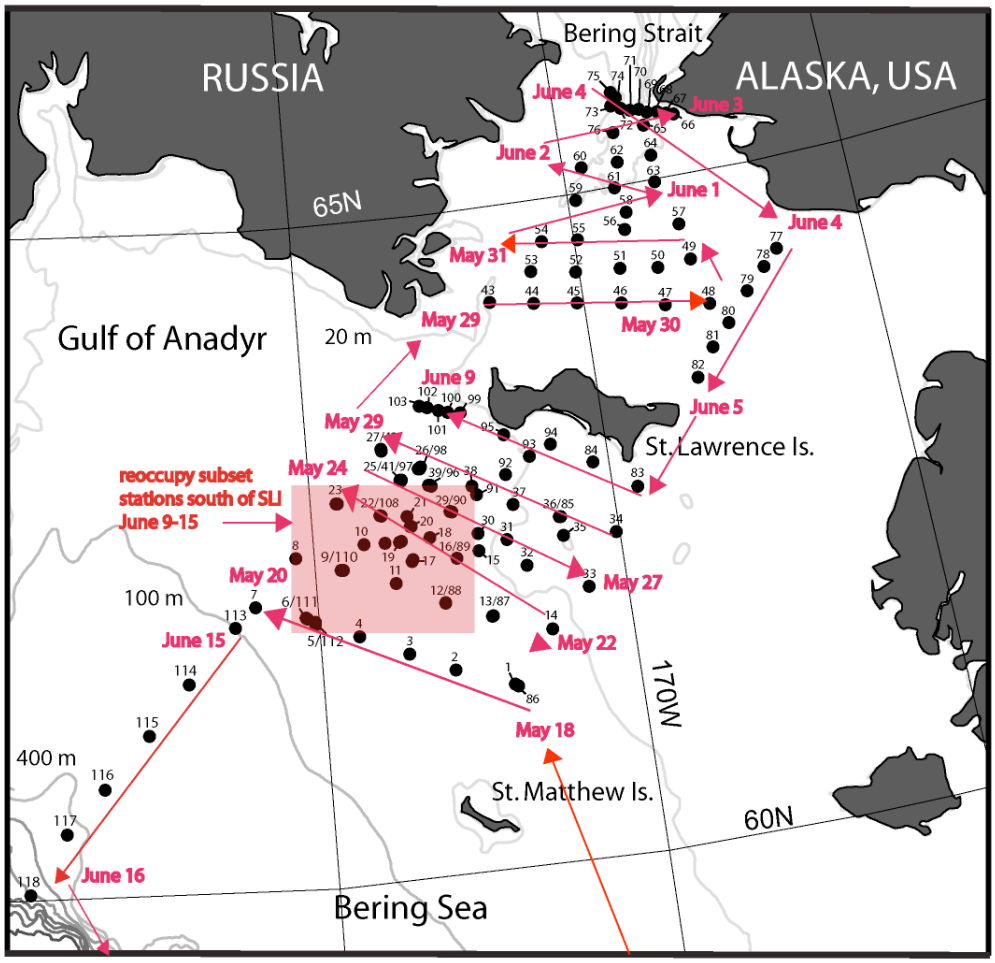
Data Synopsis for HLY0702 SLIPP07

May 16 – June 18, 2007
Dutch Harbor to Dutch Harbor

Chief Scientist- Jackie M. Grebmeier
Healy Captain- Captain Tedrick R. Lindstrom



Prepared by: Tom Bolmer, David Forcucci, David Hassilev, & Steve Roberts

Table of Contents

Project Summary

CLIMATE-DRIVEN CHANGES IN IMPACTS OF BENTHIC PREDATORS IN THE NORTHERN BERING SEA
Research Activities

PROJECT SUMMARY

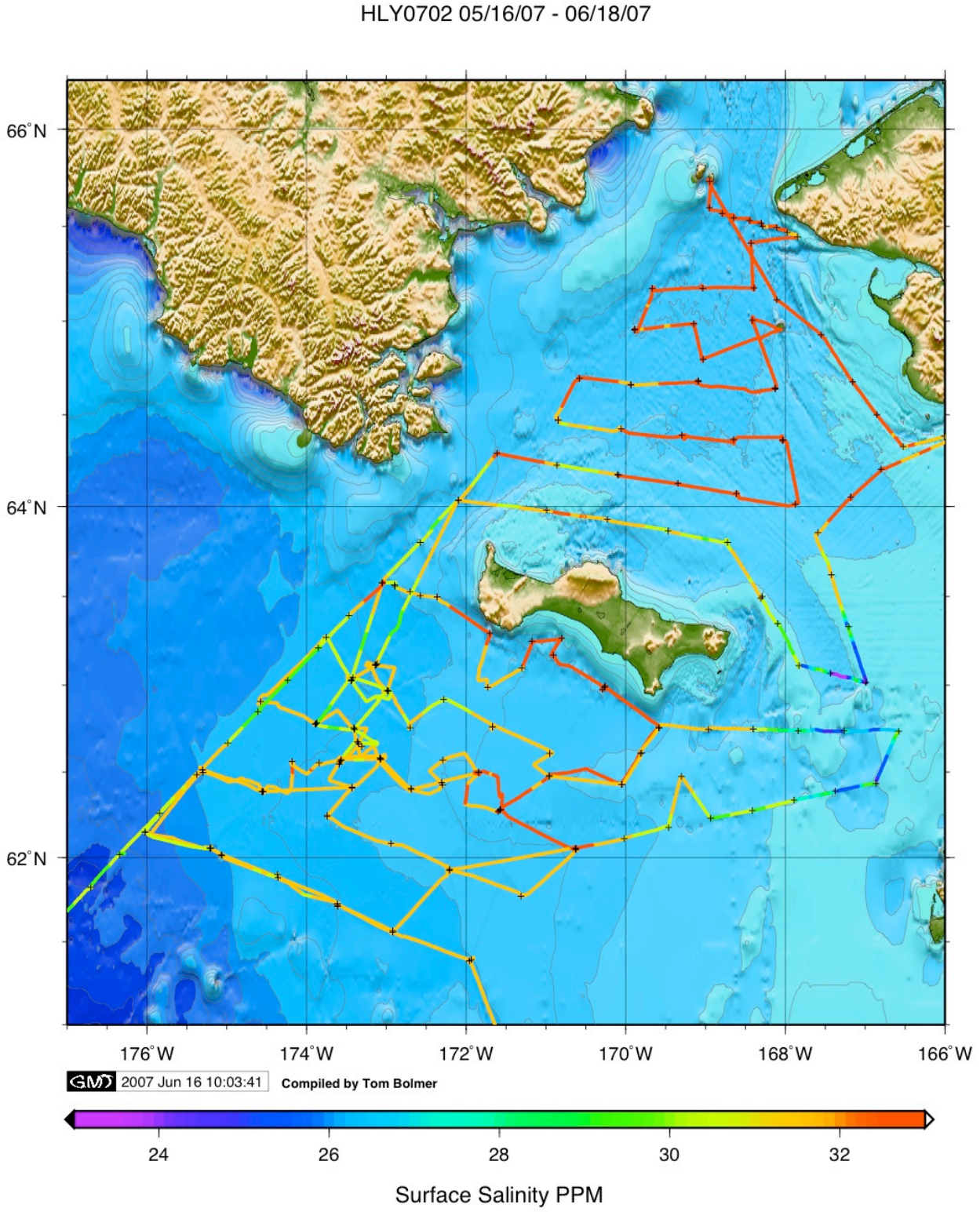
Perhaps the most striking evidence of global climate change is decreased extent of arctic sea ice and recent studies indicate this is occurring now south of St. Lawrence Island (SLI) in the SLI polynya region (SLIP). Despite research on the consequences of sea-ice change for physical oceanography and weather, effects on arctic marine food webs from microbes to top predators are by comparison very poorly understood. Our field research will investigate a major mechanism by which sea-ice change might affect the very productive, benthic-dominated food webs on shallow arctic shelves -expansion of the ranges and numbers of mobile benthic predators owing to increased temperature of bottom water. When winter sea ice melts on the north-central Bering Sea shelf, a pool of cold bottom water (<1°C) forms that persists through summer and reduces the numbers and growth of crabs and groundfish. The size of the cold pool decreases with decreasing ice extent. This area is currently the sole wintering site of the world population of the benthic-feeding Spectacled Eider (SPEI), a principal top predator. Expansion of competing crab and fish predators as ice cover declines and the cold pool contracts may affect food availability for the eiders. In this project, our main questions are:

Question 1: Is the benthic food web in the north-central Bering Sea limited by top-down control by predators? We will collect data needed to model the total impact of predators on their main benthic prey in the northcentral Bering Sea. These predators include SPEI, groundfish, snow crabs, sea stars, and gastropods.

Question 2: Are the overwinter survival and/or prebreeding condition of SPEI being impacted by climate driven trends in ice cover that are allowing populations of competing crabs and groundfish to expand? We will use past and current data to simulate impacts on the energy balance of the main endotherm predator (SPEI) of variations in crab and groundfish populations expected to occur with changes in ice cover and resulting temperature of bottom water.

Question 3: Are the time-series benthic system changes observed south of St. Lawrence Island continuing and are they forced by bottom-up (hydrographic) or top-down (predator) interactions, or both? We will continue a long-term (1950-2005) record of benthic communities and carbon cycling processes in this area, which is essential to analyses in this project. These data will also indicate whether declines in organic matter supply to sediments that we have measured at a subset of stations have occurred throughout the area, and whether these declines correspond to a decrease in direct precipitation of phytoplankton during and after the ice-edge spring bloom.

Cruise Track



Personnel

Science Party Personnel

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Ship's Crew

HEALY Sailing List for May 16, 2007.

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Lindstrom, Tedric CAPT
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Dalitsch, James LCDR
Alani, Brandon BM2
Angelo, James YNC
Arakaki, Rebecca SK2
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Beckmann, Rachel ENS
Blas, Paul FN
Brogan, John MKC
Buford, Aimee BM3
Carr, Michael LTJG
Carter, John FS2
Conroy, William BM3
Dabe, Jeffrey IT2
Daem, Steven ET3
Dahlen, Aaron ETC
Davidson, Ash BM2
Davis, Jonathon ET2
Deggans, Linzi FS2
Dull, Steven FS3
Dunning, Lara BM3
Elliott, Stephen LTJG
Faur, Jacques SK1
Fernandez, Chelsey SN
Finley, Nathan EM3
Gaskins, Kevin MK1
Gonzales, Daniel SA
Gonzalez, Fernando MK3
Hafner, Scott SN
Hamilton, Herbert FS3
Harris, Daniel SK1
Hernandez, Kelvin EM2
Hurtado, Daniell EM1
Hymes, Glenda FN
Jones, Greg MKCS
Kidd, Wayne BMC
King, Laura LCDR
Klinesteker, Chad MST2
Kosydar, Saul ET2
Laisure, Jeremy SK2

NAME
Layman, Rich MST2
Liebrecht, Brian ET1
Loftis, Jon MK2
Manangan, Sorjen OSC
Mandrie, Montarno DC3
Marsden, George DCC
McNally, Terence SK1
Meadowcroft, Brian LTJG
Merten, James SN
Murphy, Nicholas MK2
Myers, Robert MK2
Newton, Elizabeth LTJG
Olmstead, Rob MST1
Passalacqua, Joseph ETCM
Pentecost, James DC1
Perron, Peter ETCM
Podhora, Curtis EMCM
Quichocho, Robert MK1
Reed, Jonathan SN
Rieg, Mark MSTC
Rocklage, Eric MST1
Selavka, Nathan LTJG
Shaffer, Hans EM1
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Smith, Josh ENS
Sullivan, Timothy BMCS
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Thompson, Jennae SN
Travers, Cynthia ENS
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Von Kauffmann, Daniel IT1
Wagner, Alexander FN
Wallingford, Diane MK1
Ward, John CWO
Whiting, Allan, MK2
Williams, Marquessa FN
Worrell, Kenneth EM1
Wright, Tamekia FS2
Wright, Tiffany MST2
Yeckley, Andy BM3
Zitting, Arrene FS1

Science Components and their major sampling activities

Component, PIs	Sampling activities
Cooper Zhao	Mount optical sensors on forecastle. Additional, a lowered optical sensor packet will be done at the start of daytime stations.
Cooper	Determine profiles of salinity and temperature, macronutrients, $\delta^{18}O$ values, and chlorophyll *a* in the water column will be measured at each station from CTD rosette samples. These data will provide an oceanographic water mass context for our study, including data to analyze contributions of nutrients, sea ice melt, brine and runoff contributions. In addition, we will hand deploy a UV vertical measuring meter in the water column to 100 m depth after retrieval of the CTD
Lovvorn	Measure stable isotopes, fatty acids, selenium and POM in seawater at three depths at each station.
Frey	Satellite observations of ice will be evaluated via normal bridge obtained imagery and free web accessed products during the course of the cruise.
Belicka	Collection of seawater from shipboard science seawater system for carbon degradation experiments to determine the composition and age of the terrestrial fraction of particulate organic matter being delivered to the Bering Sea from rivers and coastal erosion.
Brooks	Conducted controlled seawater experiments to investigate the nature of dissolved organic matter (DOM) photooxidation in the Arctic.
Lee	Determine primary production (via C-13 method) and phytoplankton species composition in the water and sediments.
Zhao	Determine optical characteristics of seawater. The physical and ecological profile in the upper ocean (above 150 m) will be observed in order to understand heating process in marginal ice zone and open water in the Arctic Ocean. Physical (temperature and salinity), optical (radiance, irradiance and turbidity), chemical (nutrient) and biological (phytoplankton) data are collected to find their connection in different regions, ice conditions, and heating status.
Grebmeir Cassie Zeng	Continue time-series benthic measurements with multiple van Veen and HAPS benthic corer deployments. We will provide sediment subsamples for paleoclimate studies to U Massachusetts and Polar Research Institute of China.
Lovvorn	Measure the densities (by size class) of clams, predatory gastropods, sea stars (asteroids), snow crabs, and groundfish in the wintering area of (SPEI) collected via trawling
Zeng	Determine microbial composition in water and sediments
Lovvorn	Investigate the diets of predators collected by van Veen grabs and benthic trawls through analyses of gut contents, stable isotopes, and fatty acids to determine the diets of predators. We will measure prey size class of both predators and prey when possible. Based on the literature, we will develop estimates of the food intake per individual per day of the predators, considering the size classes of each predator.
Lubinski Krutz	We will have observations of seabirds and marine mammals by the USFWS.
Boveng Cameron	Will have a combination of shipboard surveys, aerial surveys via helicopter flights, and off-ship small boat operations for seal tagging.

Sheffield	Will investigate ice seal stock structure, migration routes, and dispersal patterns of ice seals that occur in the northern Bering Sea as well as assist in the NMML effort.
Polar-Palooza	Will include two media representatives on the ship the last week of May, with pick-up by helo as we round the corner past Gambell, Alaska and offload to Nome for commercial flights south before the ship heads back to Dutch Harbor.
ARCUS/PolarTREC	Will have one representative participate for a week during the cruise.

Merged Data

SCS One Minute Data File

The data are summarized into a one (1) minute data file in the SCS data logging system. This file takes the most recent value / current value to put into this summary. The data are the raw values as they are logged. There has been no quality control done on these files. Those wishing more accurate and quality controlled values should process the data in the directories described below.

This one minute data file was started at 4/14/07 at 06:00 UTC. Before this it was run intermittently with varying formats.

OneMinute_006.elg

04/17/2007,02:13:02,2007,04,17,021302.0046,0.011,350.7,353.761,351.022,351.3,11.0,60.48063,-173.62621,0.00,740417.1526,-11.61, 72,1005.79, 2.418 , -1.709 , -1.176 , 2.580 , 31.94 ,019.8,030,11.02,52.04,020,022.3,30.83,12.9,

04/17/2007,02:14:02,2007,04,17,021402.0031,0.011,15.8,18.902,016.071,10.3,10.9,60.48366,-173.62641,65.12,729287.0451,-11.61, 72,1005.72, 2.564 , -1.709 , -1.184 , 2.580 , 31.95 ,020.7,021,11.61,61.56,015,022.5,44.92,12.45,

04/17/2007,02:15:02,2007,04,17,021502.0015,0.011,14.2,17.273,014.326,12.8,10.5,60.48646,-173.62500,66.09,719746.953,-11.48, 71,1005.64, 2.696 , -1.706 , -1.187 , 2.579 , 31.95 ,023.2,024,14.46,51.27,015,025.4,39.88,16,

Field	DATA	Example	UNITS
01	SCS Logged Date	04/17/2007	
02	SCS Logged Time	02:12:02	GMT
03	POSMV-Year	2007	yyyy
04	POSMV-Month	,04	MM
05	POSMV-Day	17	DD
06	POSMV-Time	021202.0012	HHMMSS.ss
07	POSMV-Heading-Accuracy	0.011	deg
08	POSMV-Heading	349.5	deg
09	Gyro-HDT	352.423	deg
10	ADU-HDT	349.824	deg
11	POSMV-COG	347.1	deg
12	POSMV-SOG	10.7	Knots
13	POSMV-LAT	60.47765	deg
14	POSMV-LON	,-173.62502	deg
15	SB-Depth	65.33	Meters
16	PAR-derived-Value	751547.2602	uEinstein/m2.s
17	RMY-Temp	,-11.61	Deg. C
18	RMY-Humidity	71	Percent
19	RMY-Baro	1005.79	millibars
20	SCUFA-MG/L	2.381	ppm
21	TSGF-SST	-1.711	C
22	TSGF-IntTemp	-1.175	C
23	TSGF-Cond	2.580	
24	TSGF-Sal	31.95	ppt
25	StbdWndSpd-R	015.3	Knots
26	StbdWndDir-R	041	Deg
27	StbdWnd-T-Speed	10.52	

Field	DATA	Example	UNITS
28	StbdWnd-T-Direction	74.83	
29	PortWndDir-R	033	Deg
30	PortWndSpd-R	018.2	Knots
31	PortWnd-T-Direction	57.33	
32	PortWnd-T-Speed	10.33	

LDEO Averaged One Minute Data File

The data are summarized into an averaged one (1) minute data file by the LDEO technican. This file takes the average value centered around the minute, (30 seconds either side of the whole minute). The data are the raw values as they are logged. There has been no quality control done on these files. Those wishing more accurate and quality controlled values should process the data in the directories described below in the document.

Note 1:

SCUFA_Fl_V scale at 2007/04/13 03:35:08 was changed from 0-80ug/l to 0-30ug/l.
SCUFA_Fl_V prior to this time was multiplied by "80/30" in this file.
SCUFA_CHL = SCUFA_Fl_V x 6

Note *2:

Turbidity was not added as a sensor until around 2007/04/13 4:30.
Turb_Volts scale at 2007/04/16 21:47:51 was changed from 0-5NTU to 0-10NTU.
Turb_Volts prior to this time was divided by 2 in this file.
SCUFA_Turb = Turb_Volts x 2

HLY0702_one_minute.data

24945,2007/04/28 04:33,-169.866590,56.651784,11.4,21.7,20.9,82.3,1.998,2.847,32.12,1.668,2.416,
0.403,0.557,0.279,22,02,-200,26,0,01,-130,-5,0,-1.55,70,-6.33,1003.60,3.91,72.2,4.56,87.4, 532722.519
24946,2007/04/28 04:34,-169.864457,56.654721,11.4,22.0,21.1 81.8,1.980,2.845,32.11,1.648,2.352,
0.392,0.554,0.277,22,02,-200,26,0,01,-140,-5,0,-1.60,70,-6.33,1003.60,4.53,62.7,4.91,79.9, 519890.107
24947,2007/04/28 04:35,-169.862317,56.657645,11.4,22.0,20.8,81.0,1.971,2.844,32.11,1.649,2.261,
0.377,0.550,0.275,22,02,-200,26,0,01,-140,-5,0,-1.59,70,-6.40,1003.60,4.12,56.7,4.48,71.5, 514033.101

Field	DATA	Example	UNITS
01	ID	24950	samplecount
02	date	2007/04/28 04:38	date&timeUTC (year/month/dayhour:minute)
03	lon	-169.855928	POSMVLongitude (decimaldegrees)
04	lat	56.666416	POSMVLatitude (decimaldegrees)
05	sog	11.4	POSMVSpeedOverGround (Knots,1minuteaverage)
06	cog	22.0	POSMVCourseOverGround (angulardistancefrom0 (North) clockwisethrough360,1minuteaverage)
07	heading	20.7	POSMVshipheading (angulardistancefrom0 (North) clockwisethrough360,1minuteaverage)
08	depth	80.3	Seabeamcenterbeamdepth (meters,1minuteaverage)
09	TSGF_InTemp	1.968	SBE21internaltemperature (Celsius,1minuteaverage)
10	TSGF_Cond	2.843	Conductivity (Siemens/meter,1minuteaverage)
11	TSGF_Sal	32.10	Salinity (PSU,1minuteaverage)
12	TSGF_SST	1.612	RemoteTemperature,SeaChestintake (Celsius,1minuteaverage)
13	SCUFA_CHL	2.111	SCUFAFluorometer (Ug/l,1minuteaverage)

Field	DATA	Example	UNITS
14	SCUFA_Fl_V	0.352	SCUFAFluorometer (Volts,1minuteaverage)*
15	SCUFA_Turb	0.540	SCUFATurbidity (NTU,1minuteaverage)
16	Turb_Volts	0.270	SCUFATurbidity (Volts,1minuteaverage)**
17	tsg_flow	22	FlowmeterfeedingTSGandFLUOR (Liters/minute)
18	WinchAft	02	AftA-FrameWinchnumber
19	TensionAft	-200	AftA-FrameWinchWiretension (Pounds)
20	WireOutAft	26	AftA-FrameWinchWireout(Meters)
21	SpeedAft	0	AftA-FrameWinchWirespeed (Meters/minute)
22	WinchSbd	01	StarboardA-FrameWinchnumber
23	TensionSbd	-120	StarboardA-FrameWinchWiretension (Pounds)
24	WireOutSbd	-11	StarboardA-FrameWinchWireout (Meters)
25	SpeedSbd	0	StarboardA-FrameWinchWirespeed (Meters/minute)
26	RMYTemp	-1.70	RMYoungAirTemperature (Celsuis,1minuteaverage)
27	RMYHumidity	69	RMYoungRelativeHumidity (Precent,1minuteaverage)
28	RMYDewPt	-6.58	RMYoungDewPointTemperature (Celcius,1minuteaverage)
29	RMYBaro	1003.55	RMYoungBarometer (hPa,1minuteaverage)
30	PortWndSpdT	4.57	RMYoungWindSpeed,port (Knots,1minuteaverage)
31	PortWndDirT	62.7	RMYoungWindDirection,port (angulardistancefrom0 (North) clockwisethrough360,1minuteaverage)
32	StbdWndSpdT	4.83	RMYoungWindSpeed,starboard (Knots,1minuteaverage)
33	StbdWndDirT	81.5	RMYoungWindDirection,starboard (angulardistancefrom0 (North) clockwisethrough360,1minuteaverage)
34	PARderived	505144.287	DerivedsurfacePAR (Microeinstens/m2sec,1minuteaverage)

Underway Sensors

Sensor	Description		Status
Meteorology & Radiometers			
Port Anemometer	RM Young 09101	Continuous	Collected
Stbd Anemometer	RM Young 5106	Continuous	Collected
Barometer	RM Young 61201	Continuous	Collected
Air Temp/Rel. Hum.	RM Young 41382VC	Continuous	Collected
Helo shack PAR	BSI QSR-2200	Continuous	Collected
Underway Ocean			
TSG	SeaBird SBE21	Continuous	Collected
Remote Sea Temp	SeaBird SBE3S	Continuous	Collected
Fluorometer	Turner SCUFA	Continuous	Collected
Sonars			
Knudsen-subbottom	320 B/R	Continuous	Collected
ADCP 150 kHz	Broad Band (BB150)	Continuous	Not Collected
ADCP 75 kHz	Ocean Surveyor	Continuous	Collected
Multibeam	Seabeam 2112	Continuous	Collected
Speed log	Sperry	Continuous	Collected
Navigation			
P-Code GPS (aft)	Trimble Centurion	Continuous	Collected
Attitude GPS	Ashtech ADU5	Continuous	Collected
DGPS	Trimble AGGPS-AG132	Continuous	Collected
POSMV	Model- MV V4	Continuous	Collected
P-Code GPS (fwd)	?	Continuous	Collected
Glonass	?	Continuous	Collected
GYRO 1	Sperry MK25	Continuous	Collected
GYRO 2	Sperry MK25	Continuous	Collected

Distribution Contents

Introduction to Data

The Healy data acquisition systems continuously log data from the instruments used during the cruise. This document describes:

- The structure and organization of the data on the distribution media.
- The format and contents of the data strings.
- Formulas for calculating values.
- Information about the specific instruments in use during the cruise.
- A log of acquisition problems and events during the cruise that may affect the data.
- Scanned calibration sheets for the instruments in use during the cruise.

The data is distributed on a series of DVD-ROMs (DVD-R) written in ISO9660 level-4 format. It is readable by virtually every computing platform.

***IMPORTANT**: Read the section, "Acquisition Problems and Events," for important information that may affect the processing of this data.*

There are two logging system on the Healy. The ship (ESU) runs the SCS logging system and the LDEO support group runs the LDS logging system. This provides some redundancy in logging. The main purpose of LDS is to support the sonars and it's output is saved in Raw/pos_mv.

The Scientific Computer System (SCS) is a data acquisition, and display system designed for Oceanographic, Atmospheric, and Fisheries research applications. It acquires sensor data from shipboard oceanographic, atmospheric, and fisheries sensors and provides this information to scientists in real time via text and graphic displays, while simultaneously logging the data to disk for later analysis. SCS also performs quality checks by monitoring I/O, providing delta/range checks and plotting data after acquisition.

The LDEO Data System is somewhat distant relative of the logging code that has grown through more than a decade of use at LDEO. It is a significant revision of the current (2004) code used on the R/V Ewing (the Ewing Data System) and is architecturally much different. Because of this, LDS is still growing and at the moment (2005) this is the only operational implementation.

Data

Data are received via RS-232 serial connections. In SCS a time tag is added at the beginning of each line of data in the form,
mm/dd/yyyy,hh:mm:ss.sss,[data stream from instrument] where:

Format	Value used
mm	2 digit month of the year
dd	2 digit ay of the year
yyyy	4 digit year
hh	2 digit hour of the day
mm	2 digit minute
ss.sss	seconds

An example string from the Seabeam Centerbeam file is:
04/13/2007,06:49:20.920,$SBCTR,2007,4,13,06:49:09.437,57.158792,-165.664322 ,69.15,60*00
All times are reported in UTC.
The delimiters that separate fields in the raw data files are commas. Care should be taken when reprocessing the data that the field's separations are clearly understood.

Distribution DVD Contents at a Glance

Most data files are gzipped before they are written to the DVD to save space on the DVD.

There are two types/styles of DVDs created for the data for the cruise
The first DVD in the data set contains a summary of all of the data, descriptions and smaller data sets. It has a 1 minute averaged file of all the data collected under way. It also has ASCII files of many of the sensors from which data are collected. These sensors are ones that do not create huge amounts of data. There is also a directory called Meta_Data, which has descriptions of the data and the formats used. This DVD is created at the end of the cruise.
The second and subsequent DVDs contain data from sensors that create large amounts of data. These DVDs are created during the cruise as the data collected covers enough disk space to fill a DVD. By making these DVDs during the cruise, the time to create the full data set at the end of the cruise is shortened. Some data sets in this category cover several DVDs. Are must be taken to be sure all of the data of a certain type are recovered when you down load data form these DVDs to your own computers.
Appendix "Example list of the DVD directories" below for an example of the layout of each of the DVDs created.
The DVD will be name for the cruise and the number of the DVD in the series created for the cruise. So, the second DVD for HLY0702 will be named ***HLY07021Vol2***. The root directory on the DVD will be ***media-vol2***. This naming convention will let your copy all of the DVDs to a directory and keep each DVD unique but in a named sequence for accessing.

In the main directory is a file that lists all of the files on the DVD. This file is called:

media-volxx.md5: This file is a master list of every file on the DVD the file's checksum. The x is the DVD volume number.

Directories on the first DVD:

1_Minute_Averaged_Data: This directory contains all of the under way data averaged over a 1 minute window in time.

Datalog*:* This directory contains serial data collected by the SCS version 3.3b data collection system in different directories. Directory names are labeled by the instrument name and string type of the data collected. A description of the data contained in this directory is below.

Raw: This directory contains raw data as recorded by individual instruments and put into different directories. Directory names are labeled by the instrument name and string type of the data collected. A description of the data contained in this directory is below.

Meta_data: This directory contains documents useful in the post analysis of the data on this DVD media set. The data type are separated into different directories by type. A description of these directories is below.

Bathymetry: This directory contains data and figures used in creating a bathymetry data set for the SLIP area.

1_Minute_Averaged_Data:

hly0702_distance.csv.gz - Distance along track from port.
HLY0702_Averaged.csv.gz - All the Under way data averaged for 1 minute.
Shapefile - All of the 1 minute under way data averaged at 1 minute spacing in an ESRI GIS Shapefile.

Datalog:

/aft_a_frame - Wire tension, wire out, and wire speed for the Aft A frame sheaves.
/air_temp_f - Temperature data from the RM Young wind sensor in Fahrenheit. Data is derived from data from files in the rmyoung_air directory
/ashtech_attitude - Attitude in NMEA format from the Ashtech ADU5 GPS receiver
/ashtech_gga - Position data in NMEA GGA format from the Ashtech ADU5 GPS receiver
/ashtech_gll - Position data in NMEA GLL format from the Ashtech ADU5 GPS receiver
/ashtech_hdt - Heading data in NMEA HDT format from the Ashtech ADU5 GPS receiver
/dew_point_f - Dew point temperature derived from air temp
/glonass_gga - Position data in NMEA GGA format from the GLONASS GPS receiver.
/glonass_gll - Position data in NMEA GLL format from the GLONASS GPS receiver.
/gyro - Heading data in NMEA HDT format from the Sperry gyrocompass
/ibs_waypoints - Waypoints from the Healy's Integrated Bridge System
/knudsen - Depth data in a proprietary PKEL format received from Knudsen 320 B/R serial output
/par- Photosynthetic Active Radiation volts from the surface par sensor
/par_derived - Photosynthetic Active Radiation, Microeinstens/m2 sec from surface par sensor
/pcode_aft_gga - Position data in NMEA GGA format from the Trimble Centurion receiver located in the Computer lab
/pcode_aft_gll - Position data in NMEA GLL format from the Trimble Centurion receiver located in the Computer lab
/pcode_aft_vtg - Course and speed over ground in NMEA VTG format from the Trimble Centurion receiver located in the Computer lab
/pcode_aft_zda - Time and date data in the NMEA ZDA format. Data retrieved from the Trimble Centurion receiver located in the Computer lab
/pcode_bridge_gga - Position data in NMEA GGA format from the Trimble GPS receiver located on the bridge.
/pcode_bridge_gll - Position data in NMEA GLL format from the Trimble GPS receiver located on the bridge.
/pcode_bridge_vtg - Course and speed over ground data in NMEA VTG format from the Trimble GPS receiver located on the bridge.
/posmv_gga - Position data in NMEA GGA format from the POS/MV
/posmv_gst - Pseudorange error statistics in NMEA GST format from the POS/MV
/posmv_hdt - Heading data in NMEA HDT format from the POS/MV

/posmv_pashr - Roll, pitch and heave from POS MV inertial navigation system.
/posmv_vtg - Course and speed over ground in NMEA VTG format from the POS/MV
/posmv_zda - Time and date data in NMEA ZDA format from the POS/MV
/rmyoung_air - Temperature, humidity, air pressure data in NMEA XDR format from the RM Young meteorological system
/rmyportwind - Wind speed and direction data in NMEA WMV format from the RM Young weather vane on the port side of the Healy.
/rmystbdwind - Wind speed and direction data in NMEA WMV format from the RM Young weather vane on the starboard side of the Healy.
/samos_data – Meterology data files for SAMOS. ***NOT used for HLY0702***.
/sbd_a_frame - Wire tension, wire out, and wire speed for the starboard A frame sheaves.
/seabeam_center - Center depth data from the Seabeam 2112
/sperry_speedlogvbw - ground/water speed data from the Sperry Speed Log
/sv2000 - Sound Velocity data from the SV2000 sound velocimeter located in the ADCP BB150 sonar well
/true_wind_port - True wind speed data derived from gyro data and rmyportwind
/true_wind_stbd - True wind speed data derived from gyro data and rmystbdwind
/tsg_aft - Thermosalinograph and fluoromter data from the instruments in the Aft Fuel Hose room
/tsg_flow - Flow meter data just upstream of the TSG and Fluorometer
/tsg_fwd -Thermosalinograph and fluorometer data from the instruments in the Bio/Chem Lab
/winch_data - Line out and speed data from the winch system
/EventData – SCS 1 minute data. Data nearest the minute.

Meta_data:

Files describing data formats, Calibrations of Instruments, and the Data DVD descriptions are in this directory.
/elog - Contains the technician's narrative of important events, which occurred both to the network and to individual sensors.
/Bridge_Logs – Bridge logs kept by the bridge
DDMMMYY.doc - The "smooth log" containing events recorded by the bridge watch.
DDMMMYYWX.xls - Weather log recorded by the watch.
DDMMMYYNAV.xls - Navigation logs recorded by the watch.
./Systems_Calibration_Data – Calaibration files for Sensors
/CTD_Sensors – CTD calibration files
/Underway_Sensors – Under way Sensor Calibration files
/Met_Sensors – Meteorological Calibration files
/Ocean_sensors – TSG Sensor Calibration files
/HLY0702_Sensors_files – Figures for HLY0702_Sensors.htm
Science Event log as logged by the bridge.
Station log of only where the science stations were.

Raw:

/ctd - CTD data in directories by Cast number.
/pos_mv - POS/MV and other navigation data. LDS logged data.
/tsg_fwd - Thermosalinograph/Fluorometer data from instruments in the Bio/Chem Lab in their raw format.
/tsg_aft - Thermosalinograph/Fluorometer data from instruments in the aft fuel hose room in their raw format.

Bathymetry:

Files of the gridded data in different formats, a description of the data and an html file of the description.

ice_observations:

Directories of the Ice Observations taken for each day May 17 to June 10.

First DVD Contents by directory:

Datalog:	posmv_gst	**Raw:**
ashtech_gll	posmv_gga	pos_mv
ashtech_gga	posmv_hdt	pos_mv/events
ashtech_attitude	posmv_vtg	tsg_aft
ashtech_hdt	posmv_zda	tsg_fwd
glonass_gga	posmv_pashr	Ctd
glonass_gll	ibs_waypoints	Optode
gyro	tsg_aft	**Meta_Data:**
pcode_bridge_gga	tsg_fwd	elog
pcode_bridge_gll	sv2000	Bridge_Logs
pcode_bridge_vtg	par	Systems_Calibration_Data
rmyportwind	air_temp_f	Systems_Calibration_Data/CTD_Sen
pcode_aft_gga	dew_point_f	sors
pcode_aft_gll	true_wind_port	Systems_Calibration_Data/Underway
pcode_aft_zda	true_wind_stbd	_Sensors
pcode_aft_vtg	par_derived	Systems_Calibration_Data/Underway
rmyoung_air	aft_a_frame	_Sensors/MET_Sensors
rmystbdwind	sbd_a_frame	Systems_Calibration_Data/Underway
sperry_speedlog	EventData	_Sensors/Ocean_sensors
winch_data	Samos_data	HLY0702_Sensors_files
seabeam_center		**Bathymetry:**
knudsen		**Iced_observations:**

Directories on the second and subsequent DVDs:

Raw: This directory contains raw data as recorded by individual instruments and put into different directories. Directory names are labeled by the instrument name and string type of the data collected. A description of the data contained in this directory is below.

Images: This directory contains three directories of images from both the web cameras on board and Satelitte data received during the cruise.

AloftConCam: This directory contains picture files separated by directories named by Day of YearDay (YYYYJJJ). The files are rolled over at midnight GMT. Some directories are empty as the DVDs are created. The picture files are in JPEG format.

FantailCam: This directory contains picture files separated by directories named by Day of YearDay (YYYYJJJ). The files are rolled over at midnight GMT. The base folder contains different files as well.

Satellite_Images: This directory contains images from Satellites collected over the cruise. They are in dire3ctories named for their content and further broken into directories named by YearMonthDay (YYYYMMDD).

Raw:

/adcp75 - 75 KHz ADCP data

/adcp150 - 150 Khz ADCP data
/knudsenraw - Knudsen 320B/R data
/seabeam - Seabeam 2112 data in the raw format.
/xbt - Expendable Bathythermograph data.

Images:

Contains directories of Terascan, aloftconn and fantail cameras.

/AloftConCam - Contains picture files separated by folders named by Day of Year (YYYYJJJ) taken from a web camera in Aloft Con. The picture files are in JPEG format.

/FantailCam - Contains picture files separated by folders named by Day of Year (YYYYJJJ) taken from a web camera in Aft Con. The files are in JPEG format.

/Satellite_Image - Contains satellite imagery in jpeg format. Folder names are labeled as instrument name and string type of data collected
/dmsp - dmsp folders labeled by Year, Month, Day
/hrpt - hrpt folders labeled by Year, Month, Day

Second DVD Contents by directory:

The list of dated subdirectories here may be different from the actual DVD.

Images:	./Satellite_Images/dmsp/20070516
Images/AloftConnCam	./Satellite_Images/dmsp/20070517
./AloftConnCam/2007136	./Satellite_Images/dmsp/20070518
./AloftConnCam/2007137	./Satellite_Images/dmsp/20070519
./AloftConnCam/2007138	./Satellite_Images/dmsp/20070520
./AloftConnCam/2007139	./Satellite_Images/dmsp/20070521
./AloftConnCam/2007140	./Satellite_Images/dmsp/20070522
./AloftConnCam/2007141	./Satellite_Images/dmsp/20070523
./AloftConnCam/2007142	./Satellite_Images/dmsp/20070524
./AloftConnCam/2007143	./Satellite_Images/dmsp/20070525
./AloftConnCam/2007144	./Satellite_Images/dmsp/20070526
./AloftConnCam/2007145	Images/Satellite_Images/hrpt
./AloftConnCam/2007146	./Satellite_Images/hrpt/20070516
Images/FantailCam	./Satellite_Images/hrpt/20070517
295936 ./FantailCam/2007136	./Satellite_Images/hrpt/20070514
295936 ./FantailCam/2007137	./Satellite_Images/hrpt/20070515
295936 ./FantailCam/2007138	./Satellite_Images/hrpt/20070518
295936 ./FantailCam/2007139	./Satellite_Images/hrpt/20070519
295936 ./FantailCam/2007140	./Satellite_Images/hrpt/20070520
295936 ./FantailCam/2007141	./Satellite_Images/hrpt/20070521
295936 ./FantailCam/2007142	./Satellite_Images/hrpt/20070522
295936 ./FantailCam/2007143	./Satellite_Images/hrpt/20070523
295936 ./FantailCam/2007144	./Satellite_Images/hrpt/20070524
295936 ./FantailCam/2007145	./Satellite_Images/hrpt/20070525
295936 ./FantailCam/2007146	./Satellite_Images/hrpt/20070526
Images/Satellite_Images	**Raw:**
Images/Satellite_Images/dmsp	Raw/adcp75

./Satellite_Images/dmsp/20070513 ./Satellite_Images/dmsp/20070514 ./Satellite_Images/dmsp/20070515	Raw/knudsenraw Raw/seabeam

File Formats of Data Collected on HLY0702

In the sections below for each data type the directory name is listed, then an example file name, and then 3 lines from that file. This part is followed by a table that lists the data contained in the string.

./Datalog

The following data types are to be found in the DataLog directory of the DVD.

Under way Data

Meteorology Data

R. M. Young Sensors

R.M. Young Air Temperatures

Temperature, humidity, air pressure data in NMEA XDR format from the RM Young meteorological system. For HLY0702 the Dew Point Temperature did NOT work!

./rmyoung_air

RMYoung-Air_20070414-182437.Raw

04/14/2007,18:24:40.693,$WIXDR,C, -6.62,C,1,H, 89,P,1,C, -8.06,C,1,P, 994.24,B,2,D,-35,M,3hh
04/14/2007,18:24:46.677,$WIXDR,C, -6.49,C,1,H, 89,P,1,C, -7.93,C,1,P, 994.32,B,2,D,-35,M,3hh
04/14/2007,18:24:49.678,$WIXDR,C, -6.49,C,1,H, 89,P,1,C, -7.93,C,1,P, 994.24,B,2,D,-35,M,3hh

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/14/2007	mm/dd/year
2	SCS logged Time GMT	18:24:49.678	hh:mm:ss.sss
3	NMEA header	,$WIXDR	
4	Data type for field 5	C	Temperature
5	Air Temperature	-6.49	Celsius
8	Data Type for field 9	H	
9	Relative Humidity	89	Percent
12	Data type for field 13	C	
13	Dew Point Temperature	-7.93	Celcius
16	Data type for field 17	P	Pressure
17	Barometer	994.24	hPa
20	Data type for field 20	D	
21	Elevation	-35	Meters

R.M. Young Air Temperatures, Fahrenheit (Derived)

Temperature data from the RM Young wind sensor in Fahrenheit. Data is derived from data from files in the rmyoung_air directory.

./ air_temp_f

AirTemp-F_20070413-000000.Raw

04/13/2007,00:00:02.074,$DERIV,28.83,-1.76,
04/13/2007,00:00:05.074,$DERIV,28.62,-1.88,
04/13/2007,00:00:08.074,$DERIV,28.62,-1.88,

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/14/2007	mm/dd/year
2	SCS logged Time GMT	18:24:49.678	hh:mm:ss.sss
3	NMEA header	,$DERIV	
4	Air Temperature	28.83	Fahrenheit
5	Air Temperature	-1.76	Celsius

R.M. Young Wind. Port

Wind speed and direction data in NMEA WMV format from the RM Young weather vane on the port side of the Healy.

./rmyportwind

RMYPortWind_20070414-182437.Raw

04/14/2007,18:24:38.490,$WIMWV,033,R,028.1,N,A*36
04/14/2007,18:24:39.505,$WIMWV,041,R,028.7,N,A*35
04/14/2007,18:24:40.521,$WIMWV,034,R,029.4,N,A*35

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/14/2007	mm/dd/year
2	SCS logged Time GMT	18:24:40.521	hh:mm:ss.sss
3	NMEA header	$WIMWV	
4	Wind Direction	034	Degrees
5	R= Relative	R	
6	Wind Speed	029.4	Knots
7	N= Knots	N	
8	A= Valid Data	A	
9	Check sum	*35	

R.M. Young Wind, Starboard

Wind speed and direction data in NMEA WMV format from the RM Young weather vane on the starboard side of the Healy.

./rmstbwind

RMYStbdWind_20070414-182437.Raw

04/14/2007,18:24:38.677,$WIMWV,044,R,025.4,N,A*3E
04/14/2007,18:24:39.693,$WIMWV,045,R,025.6,N,A*3D
04/14/2007,18:24:40.724,$WIMWV,042,R,025.2,N,A*3E

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/14/2007	mm/dd/year
2	SCS logged Time GMT	18:24:40.724	hh:mm:ss.sss
3	NMEA header	$WIMWV	
4	Wind Direction	042	Degrees
5	R= Relative	R	
6	Wind Speed	025.2	Knots
7	N= Knots	N	
8	A= Valid Data	A	
9	Check sum	*3E	

R.M. Young Wind True, Port (Derived)

True wind speed data derived from gyro data and rmyportwind.

./true_wind_port

PortWnd-T_20070415-000000.Raw

04/15/2007,00:00:03.927,$DERIV,18.59,4.57,30.6,12,12.5,343.7,344.2,
04/15/2007,00:00:05.927,$DERIV,19.69,10.28,31.4,16,12.5,344.2,344.2,
04/15/2007,00:00:07.927,$DERIV,19.85,3.73,31.8,12,12.4,344.1,344.2,

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:07.927	hh:mm:ss.sss
3	NMEA header	$DERIV	
4	Wind Speed derived	19.85	knots
5	Wind Directions derived	3.73	degrees
6	Wind Speed relative	31.8	knots
7	Wind Direction relative	12	direction
8	Speed over ground (pos mv)	12.4	knots
9	Course over ground (pos mv)	344.1	Degrees
10	Heading (pos mv)	344.2	Degrees

R.M. Young Wind True, Starboard (Derived)

True wind speed data derived from gyro data and rmystbdwind.

./true_wind_stbd

StbdWnd-T_20070415-000000.Raw

04/15/2007,00:00:03.396,$DERIV,17.33,3.47,29.4,11,12.5,343.7,344.2,
04/15/2007,00:00:05.396,$DERIV,17.05,15.29,28.5,18,12.5,344.2,344.2,
04/15/2007,00:00:07.396,$DERIV,19.99,13.31,31.4,18,12.4,344.1,344.2,

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:07.396	hh:mm:ss.sss
3	NMEA header	$DERIV	
4	Wind Speed derived	19.99	knots
5	Wind Directions derived	13.31	degrees
6	Wind Speed relative	31.4	knots
7	Wind Direction relative	18	direction
8	Speed over ground (pos mv)	12.4	knots
9	Course over ground (pos mv)	344.1	Degrees
10	Heading (pos mv)	344.2	degrees

Dew Point (Derived)

Dew Point derived from rmyoung_air.
For HLY0702 this did NOT work!

./dew_point_f

DewPt-F_20070414-182437.Raw

04/14/2007,18:24:41.099,$DERIV,17.49,-8.06,
04/14/2007,18:24:44.099,$DERIV,17.73,-7.93,
04/14/2007,18:24:47.099,$DERIV,17.73,-7.93,

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/14/2007	mm/dd/year
2	SCS logged Time GMT	18:24:47.099	hh:mm:ss.sss
3	NMEA header	$DERIV	
4	Air Temperature	17.73	Fahrenheit
5	Air Temperature	-7.93	Celsius

Photosynthetic Active Radiation (PAR) Sensor

PAR

Photosynthetic Active Radiation volts from the surface par sensor.
./par
PAR_20070415-000000.Raw
04/15/2007,00:00:03.068,+01126.24
04/15/2007,00:00:04.068,+01133.28
04/15/2007,00:00:05.068,+01140.96

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.505	hh:mm:ss.sss
3	PAR	+01140.96	mVolts

PAR (Derived)

Photosynthetic Active Radiation, Microeinstens/m2 sec from surface par sensor.
./Par_derived
PAR-derived_20070415-000000.Raw
04/15/2007,00:00:03.146,$DERIV,1865353.0198,1126.24,
04/15/2007,00:00:09.146,$DERIV,1909343.4448,1152.8,
04/15/2007,00:00:15.146,$DERIV,1881518.176,1136,

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.193	hh:mm:ss.sss
3	NMEA header	$DERIV	
4	Derived surface PAR	1881518.176	Microeinstens/m2 sec
5	PAR volts	1136	mVolts

SAMOS (Shipboard Automated Meteorological and Oceanographic Systems)

Data formatted to be sent to the U.S. Research Vessel Surface Meteorology Data Assembly Center (DAC). For HLY0702 these files were only tests. This data is ONLY in the test stage and INCOMPLETE!

These data are in files that have only a single value. Every variable sent into SAMOS is in a separate file. The name of the file should tell the user what the variable is. There are two types of formats used. One if for data that is in degrees and the other for the rest of the data. The data for degrees has the date, time, a NMEA header for derived data, the mean data for the minute found using the arc tangent of the sine and cosine of the data, the last data value for the minute, the mean of the sums of the sin of the data, the mean of the sum of the cosines of the data and the number of values used to get the mean. The rest of the data has the date, time, a NMEA header for derived data, the mean data for the minute, the last value used in the minute, the total of all the values for the minute and the number of values used to get the mean.

Format for data in Degrees

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.505	hh:mm:ss.sss
3	NMEA header	$DERIV	
4	mean value	79.39	
5	Last Value used	93.174	
6	Mean of the Sines	57.4453621646971	
7	Mean of the Cosines	10.7645427712987	
8	number of values	59	

Format for other variables

FIELD	DATA	Example	UNITS
1	SCS logged Date	06/04/2007	mm/dd/year
2	SCS logged Time GMT	00:00:04.732	hh:mm:ss.sss
3	NMEA header	$DERIV	
4	mean value	2.55	
5	Last value used	2.71	
6	Sum of values	51.08	
7	number of values	20	

./Datalog/samos_data

For HLY0702 this data was not collected. The program to reformat and send this data in to shore was being developed. If any of this data is on the data DVDs, it was not meant for distribution as of yet.

Oceanographic Data

Thermosalinograph / Fluorometer

AFT Theromsalinograph / Fluorometer

Thermosalinograph and Fluoromter data from the instruments in the Aft Fuel Hose room.
./tsg_aft
TSGAFT_20070414-182437.Raw
NO DATA

Forward Theromsalinograph Flowmeter

Flowmeter data from the instruments in the Bio/Chem Lab

./tfg_flow.
TSGF-FlowMeter_20070415-000000.Raw
04/15/2007,00:00:02.974, 11.
04/15/2007,00:00:09.255, 11.
04/15/2007,00:00:15.537, 11.

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:15.537	hh:mm:ss.sss
3	Flowmeter feeding TSG and FLUOR	11.	Liters/minute

Forward Thermosalinograph / Fluorometer

Thermosalinograph and Fluorometer data from instruments in the Bio Chem Lab. . Also see the appendix section “SBE 21 SEACAT Thermosalinograph Data Output Formats”.

./tsg_fwd

TSGFWD_20070415-000000.Raw

After output changes made on 4-13-07 at 5:26:00 (see elog for details)

04/15/2007,00:00:04.255, 25269 -0.838 2.577 31.56 -1.457 1437.661 3.321 0.664 4.617 4.617

04/15/2007,00:00:10.287, 25270 -0.850 2.577 31.57 -1.458 1437.672 3.474 0.695 5.000 5.000

04/15/2007,00:00:16.255, 25271 -0.848 2.577 31.56 -1.458 1437.664 3.339 0.668 4.927 4.927

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:16.255	hh:mm:ss.sss
3	Scan number	25271	
4	SBE 21 internal temperature	-0.848	Celsius
5	Conductivity	2.577	Siemens/meter
6	Salinity	31.56	PSU
7	RemoteTemperature (Sea Chest intake)	-1.458	Celsius
8	Sound Velocity	1437.664	Meters per Second (m/s)
9	Fluorometer (SCUFA)	3.339	Ug/l
10	Fluorometer (SCUFA)	0.668	Volts
11	Turbidity (SCUFA)	4.927	NTU
12	Turbidity (SCUFA)	4.927	Volts

Sonar Data

Seabeam 2112 Center Beam

Center depth data derived from the Seabeam 2112 data on the POSMVNAV computer.
./seabeam_center
Seabeam-Centerbeam_20070414-182437.Raw
04/14/2007,18:24:38.427,$SBCTR,2007,4,14,18:24:35.713,58.119110,-169.839278,70.70,60*00
04/14/2007,18:24:40.177,$SBCTR,2007,4,14,18:24:37.213,58.119152,-169.839367,70.49,61*00
04/14/2007,18:24:40.615,$SBCTR,2007,4,14,18:24:38.734,58.119193,-169.839452,70.92,60*00

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/14/2007	mm/dd/year
2	SCS logged Time GMT	18:24:40.615	hh:mm:ss.sss
3	NMEA header	,$SBCTR	
4-6	Seabeam Date	2007,4,14	Year,month,day
7	Seabeam Time	18:24:38.734	hh:mm:ss.sss
8	Latitude	58.119193	Degrees
9	Longitude	-169.839452	Degrees
10	Depth	70.92	meters
11	Number of Beams	60	
12	Check sum	*00	

Knudsen

3.5 kHz

Depth data in a proprietary PKEL format received from Knudsen 320 B/R serial output.

./knudsen

Knudsen_20070414-182437.Raw

04/14/2007,18:24:38.099,$PKEL99,------
,14042007,182524.248,00192,HF,00.00,0,+008.50,LF,73.24,1,+008.50,1500,------,----,58 07.123897N,169 50.315830W,1060*12

04/14/2007,18:24:38.349,$PKEL99,------
,14042007,182525.759,00191,HF,00.00,0,+008.50,LF,73.22,1,+008.50,1500,------,----,58 07.127267N,169 50.322883W,0565*1F

04/14/2007,18:24:39.865,$PKEL99,------
,14042007,182527.269,00191,HF,00.00,0,+008.50,LF,73.22,1,+008.50,1500,------,----,58 07.128948N,169 50.326409W,1078*10

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/14/2007	mm/dd/year
2	SCS logged Time GMT	18:24:39.865	hh:mm:ss.sss
3	NMEA header	$PKEL99	KEL Proprietary Data String
4	Record Number???	------	
5	Knudsen Date	14042007	DDMMYYYY
6	Knudsen Time	182527.269	HHMMSS.sss
7		00191	
8	HF Header (12 kHz)	HF	
9	HF Depth to Surface	00.00	Meters *
10	HF Draft	,+008.50	Meters
11	LF Header	LF	
12	LF Depth to Surface	73.22	Meters *
13	LF Depth Valid Flag	1	
14	LF Draft	+008.50	Meters
15	Sound Speed	1500	Meters Per Second**
18	Latitude	58 07.128948N	DD MM.MMMMMM***
19	Longitude	169 50.326409W	DDD MM.MMMMMM***
20	Position Latency	1078	
21	Checksum	*10	

* Knudsen depth is currently set for Meters

** Knudsen default sound speed *** Current GPS source is the POS/MV

Winch data

Starboard A-Frame Winch Data

1 second data from the Starboard A Frame winch data output.
./sbd_a_frame
Stbd-A-Frame_20070418-000000.Raw
04/18/2007,06:13:18.281,01, 890, , 36, , -27, ,0000
04/18/2007,06:13:19.250,01, 890, , 35, , -28, ,0000
04/18/2007,06:13:20.235,01, 900, , 35, , -28, ,0000

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/18/2007	mm/dd/year
2	SCS logged Time GMT	06:13:20.235	hh:mm:ss.sss
3	Winch number	01	
4	Wire tension	900	Pounds
5	Wire out	35	Meters
7	Wire speed	-28	Meters/minute

Aft A-Frame Winch Data

1 second data from the Aft A Frame winch data output.
./aft_a_frame
Aft-A-Frame_20070418-000000.Raw
04/18/2007,08:46:45.844,02, -160, , 31, , 58, ,0000
04/18/2007,08:46:46.844,02, -160, , 32, , 60, ,0000
04/18/2007,08:46:47.812,02, -160, , 33, , 60, ,0000

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/18/2007	mm/dd/year
2	SCS logged Time GMT	08:46:47.812	hh:mm:ss.sss
3	Winch number	02	
4	Wire tension	-160	Pounds
5	Wire out	33	Meters
7	Wire speed	60	Meters/minute

Navigational Data

POSMV

The POSMV device is located above the Helo Control Shack. The results are corrected to the Master Reference Point (MRP) for the ship. See the Instrument Locations on the Healy section in the Appendix.

POSMV GGA

Position data in NMEA GGA format from the POS/MV.
./posmv_gga
POSMV-GGA_20070415-000000.Raw
04/15/2007,00:00:03.052,$INGGA,000002.737,5830.47054,N,17012.64182,W,2,08,1.0,1.80,M,,,4,0297*07
04/15/2007,00:00:04.052,$INGGA,000003.737,5830.47385,N,17012.64365,W,2,08,1.0,1.76,M,,,5,0297*0A
04/15/2007,00:00:05.052,$INGGA,000004.737,5830.47716,N,17012.64550,W,2,08,1.0,1.71,M,,,6,0297*07

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.052	hh:mm:ss.sss
3	NMEA header	$INGGA	
4	GPS time at position GMT	000004.737	hhmmss.sss
5	Latitude	5830.47716	ddmm.mmmmm
6	North (N) or South(S)	N	
7	Longitude	17012.64550	dddmm.mmmmm
8	East (E) or West (W)	W	
9	GPS Quality: 1 = GPS2=DGPS	2	
10	Number of GPS Satellites Used	08	
11	HDOP (horizontal dilution of precision)	1.0	
12	Antenna height	1.71	meters
13	M for Meters	M	
14	Geoidal Height		meters
15	M for Meters		
16	Differential reference station ID	0297	
17	Checksum	*07	

POSMV Psuedo Noise

Psuedorange error statistics in NMEA GST format from the POS/MV.

./posmv_gst

POSMV-Pseudo-Noise_20070415-000000.Raw

04/15/2007,00:00:02.990,$INGST,000002.737,,0.6,0.4,22.3,0.4,0.6,0.8*63
04/15/2007,00:00:03.990,$INGST,000003.737,,0.6,0.4,22.3,0.4,0.6,0.8*62
04/15/2007,00:00:04.990,$INGST,000004.737,,0.6,0.4,22.3,0.4,0.6,0.8*65

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.052	hh:mm:ss.sss
3	NMEA header	$INGST	
4	GPS time at position GMT	000004.737	hhmmss.sss
5			
6	Smjr.smjr	0.6	
7	Smnr.smnr	0.4	
8	000.0	22.3	
9	l.l	0.4	
10	y.y	0.6	
11	Standard deviation of altitude (a.a)	0.8	meters
12	Checksum	*65	

POSMV HDT

Heading data in NMEA HDT format from the POS/MV.

./posmv_hdt

POSMV-HDT_20070415-000000.Raw

04/15/2007,00:00:03.083,$INHDT,344.2,T*24
04/15/2007,00:00:04.083,$INHDT,344.2,T*24
04/15/2007,00:00:05.083,$INHDT,344.2,T*24

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.083	hh:mm:ss.sss
3	NMEA header	$INHDT	
4	Heading	344.2	Degrees
5	True(T) or Magnetic(M)	T	
6	Checksum	*24	

POSMV PASHR

Pitch and Roll data in NMEA PASHR format from the POS/MV.

./posmv_pashr

POSMV-PASHR_20070415-000000.Raw

04/15/2007,00:00:02.912,$PASHR,000002.737,344.17,T,-0.21,0.10,-0.02,0.017,0.017,0.011,2,1*17
04/15/2007,00:00:03.912,$PASHR,000003.737,344.19,T,-0.22,0.10,-0.02,0.017,0.017,0.011,2,1*1B
04/15/2007,00:00:04.912,$PASHR,000004.737,344.20,T,-0.24,0.10,-0.02,0.017,0.017,0.011,2,1*10

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.052	hh:mm:ss.sss
3	NMEA header	$PASHR	
4	Time GMT	000004.737	hhmmss.sss
5	Heading	344.20	heading
6	True	T	
7	Roll	-0.24	Degrees
8	Pitch	0.10	Degrees
9	Heave	-0.02	Degrees
10	Accuracy roll	0.017	Degrees
11	Accuracy pitch	0.017	Degrees
12	Accuracy heading	0.011	Degrees
13	Accuracy of heading 0-no aiding, 1-GPS 2= GPS & GAMS	2	
14	IMU 0= out 1= satisfactory	1	
15	Check Sum	*10	

POSMV VTG

Course and speed over ground in NMEA VTG format from the POS/MV.

./posmv_vtg

POSMV-VTG_20070415-000000.Raw

04/15/2007,00:00:03.130,$INVTG,343.7,T,,M,12.5,N,23.1,K*75
04/15/2007,00:00:04.130,$INVTG,344.0,T,,M,12.5,N,23.1,K*75
04/15/2007,00:00:05.115,$INVTG,344.2,T,,M,12.5,N,23.1,K*77

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.115	hh:mm:ss.sss
2	NMEA header	$INVTG	
3	Heading	344.2	Degrees
4	Degrees true (T)	T	
5	Heading		Degrees
6	Degrees magnetic	M	
7	Ship Speed	12.5	knots
8	N=Knots	N	
9	Ship Speed	23.1	km/hr
10	K=KM per hour	K	
11	Check sum	*77	

POSMV ZDA

Time and date data in NMEA ZDA format from the POS/MV.

./posm_zda

POSMV-ZDA_20070415-000000.Raw

04/15/2007,00:00:03.162,$INZDA,000003.0016,15,04,2007,,*77
04/15/2007,00:00:04.162,$INZDA,000004.0016,15,04,2007,,*70
04/15/2007,00:00:05.162,$INZDA,000005.0016,15,04,2007,,*71

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.162	hh:mm:ss.sss
2	NMEA header	$INZDA	
3	Time UTC	000005.0016	HHMMSS.ssss
4	Day	15	DD
5	Month	04	MM
6	Year	2007	Year
7	??		??
8	??	00	??
9	Checksum	*71	

Ashtech GPS

Ashtech Attitude

Attitude in NMEA format from the Ashtech ADU5 GPS receiver.

./ashtech_attiude

Ashtech-Attitude_20070415-000000.Raw

04/15/2007,00:00:03.490,$GPPAT,000003.00,5830.44196,N,17012.62728,W,00030.21,344.3730,000.25,-000.01,0.0015,0.0074,0*42

04/15/2007,00:00:04.490,$GPPAT,000004.00,5830.44527,N,17012.62914,W,00030.23,344.3537,000.20,-000.06,0.0015,0.0071,0*4A

04/15/2007,00:00:05.490,$GPPAT,000005.00,5830.44859,N,17012.63099,W,00030.23,344.3431,000.22,-000.07,0.0014,0.0077,0*41

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.490	hh:mm:ss.sss
3	NMEA header	$GPPAT	
4	GPS time at position GMT	000005.00	hhmmss.ss
5	Latitude	5830.44859	ddmm.mmmmm
6	North (N) or South(S)	N	
7	Longitude	17012.63099	dddmm.mmmmm
8	East (E) or West (W)	W	
9	Altitude	00030.23	Meters
10	Heading	344.3431	Degrees
11	Pitch	000.22	Degrees
12	Roll	-000.07	degrees
13	Attitude phase measurement rms error, MRMS	0.0014	meters
14	Attitude baseline length rms error, BRMS	0.0077	meters
15	Attitude reset flag (0:good attitude, 1:rough estimate or bad attitude)	0	
16	Check sum	*41	

Ashtech GGA

Position data in NMEA GGA format from the Ashtech ADU5 GPS receiver.

./ashtech_gga

Ashtech-GGA_20070415-000000.Raw

04/15/2007,00:00:02.333,$GPGGA,000002.00,5830.43864,N,17012.62542,W,1,13,0.7,20.74,M,9.47,M,,*73
04/15/2007,00:00:03.333,$GPGGA,000003.00,5830.44196,N,17012.62728,W,1,13,0.7,20.75,M,9.47,M,,*7E
04/15/2007,00:00:04.333,$GPGGA,000004.00,5830.44527,N,17012.62914,W,1,13,0.7,20.76,M,9.47,M,,*75

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:04.333	hh:mm:ss.sss
3	NMEA header	$GPGGA	
4	GPS time at position GMT	000004.00	hhmmss.ss
5	Latitude	5830.44527	ddmm.mmmmm
6	North (N) or South(S)	N	
7	Longitude	17012.62914	dddmm.mmmmm
8	East (E) or West (W)	W	
9	GPS Quality: 1 = GPS2=DGPS	1	
10	Number of GPS Satellites Used	13	
11	HDOP (horizontal dilution of precision)	0.7	
12	Antenna height	20.76	meters
13	M for Meters	M	
14	Geoidal Height	9.47	meters
15	M for Meters	M	
16	Differential reference station ID (no data in sample string)		
17	Checksum	*75	

Ashtech GGL

Position data in NMEA GLL format from the Ashtech ADU5 GPS receiver.

./ashtech_ggl

Ashtech-GLL_20070415-000000.Raw

04/15/2007,00:00:03.271,$GPGLL,5830.44196,N,17012.62728,W,000003.00,A,A*74
04/15/2007,00:00:04.255,$GPGLL,5830.44527,N,17012.62914,W,000004.00,A,A*7C
04/15/2007,00:00:05.255,$GPGLL,5830.44859,N,17012.63099,W,000005.00,A,A*74

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.255	hh:mm:ss.sss
3	NMEA header	$GPGLL	
4	Latitude	5830.44859	ddmm.mmmmm
5	North or South	N	
6	Longitude	17012.63099	dddmm.mmmmm
7	East or West	W	
8	GMT of Position	000005.00	hhmmss.ss
9	Status of data (A=valid)	A	
10	???	A	
11	Checksum	*74	

Ashtech HDT

Heading data in NMEA HDT format from the Ashtech ADU5 GPS receiver.
./ashtech_hdt
Ashtech-HDT_20070415-000000.Raw
04/15/2007,00:00:03.505,$GPHDT,344.373,T*31
04/15/2007,00:00:04.505,$GPHDT,344.354,T*34
04/15/2007,00:00:05.505,$GPHDT,344.343,T*32

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.505	hh:mm:ss.sss
3	NMEA header	$GPHDT	
4	Heading	344.343	Degrees
5	True(T) or Magnetic(M)	T	
6	Checksum	*32	

PCode

PCode AFT

PCode Aft GGA

Position data in NMEA GGA format from the Trimble Centurion receiver located in the Computer lab.
./pcode_aft_gga
PCode-AFT-GGA_20070415-000000.Raw
04/15/2007,00:00:03.443,$GPGGA,000002.522,5830.4417,N,17012.6249,W,1,04,1.5,019.8,M,-008.9,M,,*51
04/15/2007,00:00:04.427,$GPGGA,000003.522,5830.4450,N,17012.6267,W,1,04,1.5,019.8,M,-008.9,M,,*5F
04/15/2007,00:00:05.427,$GPGGA,000004.522,5830.4483,N,17012.6286,W,1,04,1.5,019.8,M,-008.9,M,,*59

FIELD	DATA	Examples	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.427	h:mm:ss.sss
3	NMEA header	$GPGGA	
4	GPS time at position GMT	000004.522	hhmmss.ss
5	Latitude	5830.4483	ddmm.mmmm
6	North (N) or South(S)	N	
7	Longitude	17012.6286	dddmm.mmmm
8	East (E) or West (W)	W	
9	GPS Quality: 1 = GPS2=DGPS	1	
10	Number of GPS Satellites Used	04	
11	HDOP (horizontal dilution of precision)	1.5	
12	Antenna height	019.8	meters
13	M for Meters	M	
14	Geoidal Height	-008.9	meters
15	M for Meters	M	
16	Differential reference station ID (no data in sample string)		
17	Checksum	*59	

PCode Aft GLL

Position data in NMEA GLL format from the Trimble Centurion receiver located in the Computer lab.

./pcode_aft_gll

Pcode-AFT-GLL_20070415-000000.Raw

04/15/2007,00:00:03.474,$GPGLL,5830.4417,N,17012.6249,W,000002.522,A*25
04/15/2007,00:00:04.474,$GPGLL,5830.4450,N,17012.6267,W,000003.522,A*2
04/15/2007,00:00:05.490,$GPGLL,5830.4483,N,17012.6286,W,000004.522,A*2D

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.490	hh:mm:ss.sss
3	NMEA header	$GPGLL	
4	Latitude	5830.4483	ddmm.mmmm
5	North or South	N	
6	Longitude	17012.6286	dddmm.mmmm
7	East or West	W	
8	GMT of Position	000004.522	hhmmss.sss
9	Status of data (A=valid)	A	
10	Checksum	*2D	

PCode AFT VTG

Course and speed over ground in NMEA VTG format from the Trimble Centurion receiver located in the Computer lab.

./pcode_aft_vtg

Pcode-AFT-VTG_20070415-000000.Raw

04/15/2007,00:00:03.537,$GPVTG,343.7,T,331.4,M,012.4,N,023.0,K*4E
04/15/2007,00:00:04.537,$GPVTG,343.6,T,331.3,M,012.5,N,023.1,K*48
04/15/2007,00:00:05.537,$GPVTG,343.6,T,331.3,M,012.4,N,023.0,K*48

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.537	hh:mm:ss.sss
2	NMEA header	$GPVTG	
3	Heading	343.6	Degrees
4	Degrees true (T)	T	
5	Heading	331.3	Degrees
6	Degrees magnetic	M	
7	Ship Speed	012.4	knots
8	N=Knots	N	
9	Ship Speed	023.0	km/hr
10	K=KM per hour	K	
11	Check sum	*48	

PCode AFT ZDA

Time and date data in the NMEA ZDA format. Data retrieved from the Trimble Centurion receiver located in the Computer lab.

./pcode_aft_zda

Pcode-AFT-ZDA_20070415-000000.Raw

04/15/2007,00:00:03.224,$GPZDA,000003.00,15,04,2007,00,00,*4C
04/15/2007,00:00:04.224,$GPZDA,000004.00,15,04,2007,00,00,*4B
04/15/2007,00:00:05.224,$GPZDA,000005.00,15,04,2007,00,00,*4A

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.537	hh:mm:ss.sss
2	NMEA header	$GPZDA	
3	Time UTC	000005.00	hhmmss.sss
4	Day	15	DD
5	Month	04	MM
6	Year	2007	Year
7	??	00	??
8	??	00	??
9	Checksum	*4A	

PCode Bridge

PCode Bridge GGA

Position data in NMEA GGA format from the Trimble GPS receiver located on the bridge.

./pcode_bridge_gga

PCode-Bridge-GGA_20070415-000000.Raw

04/15/2007,00:00:03.037,$GPGGA,000002.00,5830.469,N,17012.644,W,1,04,2.666,32.15,M,8.930,M,,*4D
04/15/2007,00:00:05.037,$GPGGA,000004.00,5830.476,N,17012.648,W,1,04,2.667,31.82,M,8.930,M,,*45
04/15/2007,00:00:07.052,$GPGGA,000006.00,5830.482,N,17012.651,W,1,04,2.668,31.55,M,8.930,M,,*41

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:07.052	hh:mm:ss.sss
3	NMEA header	$GPGGA	
4	GPS time at position GMT	000006.00	hhmmss.ss
5	Latitude	5830.482	ddmm.mmm
6	North (N) or South(S)	N	
7	Longitude	17012.651	dddmm.mmm
8	East (E) or West (W)	W	
9	GPS Quality: 1 = GPS2=DGPS	1	
10	Number of GPS Satellites Used	04	
11	HDOP (horizontal dilution of precision)	2.668	
12	Antenna height	31.55	meters
13	M for Meters	M	
14	Geoidal Height	8.930	meters
15	M for Meters	M	
16	Differential reference station ID (no data in sample string)		
17	Checksum	*41	

PCode Bridge GLL

Position data in NMEA GLL format from the Trimble GPS receiver located on the bridge.

./pcode_bridge_gll

Pcode-Bridge-GLL_20070415-000000.Raw

04/15/2007,00:00:03.099,$GPGLL,5830.469,N,17012.644,W,000002.00,A*12
04/15/2007,00:00:05.099,$GPGLL,5830.476,N,17012.648,W,000004.00,A*16
04/15/2007,00:00:07.099,$GPGLL,5830.482,N,17012.651,W,000006.00,A*17

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:07.099	hh:mm:ss.sss
3	NMEA header	$GPGLL	
4	Latitude	5830.482	ddmm.mmm
5	North or South	N	
6	Longitude	17012.651	dddmm.mmm
7	East or West	W	
8	GMT of Position	000006.00	hhmmss.ss
9	Status of data (A=valid)	A	
10	Checksum	*17	

PCode Bridge VTG

Course and speed over ground data in NMEA VTG format from the Trimble GPS receiver located on the bridge.

./pcode_bridge_vtg

Pcode-Bridge-VTG_20070415-000000.Raw

04/15/2007,00:00:03.162,$GPVTG,343.9,T,333.8,M,12.46,N,23.08,K*40
04/15/2007,00:00:05.162,$GPVTG,343.8,T,333.8,M,12.49,N,23.12,K*45
04/15/2007,00:00:07.146,$GPVTG,343.9,T,333.8,M,12.48,N,23.11,K*46

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:07.146	hh:mm:ss.sss
2	NMEA header	$GPVTG	
3	Heading	343.9	Degrees
4	Degrees true (T)	T	
5	Heading	333.8	Degrees
6	Degrees magnetic	M	
7	Ship Speed	12.48	knots
8	N=Knots	N	
9	Ship Speed	23.11	km/hr
10	K=KM per hour	K	
11	Check sum	*46	

Glonass

Glonass GGA

Position data in NMEA GGA format from the GLONASS GPS receiver.
./glonass_gga
Glonass-GGA_20070415-000000.Raw
04/15/2007,00:00:02.412,$GPGGA,000002.00,5830.472078,N,17012.636881,W,1,09,0.9,22.999,M,9.46,M,,*49
04/15/2007,00:00:03.396,$GPGGA,000003.00,5830.475412,N,17012.638716,W,1,09,0.9,23.000,M,9.46,M,,*40
04/15/2007,00:00:04.412,$GPGGA,000004.00,5830.478732,N,17012.640527,W,1,09,0.9,22.932,M,9.46,M,,*4D

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:04.412	hh:mm:ss.sss
3	NMEA header	$GPGGA	
4	GPS time at position GMT	000004.00	hhmmss.ss
5	Latitude	5830.478732	ddmm.mmmmmm
6	North (N) or South(S)	N	
7	Longitude	17012.640527	dddmm.mmmmmm
8	East (E) or West (W)	W	
9	GPS Quality: 1 = GPS2=DGPS	1	
10	Number of GPS Satellites Used	09	
11	HDOP (horizontal dilution of precision)	0.9	
12	Antenna height	22.932	meters
13	M for Meters	M	
14	Geoidal Height	9.46	meters
15	M for Meters	M	
16	Differential reference station ID (no data in sample string)		
17	Checksum	*4D	

Glassnos GLL

Position data in NMEA GLL format from the GLONASS GPS receiver.
./glassnos_gll
Glonass-GLL_20070415-000000.Raw
04/15/2007,00:00:03.240,$GPGLL,5830.475412,N,17012.638716,W,000003.00,A*12
04/15/2007,00:00:04.255,$GPGLL,5830.478732,N,17012.640527,W,000004.00,A*16
04/15/2007,00:00:05.255,$GPGLL,5830.482216,N,17012.642424,W,000005.00,A*11

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.255	hh:mm:ss.sss
3	NMEA header	$GPGLL	
4	Latitude	5830.482216	ddmm.mmmmmm
5	North or South	N	
6	Longitude	17012.642424	dddmm.mmmmmm
7	East or West	W	
8	GMT of Position	000005.00	hhmmss.ss
9	Status of data (A=valid)	A	
10	Checksum	*74	

Gyro

Gyro Heading

Heading data in NMEA HDT format from the Sperry gyrocompass.
./gyro
Gyro_20070415-000000.Raw
04/15/2007,00:00:01.912,$HEHDT,346.647,T*2B
04/15/2007,00:00:03.912,$HEHDT,346.713,T*2B
04/15/2007,00:00:05.927,$HEHDT,346.735,T*2F

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.927	hh:mm:ss.sss
3	NMEA header	$HEHDT	
4	Heading	346.735	degrees
5	True (T) or Magnetic (M)	T	
6	Check sum	*2F	

Waypoints

IBS Waypoints

Waypoints from the Healy's Integrated Bridge System (IBS).
./ibs_waypoints
IBS-WayPoints_20070415-000000.Raw
04/15/2007,00:00:03.193,$NVWPL,6152.68,N,17402.58,W,62*51
04/15/2007,00:00:04.193,$NVWPL,6156.58,N,17422.68,W,63*56
04/15/2007,00:00:05.193,$NVWPL,6202.16,N,17439.96,W,64*52

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:05.193	hh:mm:ss.sss
3	NMEA header	$NVWPL	
4	Latitude	6202.16	ddmm.mm
5	North or South	N	
6	Longitude	17439.96	dddmm.mm
7	East or West	W	
8	Waypoint number	64	
9	Checksum	*52	

Speed Log

Sperry Sped Log

Ground/water speed data from the Sperry Speed Log.
./sperry_speedlog
Sperry-Speedlog_20070415-000000.Raw
04/15/2007,00:00:02.755,$VDVBW,12.32,0.85,A,12.43,0.66,A*5A
04/15/2007,00:00:03.271,$VDVBW,12.33,0.80,A,12.44,0.66,A*59
04/15/2007,00:00:03.771,$VDVBW,12.34,0.78,A,12.45,0.68,A*56

FIELD	DATA	Example	UNITS
1	SCS logged Date	04/15/2007	mm/dd/year
2	SCS logged Time GMT	00:00:03.771	hh:mm:ss.sss
2	NMEA header	$VDVBW	
3	Fore-aft Water Speed - = astern	12.34	knots
4	Port-Stbd Water Speed - = port	0.78	knots
5	A= Data Valid V=Invalid	A	
6	Fore-aft Bottom Speed - = astern	12.45	knots
7	Port-Stbd Bottom Speed - = port	0.68	knots
8	A= Data Valid V=Invalid	A	
9	Checksum	*56	

Sound Velocimeter

SV2000

Sound Velocity data from the SV2000 sound velocimeter.

./sv2000
Sound-Velocimeter_20070415-000000.Raw
NO DATA

./Raw

The following section are in the Raw data directory on the DVD.

75 KHz ADCP data

./adcp75
The shipboard ADCP system measures currents in the depth range from about 30 to 300 m -- in good weather. In bad weather or in ice, the range is less, and sometimes no valid measurements are made. ADCP data collection occurs on the Healy for the benefit of the scientists on individual cruises and for the long-term goal of building a climatology of current structure in the Ocean.
The ADCP data set collected during this cruise are placed in the directory ./Raw/adcp75. The archive consists of a single file for each day of data collection. The files are named by the cruise HLY0702, a three place number of the sequence in the files, then an extra "_000000", and then an extent for the kind of data in the file. An example of the files for one set is:

FILE NAME	FILE EXTENSION	DEFINITION
HLY0702022_000000	*.ENR*	Raw Binary ADCP Data
HLY0702022_000000	*.ENS*	Binary Adcp Data
HLY0702022_000000	*.ENX*	Binary Ensemble Data
HLY0702022_000000	*.STA*	short term average
HLY0702022_000000	*.LTA*	long term average
HLY0702022_000000	*.N1R*	Raw NMEA ASCII
HLY0702022_000000	*.N2R*	Raw NMEA ASCII
HLY0702022_000000	*.NMS*	Averaged Nav Data
Cruise Name_000008	Copy of .ini	

150 Khz ADCP data

There was no adcp 150 run during HLY0702
./adcp150

KNUDSEN 320B/R

The Knudsen 320B/R depth sounder can record depth in both 3.5 and 12 kHz mode. The Healy records the 3.5 kHz data (Sub Bottom Profile) under way. This data is saved in all of the formats that the Knudsen can record data in. These files are in both ASCII and BINARY format (see the table below). This data is also saved as depth in Datalog/Knudsen.

./knudsenraw

FILENAME	FORMAT	DEFINITION
2007_102_0005_004.keb	Binary	Knudsen Playback File
2007_102_0005_008.kea	Ascii	Log of depth, settings and environmental data
2007_102_0005_HF_001.sgy	Binary	SEG-Y extended Seismic format

POSMV

The files saved in the directory pos_mv are all ones that the posmvnav computer logged from various navigation devices and devices related to the Seabeam system. The files use the naming convention of the name of the cruise, the device and an extent that has the year and Day of Year day. An example for the ADU5 GPS receiver on day 105 in 2007 would be: HLY0702-adu5.y2007d105. The files are ASCII

./pos_mv

HLY0702-adu5.y2007d105 – "Ashtech" GPS
HLY0702-aggps.y2007d105 – Differential GPS
HLY0702-ftsgauss.y2007d105 – TSG ASCII data
HLY0702-ftsgaussraw.y2007d105 – Raw TSG in HEX with a time stamp
HLY0702-par.y2007d105 – Raw PAR sensor data
HLY0702-posatt.y2007d105 – POSNV Attitude data
HLY0702-posnav.y2007d105 – POSMV Nav data
HLY0702-posreform2sb.y2007d105 – Reformatted POSMV for Seabeam
HLY0702-sbsv.y2007d105 – Surface Sound Velocity

POSMV Events

The events directory in the pos_mv directory has event files from various system showing start and stop times and various events in the recording and setup history of the device.

/pos_mv/events

Seabeam

The raw Seabeam 2112 binary files are in this directory. The naming convention uses the year, month, Day of Year day, and the start hour and minute in it. For year 2007 on day 110 starting at 11:12 the name would be sb20071101112.mb41. mb41 is the multibeam format number for the Seabeam 2112 that the Healy uses. This can best be accessed and used by using the MB-System software.

./Seabeam

sb20071091600.mb41

Thermosalinograph

Thermosalinograph AFT

Not used for HLY0702
./tsg_aft

Thermosalinograph Forward

The Forward Thermosalinograph data is written here in the binary format that SeaBird puts out. There are 2 files for each time period. The files use the name of the cruise and a sequence number in the recording for the cruise. See the SeaBird software Seacat for further processing.
./tsg_fwd
HLY07TSGFwd0702-2.CON
HLY07TSGFwd0702-2.hex

CTD

Data for the each CTD cast are contained here. These files are in SeaBird software's format. Each cast is in a separately numbered subdirectory.
./ctd

FILENAME	FORMAT	DEFINITION
021.BL	ASCII	Bottle firing information
021.CON	ASCII	The configuration file for the cast
021.HDR	ASCII	Header information for the cast
021.btl	ASCII	Averaged Bottle firing information
021.cnv	ASCII	The data
021.dat	Binary	The data
021.jpg	Binary	Plotted JPEG image of the cast
021.ros	ASCII	Data from when bottles fire
021avg.cnv	ASCII	Meaned 1 meter down cast of the data

Expandable Bathythermograph (XBT)

No XBTs were taken on HLY0702. The file names use the probe type and the sequence number of the XBT in the series used for the cruise.
./xbt

FILENAME	EXTENSION	DEFINITION	PROGRAM REQUIRED to read the file
T5_00014.rdf	.RDF	Raw Data Format	Sippican Software
T5_00014.edf	.EDF	Exportable Data Format	Any text/spreadsheet

./Images

Aloft Con Camera

This directory contains picture files, from the Aloft Con forward view, separated into sub-directories named by Day of Year (YYYYJJJ). The picture files are in JPEG format taken every 5 minutes. The file names have the year, Day of Year and time in them.
/AloftConCam
2007-106-2255.jpeg
2007-106-2300.jpeg
2007-106-2305.jpeg

Fan Tail Camera

This directory contains picture files, from the Fan Tail view from Aft Con, separated into sub-directories named by Day of Year (YYYYJJJ). The picture files are in JPEG format taken every 1 minute. The file names have the year, Day of Year and time in them.
/FantailCam
2007-115-221501.jpeg
2007-115-222001.jpeg
2007-115-222501.jpeg

Satellite Images

/Satellite_Image
This directory contains satellite imagery of two types in jpeg format. Each type of data is separated into sub-directories by Year, Month and Day (YYYYMMDD).

/hrpt

This is data a High-Resolution Picture Transmission (HRPT) from the Chinese FengYun-1 (FY-1) Meteorological Satellite. The files are in Jpeg format named using Year, Month, Day, Hour and Minute. There are several types of images for each time frame.
200704210752.noaa-14.1km_ir_ch5.jpeg
200704210752.noaa-14.1km_vis_ch1.jpeg
200704210752.noaa-14.1km_vis_ch2.jpeg

/dmsp

This data is from the Defense Meteorological Satellite Program (DMSP). The files are in Jpeg format named using Year, Month, Day, Hour and Minute. There are several types of images for each time frame.
200704210101.f-12.1km_vis.jpeg
200704210101.f-12.4km_ir.jpeg
200704210101.f-12.4km_vis.jpeg

APPENDIX:

Acquisition Problems and Events

This table summarizes problems with acquisition noted during this cruise including instrument failures, data acquisition system failures and any other factor affecting this data set. Times are reported in GMT. You should look for more complete details for these events in the ELOG accounts.

Date	*Time*	*Event*
05/16/07	20:55	Underweigh for HLY0702
05/16/07	21:22	Start Seabeam for HLY0702
05/16/07	21:25	Start ADCP75 with trigger from Seabeam for HLY0702
05/16/07	21:27	Start Knudsen 3.5 with trigger from Seabeam for HLY0702
05/16/07	22:40	Start TSG Forward for HLY0702
05/17/07	12:44	Humidity sensor is way off.
05/17/07	12:46	Knudsen was reading too deep since the shallow limit was too deep. Reset
05/17/07	17:17	Thin sheet of ice was noted over humidity sensor
05/17/07	19:04	Start re-synching of LDS logging and Seabeam data to snap1
05/17/07	21:34	The humidity sensor and sling psychrometer are way different
05/18/07	00:53	new SVP for Seabeam
05/18/07	12:49	new SVP for Seabeam
05/18/07	13:24	Noted Knudsen does NOT have the 8.5 draft included in it's depth since the start of HLY0702
05/18/07	13:29	Knudsen now does have the 8.5 draft included in it's depth
05/18/07	15:46	Abrupt shift in TSG Salinity
05/18/07	16:33	ET shop says there are no more Humidity sensors. He values will be wrong for HLY0702 for it and the Derived Dew point.
05/19/07	13:02	new SVP for Seabeam
05/19/07	19:00	new SVP for Seabeam
05/20/07	14:01	new SVP for Seabeam
05/02/07	21:18	note GYRO heading to ADCP75 is still frozen. Noted it first yesterday.
05/20/07	21:55	reset AD Syncro Converter to bridge. ADCP75 Gyro values working again.
05/22/07	12:21	new SVP for Seabeam
05/23/07	08:02	New 8mm tape #2 for Seabeam
05/23/07	15:14	New archive tape into Terascam
05/23/07	18:32	new SVP for Seabeam
05/24/07	12:50	new SVP for Seabeam
05/25/07	11:09	new SVP for Seabeam

05/26/07	14:48	POSMV reset by ET2 and subsequently all POSMV input was lost to ADCP75
05/26/07	19:43	POSMV nav data to ADCP75 fixed
05/27/07	06:27	new SVP for Seabeam
05/27/07	11:04	new SVP for Seabeam
05/28/07	04:12	Ship did 2 circles to verify IMMARSAT operation.
05/28/07	06:19	new SVP for Seabeam
05/28/07	07:56	new SVP for Seabeam
05/28/07	14:03	new SVP for Seabeam
05/29/07	11:51	new SVP for Seabeam
05/29/07	14:22	TSG shutdown by mistake
05/29/07	15:16	TSG restarted with wrong Config
05/29/07	15:23	TSG Config changed, still not right one
05/29/07	20:54	TSG Config changed to proper config
05/29/07	22:15	TSG paused for Operational check
05/29/07	22:17	TSG restarted
05/29/07	22:23	TSG paused for Operational check
05/29/07	22:25	TSG restarted
05/30/07	10:06	new SVP for Seabeam
05/30/07	02:00	stop SCS Logger
05/30/07	02:02	Start SCS Logger, SAMOS data now inclluded in SCS
05/31/07	09:03	Stop SCS logging
05/31/07	09:33	After several stop and started SCS is logging with SAMOS fixes used
05/31/07	16:35	new SVP for Seabeam
06/01/07	11:13	new SVP for Seabeam
06/01/07	21:02	new tape for Terascam
06/03/07	07:13	remove noaa-14 from Terascam tracking
06/03/07	15:59	new SVP for Seabeam
06/04/07	20:19	new SVP for Seabeam
06/05/07	10:23	New Tape in Seabeam #3 out #4 in
06/05/07	12:20	new SVP for Seabeam
06/06/07	11:16	new SVP for Seabeam
06/06/07	16:41	A/D Synchro was reset since ADCP was getting bad “GYRO” headings
06/06/07	18:16	new SVP for Seabeam
06/06/07	22:11	Reset ADU5 at 21:15 (13:15 Local)
06/07/07	2:130	Power cycle A/D Synchro reset since ADCP was getting bad “GYRO” headings

06/08/07	19:27	new SVP for Seabeam
06/09/07	14:52	new SVP for Seabeam
06/09/07	19:25	Ashtech 3DGPS reset at 1115 (Local???)
06/09/07	20:20	note Knudsen depth see3ms to deep for at least the last 20 minutes.
06/10/07	02:50	Changed Knudsen TX Bank to 9 from 20 which caused data shallower than 28.5 meters to be resolved as deeper. Data from about 6/9/7 20:00 is suspect
06/10/07	19:36	new SVP for Seabeam
06/10/07	20:0	PAR sensor powered off
06/10/07	20:07	PAR sensor power on again
06/11/07	19:18	new SVP for Seabeam
06/12/07	20:06	New 8mm tape #5 in SeaBeam
06/12/07	15:46	new SVP for Seabeam
06/12/07	11:38	CCC #1 temp adjusted to 3 degrees C
06/13/07	09:46	new SVP for Seabeam
06/14/07	14:33	new SVP for Seabeam
06/15/07	09:48	new SVP for Seabeam
06/15/07	13:42	new SVP for Seabeam
06/15/07	17:53	new SVP for Seabeam
06/15/07	22:50	new SVP for Seabeam
06/16/07	00:54	new SVP for Seabeam
06/16/07	03:22	new SVP for Seabeam
06/16/07	05:41	Degradation of Seabeam in the last hour.
06/16/07	07:00	Seabeam sutdown and restarted. New tape #6
06/16/07	07:52	Knudsen 3.5 back to external trigger
06/16/07	08:11	new SVP for Seabeam
06/16/07	12:28	new SVP for Seabeam
06/16/07	12:50	Knudsen to pinger mode
06/16/07	14:01	Knudsen out of pinger mode
06/16/07	17:49	Tscan computer was down rebooted
06/17/07	16:50	Knudsen bottom was way off by more than 1000 meters
06/17/07	18:22	Knudsen bottom was way off by more than 1000 meters
06/18/07	00:01	terascan tape updated
06/18/07	10:58	new SVP for Seabeam
06/18/07	12:05	adjust SVP for Seabeam
06/18/07	15:47	Seabeam SSV to manual

06/18/07	15:52	TSG secured
06/18/07	15:53	Science Seawater secured
06/18/07	16:06	Seabeam to idle
06/18/07	16:06	Knudsen secured
06/18/07	16:06	ADCP 75 secured
06/18/07	16:09	Seabeam back to survey
06/18/07	16:11	SCS Logging stopped
06/18/07	16:26	Seabeam to idle and secured
06/18/07	16:31	LDS stopped

Sensors and Calibrations

HLY0702 Shipboard Sensors

Sensor	Description	Serial #	Last Calibration Date	Status
Meteorology & Radiometers				
Port Anemometer	RM Young 09101	L001	02/06/07	Collected
Stbd Anemometer	RM Young 09101	L003	03/07/07	Collected
Barometer	RM Young 61201	BP01643	03/07	Collected
Air Temp/Rel. Hum.	RM Young 41382VC	109652	03/07	Collected
Helo shack PAR	BSI QSR-2200	20270	01/09/07	Collected
Underway Ocean				
TSG	SeaBird SBE21	1864	01/23/07	Collected
Remote Sea Temp	SeaBird SBE3S	4063	01/24/07	Collected
Fluorometer	Turner SCUFA	0584	01/22/07	Collected
Sonars				
Knudsen- subbottom	320 B/R	K2K-00-0013	N/A	Collected
ADCP 150 kHz	Broad Band (BB150)	80	N/A	Collected
ADCP 75 kHz	Ocean Surveyor	172	N/A	Collected
Multibeam	Seabeam 2112	?	N/A	Collected
Speed log	Sperry	?	N/A	Collected
Navigation				
P-Code GPS (aft)	Trimble Centurion	0220035469	N/A	Collected
Attitude GPS	Ashtech ADU5	AD520033513	N/A	Collected
DGPS	Trimble AGGPS-AG132	0224016199	N/A	Collected
POSMV	Model- MV V4	2306	N/A	Collected
P-Code GPS (fwd)	?	?	N/A	Collected
Glonass	?	?	N/A	Collected
GYRO 1	Sperry MK25	?	N/A	Collected
GYRO 2	Sperry MK25	?	N/A	Collected

HLY0702- CTD Sensors

Sensor	Comments	Serial #	Last service/ Calibration Date	Status
CTD fish	SBE 911plus	638	05-Dec-06	Collected
Pressure Sensor #1	Digiquartz with TC	83009	05-Dec-06	Collected
Temperature #1	SBE3- Primary	2841	24-Jan-07	Collected
Temperature #2	SBE3- Secondary	2824	25-Jan-07	Collected
Conductivity #1	SBE4- Primary	2545	19-Jan-07	Collected
Conductivity #2	SBE4- Secondary	2619	19-Jan-07	Collected
Dissolved Oxygen #1	SBE-43	0458	10-Feb-07	Collected
PAR Sensor	BSI QSP2300	70115	09-Jan-07	Collected
Fluorometer #1	Chelsea Mk III Aquatracka	088234	06-Mar-07	Collected
Transmissometer	Wetlabs CST-397DR	CST-390DR	27-Feb-07	Collected
Pump	SBE5 Primary	3115	27-Jan-07	
Pump	SBE5 Secondary	3116	27-Jan-07	
Carousel Water Sampler	SBE-32	0348	?	
Deck Unit	SBE 11-Plus V2	0416	?	
Altimeter	PSA916D	1062	Jan 07	Collected

Calibrations

The following pages are replicas of current calibration sheets for the sensors used during this cruise.

Turner SCUFA Fluorometer

serial # 0584 page 1- APP. NOTE NO. 63- www.seabird.com

SCUFA(TM) TEST LOG

USE PEN ONLY

Reference TD130059 Scufa (TM) Test Procedure

Electrical test

S/N:		0584				
Date:		01/22/07				
Initial:		HB				
P/N	2000-006	2000-007	2000-008	2000-005	2000-010	Range
Vin		12.50				12.5V
Power		12.15				12.2+/-0.2V
"+5.5V"		5.30				5.5+0-0.3V
"3.3V"		3.29				3.3V +/-0.1V
Vcc		3.28				3.3V +/-0.1V
Va+		4.98				5+/-0.1V
Va-		5.13				"-5 +/- 0.2V"
U19 offset		-1.5				<15 mV
U29 offset	N/A	0.3		N/A		<15 mV
Signal offset		83				<+/-50
Turb. Offset	N/A	28		N/A		<+/-50
Current cons. Power ON		40				<60 mA
Over-V threshold		15.3				15-15.5 V
Signal offset noise		48 (10 ripple).				<20 mV p-p
Turb. Offset noise	N/A	10		N/A		<20 mV p-p
Temp. Readout check		1798/1852				Ambient +/- 1° C

Unit Configuration. Table #1

Turbidity	No.	Yes. (circled)	Yes.	No.
Temp. Compensation	Yes.	Yes. (circled)	Yes.	No.
Internal Data Logger	Yes.	Yes. (circled)	Yes.	No

Calibration

	Blank %	Range	Standard %	Range
CHL	0.018 (.020)	0-0.03	2.67	2.2-4.5
TRB	0.015	0-0.03	41.9	43-70
RWT		0-0.09		7.0-15.0
TRB		0-0.05		20.5-70.0
PC		0-0.03		0.5-1.2
TRB				
FLU		0-0.05		2.0-10.0
TRB		0-0.05		1.0-6.0

Internal Data Logger Test IDL: ON or OFF (Circle one)
IDL Tested OK: ☐

Analog output calibration 80

Analog Out 1	619 mV	(1)
Analog Out 2	2.4 V	(1)

Pressure test & Burn In 821.3

Date:	1/22/07			
Initial:	HB			
Pressure PSI	ST #12 1000	ST #15 1000	ST #20 1000	ST #23 1000
Pre test weight	820.7	820.8		
After test weight	821.1			
Difference				<0.5 gram

1) NOTES: Analog out: 1) Rhod and TRB : 2.5 +/-0.1
2) CHL: 0.625 +/- 0.05V
3) FLU: 0.250 +/- 0.05V
4) Others: Consult Product Development

TD130060 Revision N Page 1 of 2

serial # 0584 Page 2

USE PEN ONLY

Burn In Test			
Start		Finish	
Date:	01/22	Date:	01/24
Time:	1500	Time:	0830
Initial:	MH	Initial:	MH

Check / configuration test					
Configuration	2000-006	2000-007	2000-008	2000-005 2000-010	
Date:		01/24			
Time:		830			
Initial:		MH			
Fluorescence (Black Rod)		0006			
Turbidity (Black Rod)	N/A	0.010		N/A	
Fluorescence (Solid Std)		(9.12)			
Tubidity (Solid Std)	N/A	(94.95)		N/A	
Sig. Pre-amp. Out		(-6)			<+/-50
Turb. Pre-amp. Out	N/A	(-1)		N/A	<+/-50
Analog Out 1		(557)			(1)
Analog Out 2		(2.28)			(1)
IDL	ON	ON	ON	OFF	
Temp. Comp.	ON	ON	ON	OFF	
Temp. Readout check		265 / 195			Ambient +/- 1°C BF

FINAL INSTRUMENT CONFIGURATION (FOR CUSTOM ORDERS ONLY)

Refer to 2000-010 Configuration Instructions (TD130063)

Shop Order #:	IDL	Temp Comp	Turbidity	Date:
2000-010 07	ON	ON	ON	Initial(1): Initial (2)

SCUFA TEST STATUS

INIT. MH

1. S/N 0584 MODEL # 9000-007 S/O # 5356.
2. S/N _____ MODEL # _____ S/O # _____
3. S/N _____ MODEL # _____ S/O # _____
4. S/N _____ MODEL # _____ S/O # _____
5. S/N _____ MODEL # _____ S/O # _____

BURN-IN:
DATE IN 1/22/07 TIME 1500
DATE OUT 1/24/07 TIME 0830

WEIGHT: ☑ (TEST LOG)

POST BURN-IN: ☑ (TEST LOG)

LABEL: ☐

BOX: ☐

92.4

COMMENTS: _____

TD1300

Page 3 of 2

TD130117
Rev. A

Seabird SBE21 Thermosalinograph Calibration

Serial number 1864 Conductivity Calibration

SEA-BIRD ELECTRONICS, INC.
1808 136th Place N.E., Bellevue, Washington, 98005 USA
Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 1864
CALIBRATION DATE: 17-Feb-07

SBE21 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Seimens/meter

GHIJ COEFFICIENTS

```
g = -4.01848022e+000
h =  4.78130246e-001
i =  1.73756277e-003
j = -5.35324252e-005
CPcor = -9.5700e-008 (nominal)
CTcor =  3.2500e-006 (nominal)
```

ABCDM COEFFICIENTS

```
a =  5.51772628e-002
b =  4.20577678e-001
c = -4.01119247e+000
d = -1.84582181e-004
m =  2.1
CPcor = -9.5700e-008 (nominal)
```

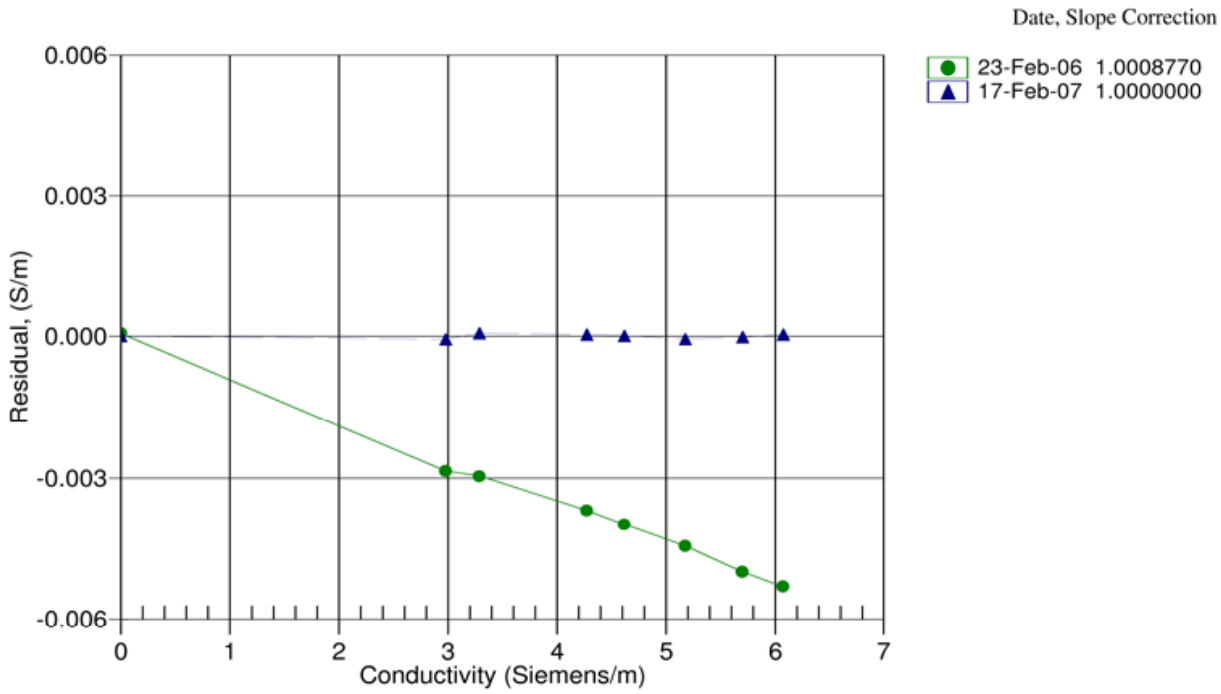
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2.88532	0.00000	0.00000
1.0000	34.8699	2.98011	8.31725	2.98005	-0.00006
4.4999	34.8506	3.28763	8.68467	3.28769	0.00006
15.0000	34.8098	4.27090	9.76567	4.27093	0.00003
18.4999	34.8013	4.61658	10.11804	4.61660	0.00001
23.9999	34.7923	5.17544	10.66287	5.17538	-0.00006
29.0000	34.7872	5.69809	11.14827	5.69807	-0.00002
32.5000	34.7840	6.07099	11.48204	6.07103	0.00003

Conductivity = $(g + hf^2 + if^3 + jf^4) / 10(1 + \delta t + \varepsilon p)$ Siemens/meter

Conductivity = $(af^m + bf^2 + c + dt) / [10 (1 + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = (instrument conductivity - bath conductivity) using g, h, i, j coefficients



Serial number 1864 Temperature Calibration

SEA-BIRD ELECTRONICS, INC.

1808 136th Place N.E., Bellevue, Washington, 98005 USA

Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 1864
CALIBRATION DATE: 17-Feb-07

SBE21 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPRATURE SCALE

ITS-90 COEFFICIENTS

g = 4.22123757e-003
h = 6.00091050e-004
i = 2.92943927e-006
j = -2.15310298e-006
f0 = 1000.0

ITS-68 COEFFICIENTS

a = 3.64763550e-003
b = 5.88588087e-004
c = 9.17857335e-006
d = -2.15270275e-006
f0 = 2621.105

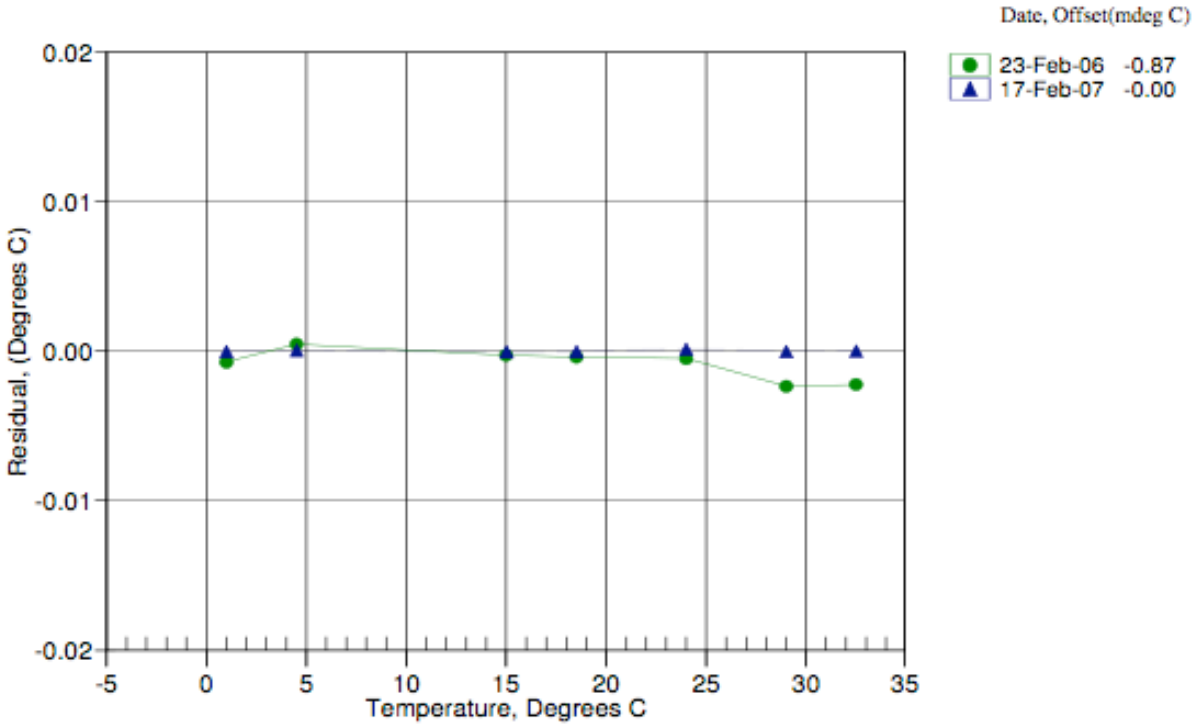
BATH TEMP (ITS-90)	INSTRUMENT FREQ (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	2621.105	1.0000	-0.00004
4.4999	2834.409	4.5000	0.00008
15.0000	3547.678	14.9999	-0.00007
18.4999	3811.076	18.4999	-0.00003
23.9999	4252.251	24.0000	0.00011
29.0000	4683.211	29.0000	-0.00005
32.5000	5002.409	32.5000	-0.00000

Temperature ITS-90 = $1/\{g + h[ln(f_0/f)] + i[ln^2(f_0/f)] + j[ln^3(f_0/f)]\} - 273.15$ (°C)

Temperature ITS-68 = $1/\{a + b[ln(f_0/f)] + c[ln^2(f_0/f)] + d[ln^3(f_0/f)]\} - 273.15$ (°C)

Following the recommendation of JPOTS: T_{68} is assumed to be 1.00024 * T_{90} (-2 to 35 °C)

Residual = instrument temperature - bath temperature



MET Sensors

PAR

Biospherical Instruments Inc.

CALIBRATION CERTIFICATE

Calibration Date	1/9/2007
Model Number	QSR-2200
Serial Number	20270
Operator	TPC
Standard Lamp	F-863
Probe Excitation Voltage Range:	6 to 18 VDC(+)
Output Polarity:	Positive

Probe Conditions at Calibration(in air):

Calibration Voltage:	6	VDC(+)
Probe Current:	4.0	mA

Probe Output Voltage:

Probe Illuminated	95.87	mV
Probe Dark	1.32	mV
Probe Net Response	94.55	mV

Corrected Lamp Output:

Output In Air (same condition as calibration):

9.43E+15	quanta/cm²sec
0.01566	uE/cm^{2}sec

Calibration Factor:

(To calculate irradiance, divide the net voltage reading in Volts by this value.)

Dry:	1.00E-17	V/(quanta/cm²sec)
	6.04E+00	V/(uE/cm^{2}sec)

Notes:

1. Annual calibration is recommended.
2. Calibration is performed using a Standard of Spectral Irradiance traceable to the National Institute of Standards and Technology (NIST).
3. The collector should be cleaned frequently with alcohol.
4. Calibration was performed with customer cable, when available.

QSR240R 05/24/95

R.M. Young Wind Bird, Starboard

R. M. Young Wind bird Calibration Results
Model # 09101, S/N L003 (Starboard Windbird)

As per Young Meteorological Instruments
Wind System Calibration Manual

Date: 07 Mar 07 Technician: ET1 Berringer / ETC Rodda

Wind speed torque: Passed

Maximum toque = 2.4 gm/cm

Test results:

CW	0.7
CCW	0.7

Wind direction torque: Passed

Maximum toque = 30 gm/cm

Test results:

CW	20 gm/cm
CCW	22 gm/cm

Wind speed signal:

Maximum % error = 1%

Test results: Passed

Actual RPM	Actual Wind Speed	Measured	% Error
200	1.90	1.9	0.21
500	4.76	4.8	0.84
1200	11.42	11.4	0.21
3600	34.27	34.3	0.08
5000	47.60	47.6	0.00

Note; Wind speed in knots = 0.00952 * shaft RPM

Wind direction signal:

Maximum error = +/- 2 degrees

Test results: Failed – off by 1 degree

Actual	Meaured	Error
0	358	-2
30	27	3
60	58	2
90	88	2
120	118	2
150	149	1
180	178	2
210	207	3
240	238	2
270	268	2
300	297	3
330	327	3

R.M. Young Wind Bird Port

R. M. Young Wind bird Calibration Results
Model # 09101, S/N L001 (Port Windbird)

As per Young Meteorological Instruments
Wind System Calibration Manual

Date: 06 Feb 07 Technician: ET3 Daem / ET2 Davis

Wind speed torque: Passed

Maximum toque =2.40 gm/cm

Test results:

CW	.2 gm/cm
CCW	.2 gm/cm

Wind direction torque: Passed

Maximum toque = 30 gm/cm

Test results:

CW	10gm/cm
CCW	10gm/cm

Wind speed signal: Passed

Maximum % error = 1%

Test results:

Actual RPM	Actual Wind Speed	Measured	% Error
200	1.90	1.9	0.21
500	4.76	4.8	0.84
1200	11.42	11.4	0.21
3600	34.27	34.3	0.08
5000	47.60	47.6	0.00

Note; Wind speed in knots = 0.00952 * shaft RPM

Wind direction signal: Passed

Maximum error = +/- 2 degrees

Test results:

Actual	Meaured	Error
0	359	-1
30	29	1
60	59	1
90	90	0
120	120	0
150	150	0
180	180	0
210	210	0
240	240	0
270	269	1
300	298	2
330	330	0

CTD Sensors

Pump

Serial number 53115

SBE **SEA-BIRD ELECTRONICS, INC.**

1808 - 136th Place Northeast, Bellevue, Washington 98005 USA
Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Service Report

RMA Number 45437

Customer Information:

Company	Scripps Institute of Oceanography	Date	1/27/2007
Contact	Scott Hiller		
PO Number	TBD		

Serial Number	053115
Model Number	SBE 05T

Services Requested:

1. Evaluate/Repair Instrumentation.

Problems Found:

Services Performed:

1. Performed hydrostatic pressure test.
2. Performed internal inspection and O-ring replacement.
3. Replaced the pump impeller thrust washers.
4. Performed initial diagnostic evaluation.

Special Notes:

Saturday, January 27, 2007 Page 3 of 4

SEA-BIRD ELECTRONICS, INC.
1808 - 136th Place Northeast, Bellevue, Washington 98005 USA
Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

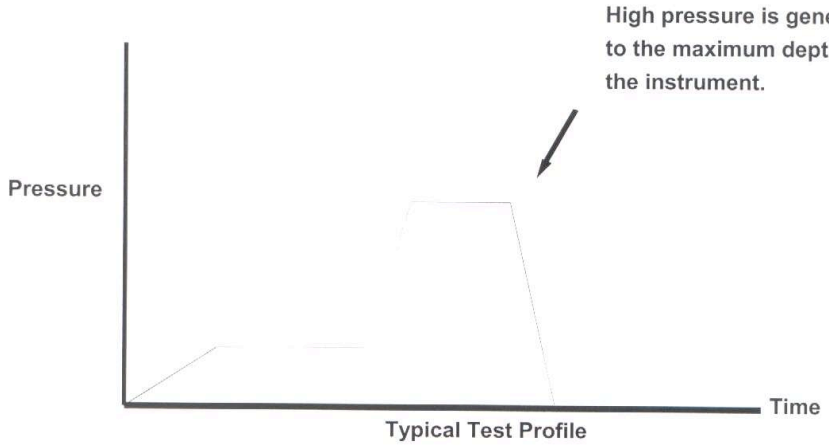
Pressure Test Certificate

Customer	Scripps Institute of Oceanography
Job Number	45437
Date	1/26/2007
Technician	SF

Serial Number	053115	
Low Pressure (PSI)	50	PSI
Time (Minutes)	15	Minutes
High Pressure (PSI)	10000	PSI
Time (Minutes)	30	Minutes

Pass ☑
Fail ☐

Comments
Replaced the main piston "O"-Rings



Typical Test Profile

Temperature

Serial number 2824

SEA-BIRD ELECTRONICS, INC.
1808 136th Place N.E., Bellevue, Washington, 98005 USA
Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 2824
CALIBRATION DATE: 25-Jan-07

SBE3 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPRATURE SCALE

ITS-90 COEFFICIENTS

g = 4.32220228e-003
h = 6.37040873e-004
i = 2.19538904e-005
j = 2.06610336e-006
f0 = 1000.0

ITS-68 COEFFICIENTS

a = 3.68121203e-003
b = 5.98231489e-004
c = 1.55358613e-005
d = 2.06757922e-006
f0 = 2828.715

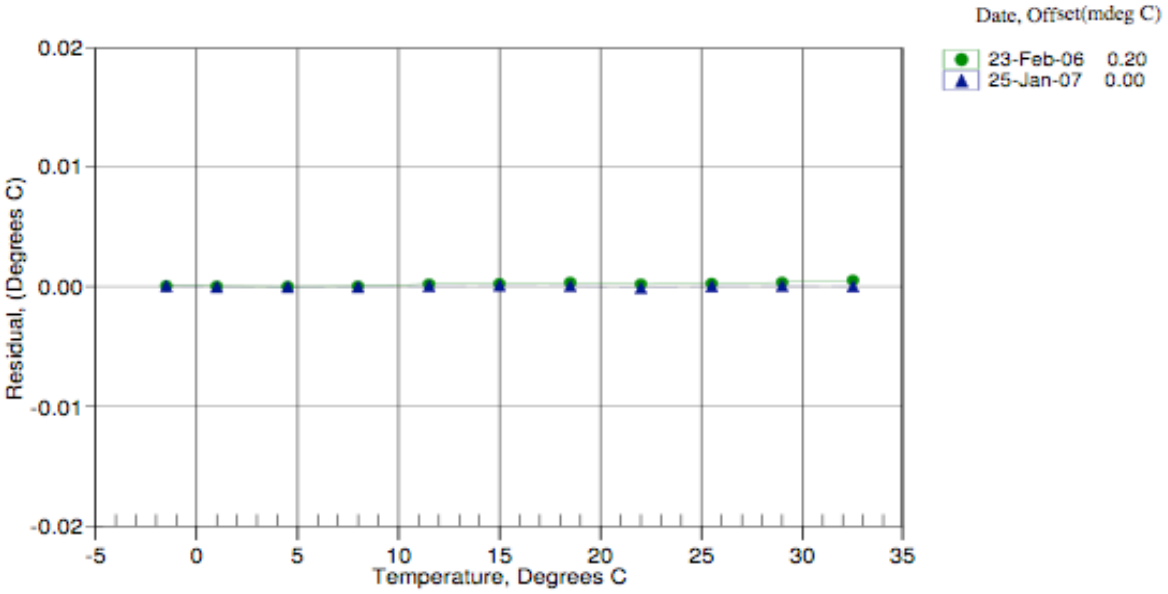
BATH TEMP (ITS-90)	INSTRUMENT FREO (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
-1.5000	2828.715	-1.5000	0.00002
1.0000	2992.266	1.0000	-0.00001
4.5000	3232.590	4.5000	-0.00003
8.0000	3486.502	8.0000	-0.00002
11.5000	3754.371	11.5000	0.00002
15.0000	4036.556	15.0001	0.00007
18.5000	4333.398	18.5000	0.00004
22.0000	4645.228	21.9999	-0.00012
25.5000	4972.410	25.5000	-0.00001
29.0000	5315.227	29.0000	0.00004
32.5000	5673.975	32.5000	-0.00001

Temperature ITS-90 = $1/\{g + h[ln(f_0/f)] + i[ln^2(f_0/f)] + j[ln^3(f_0/f)]\} - 273.15$ (°C)

Temperature ITS-68 = $1/\{a + b[ln(f_0/f)] + c[ln^2(f_0/f)] + d[ln^3(f_0/f)]\} - 273.15$ (°C)

Following the recommendation of JPOTS: T_{68} is assumed to be 1.00024 * T_{90} (-2 to 35 °C)

Residual = instrument temperature - bath temperature



Serial number 2841

SEA-BIRD ELECTRONICS, INC.

1808 136th Place N.E., Bellevue, Washington, 98005 USA

Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 2841
CALIBRATION DATE: 24-Jan-07

SBE3 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPRATURE SCALE

ITS-90 COEFFICIENTS

g = 4.36167363e-003
h = 6.43418980e-004
i = 2.26968381e-005
j = 2.09713034e-006
f0 = 1000.0

ITS-68 COEFFICIENTS

a = 3.68121210e-003
b = 6.01382162e-004
c = 1.58311859e-005
d = 2.09863963e-006
f0 = 2991.089

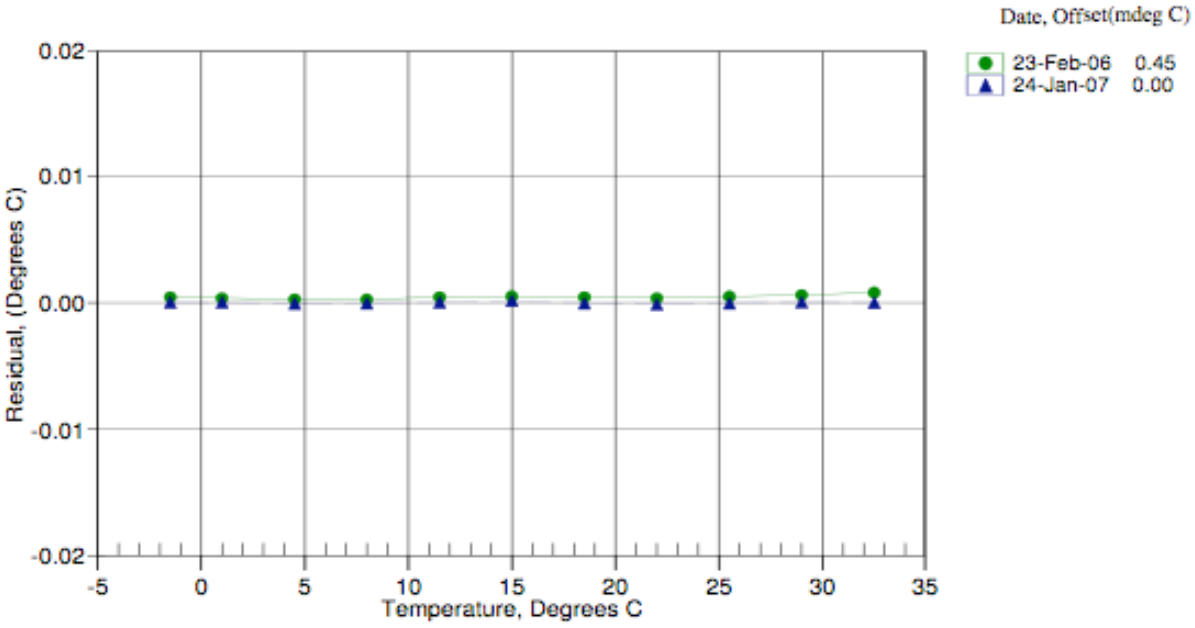
BATH TEMP (ITS-90)	INSTRUMENT FREQ (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
-1.5000	2991.089	-1.5000	0.00002
1.0000	3163.101	1.0000	0.00002
4.5000	3415.769	4.4999	-0.00007
8.0000	3682.633	8.0000	-0.00003
11.5000	3964.067	11.5000	0.00003
15.0000	4260.445	15.0001	0.00015
18.5000	4572.094	18.5000	-0.00003
22.0000	4899.396	21.9999	-0.00011
25.5000	5242.694	25.5000	-0.00001
29.0000	5602.291	29.0001	0.00005
32.5000	5978.486	32.5000	-0.00000

Temperature ITS-90 = $1/\{g + h[ln(f_0/f)] + i[ln^2(f_0/f)] + j[ln^3(f_0/f)]\} - 273.15$ (°C)

Temperature ITS-68 = $1/\{a + b[ln(f_0/f)] + c[ln^2(f_0/f)] + d[ln^3(f_0/f)]\} - 273.15$ (°C)

Following the recommendation of JPOTS: T_{68} is assumed to be 1.00024 * T_{90} (-2 to 35 °C)

Residual = instrument temperature - bath temperature



Conductivity

Serial number 2545

SEA-BIRD ELECTRONICS, INC.
1808 136th Place N.E., Bellevue, Washington, 98005 USA
Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 2545
CALIBRATION DATE: 19-Jan-07

SBE4 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Seimens/meter

GHIJ COEFFICIENTS

```
g = -1.06802227e+001
h =  1.64309266e+000
i = -1.41782050e-003
j =  2.03407248e-004
CPcor = -9.5700e-008 (nominal)
CTcor =  3.2500e-006 (nominal)
```

ABCDM COEFFICIENTS

```
a =  4.98318372e-006
b =  1.63987312e+000
c = -1.06749650e+001
d = -8.74381693e-005
m =  5.3
CPcor = -9.5700e-008 (nominal)
```

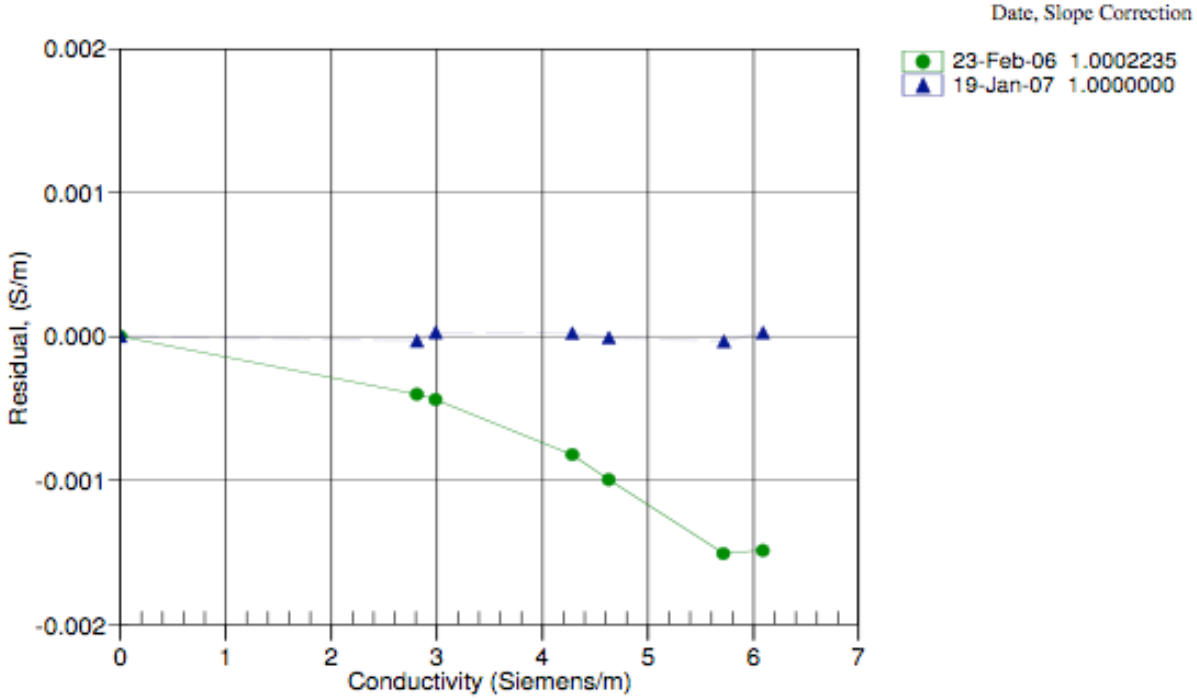
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREO (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
0.0000	0.0000	0.00000	2.55131	0.00000	0.00000
-1.0001	34.9205	2.81218	4.86261	2.81215	-0.00003
1.0536	34.9202	2.98865	4.97191	2.98868	0.00003
14.9999	34.9203	4.28301	5.70940	4.28303	0.00002
18.4999	34.9199	4.63062	5.89163	4.63061	-0.00001
28.9999	34.9176	5.71703	6.42770	5.71699	-0.00003
32.4999	34.9094	6.09037	6.60180	6.09040	0.00002

Conductivity = $(g + hf^2 + if^3 + jf^4) / 10(1 + \delta t + \varepsilon p)$ Siemens/meter

Conductivity = $(af^m + bf^2 + c + dt) / [10 (1 + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = (instrument conductivity - bath conductivity) using g, h, i, j coefficients



Serial number 2619

SEA-BIRD ELECTRONICS, INC.

1808 136th Place N.E., Bellevue, Washington, 98005 USA

Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 2619
CALIBRATION DATE: 19-Jan-07

SBE4 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Seimens/meter

GHIJ COEFFICIENTS

```
g = -1.00855638e+001
h =  1.38321092e+000
i = -1.07293154e-003
j =  1.48636626e-004
CPcor = -9.5700e-008 (nominal)
CTcor =  3.2500e-006 (nominal)
```

ABCDM COEFFICIENTS

```
a =  4.31809229e-006
b =  1.38064220e+000
c = -1.00808889e+001
d = -8.80711205e-005
m =  5.2
CPcor = -9.5700e-008 (nominal)
```

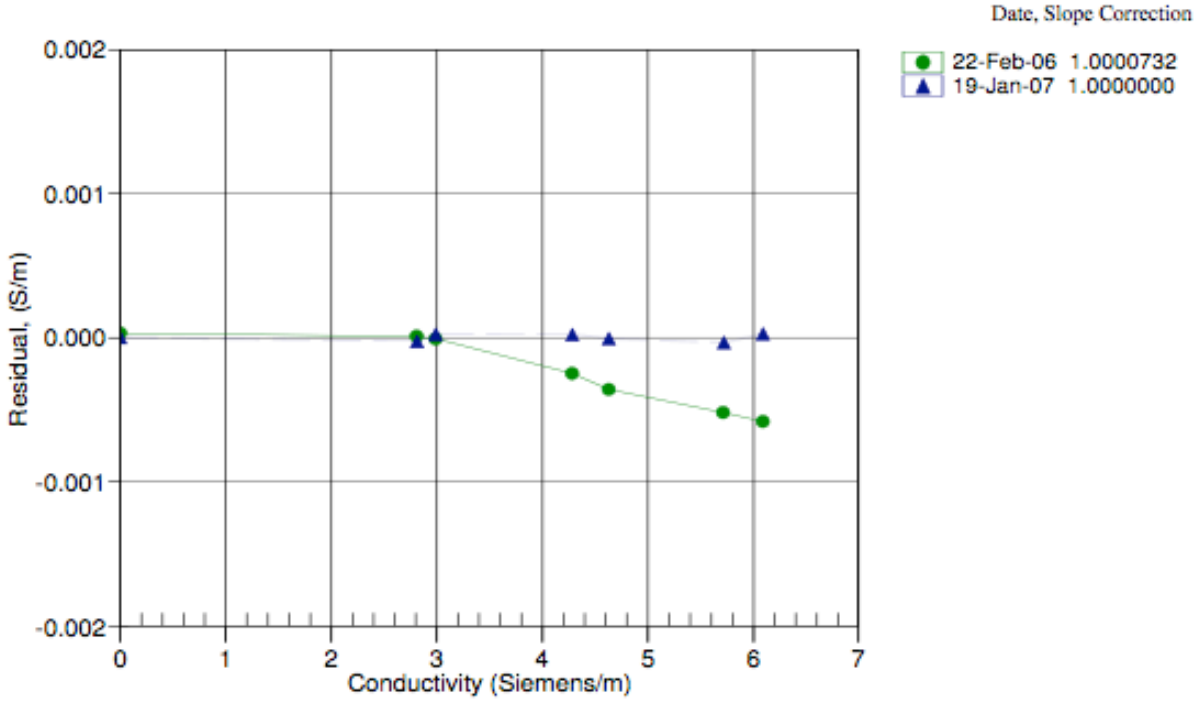
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
0.0000	0.0000	0.00000	2.70204	0.00000	0.00000
-1.0001	34.9205	2.81218	5.25857	2.81215	-0.00003
1.0536	34.9202	2.98865	5.37857	2.98868	0.00002
14.9999	34.9203	4.28301	6.18737	4.28303	0.00002
18.4999	34.9199	4.63062	6.38701	4.63061	-0.00001
28.9999	34.9176	5.71703	6.97392	5.71699	-0.00004
32.4999	34.9094	6.09037	7.16443	6.09040	0.00003

Conductivity = $(g + hf^2 + if^3 + jf^4) / 10(1 + \delta t + \epsilon p)$ Siemens/meter

Conductivity = $(af^m + bf^2 + c + dt) / [10 (1 + \epsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ϵ = CPcor;

Residual = (instrument conductivity - bath conductivity) using g, h, i, j coefficients



Oxygen

Serial number 0458

SEA-BIRD ELECTRONICS, INC.
1808 136th Place N.E., Bellevue, Washington, 98005 USA
Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 0458
CALIBRATION DATE: 10-Feb-07p

SBE 43 OXYGEN CALIBRATION DATA

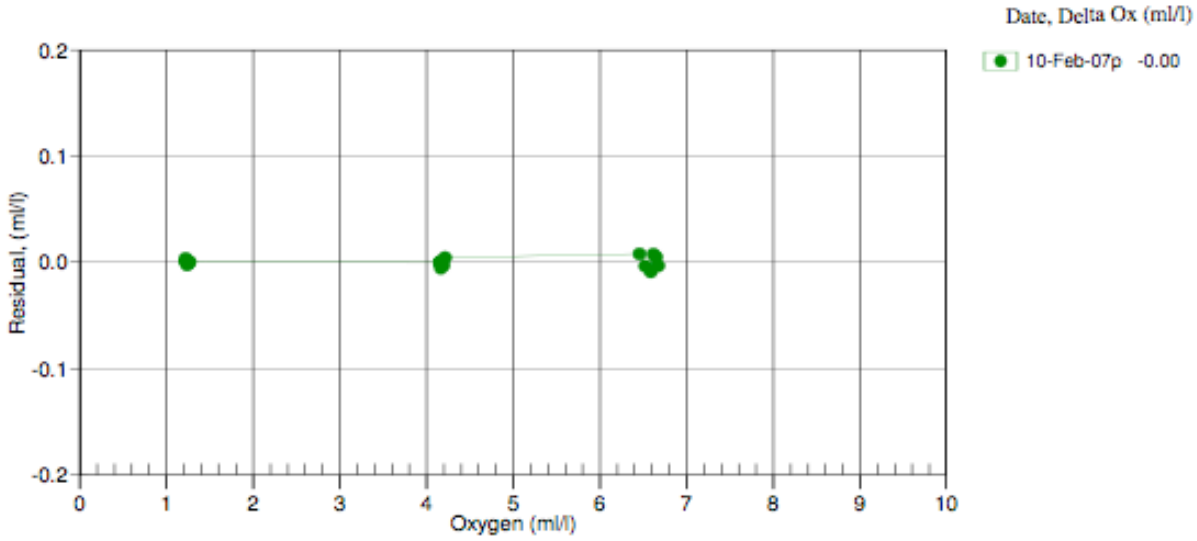
COEFFICIENTS

```
Soc =  0.3786
Boc =  0.0000
Voffset = -0.4897

TCor =  0.0006
PCor =  1.350e-04
```

BATH OX (ml/l)	BATH TEMP ITS-90	BATH SAL PSU	INSTRUMENT OUTPUT(VOLTS)	INSTRUMENT OXYGEN(ml/l)	RESIDUAL (ml/l)
1.22	2.00	0.00	0.822	1.22	0.00
1.22	6.00	0.00	0.860	1.22	0.00
1.23	12.00	0.01	0.917	1.23	0.00
1.24	20.00	0.01	0.999	1.24	-0.00
1.26	26.00	0.01	1.067	1.26	-0.00
1.27	30.00	0.01	1.115	1.27	0.00
4.15	2.00	0.00	1.623	4.15	-0.00
4.16	12.00	0.01	1.936	4.15	-0.00
4.16	6.00	0.00	1.748	4.16	0.00
4.17	20.00	0.01	2.200	4.16	-0.01
4.20	26.00	0.01	2.416	4.19	-0.00
4.21	30.00	0.01	2.563	4.22	0.00
6.45	30.00	0.01	3.667	6.46	0.01
6.52	26.00	0.01	3.482	6.52	-0.00
6.59	20.00	0.01	3.192	6.58	-0.01
6.62	12.00	0.01	2.795	6.62	0.01
6.65	6.00	0.00	2.502	6.65	0.00
6.67	2.00	0.00	2.309	6.67	-0.00

oxygen (ml/l) = (Soc * (V + Voffset)) * exp(Tcor * T) * Oxsat(T,S) * exp(Pcor * P)
V = voltage output from SBE43, T = temperature [deg C], S = salinity [PSU]
Oxsat(T,S) = oxygen saturation [ml/l], P = pressure [dbar]
Residual = instrument oxygen - bath oxygen



Transmisometer

Serial number CST-390DR

PO Box 518
620 Applegate St.
Philomath, OR 97370

(541) 929-565
Fax (541) 929-527
www.wetlabs.co

WET Labs

C-Star Calibration

Date February 27, 2007 Customer US Coast Guard Work order 004

Job # 0012004 S/N# CST-390DR Pathlength 25 cm

	Analog meter
V_d	0.058 V
V_{air}	4.788 V
V_{ref}	4.707 V

Temperature of calibration water 18.8 °C
Ambient temperature during calibration 23.4 °C

Relationship of transmittance (Tr) to beam attenuation coefficient (c), and pathlength (x): $Tr = e^{-cx}$

To determine beam transmittance: $Tr = (V_{sig} - V_{dark}) / (V_{ref} - V_{dark})$

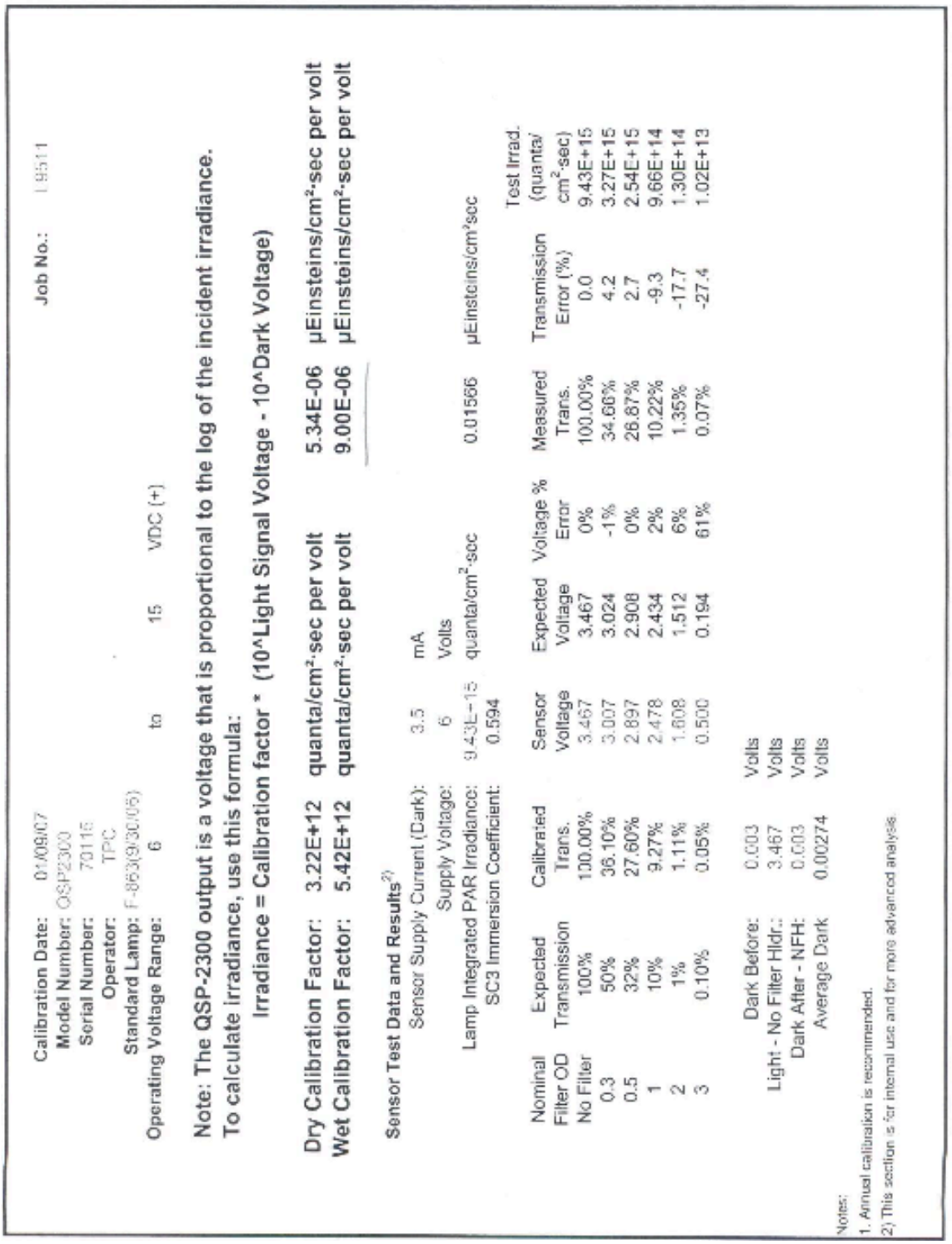
To determine beam attenuation coefficient: $c = -1/x * \ln(Tr)$

V_d Meter output with the beam blocked. This is the offset.
V_{air} Meter output in air with a clear beam path.
V_{ref} Meter output with clean water in the path.
Temperature of calibration water: temperature of clean water used to obtain V_{ref}.
Ambient temperature: meter temperature in air during the calibration.
V_{sig} Measured signal output of meter.

cstarwkbkf1.xls Revision F 1/17/05

PAR Sensor

Serial number 70115



Calibration Date: 01/09/07 Job No.: 19511
Model Number: QSP2300
Serial Number: 70115
Operator: TPC
Standard Lamp: F-863(9/30/05)
Operating Voltage Range: 6 to 15 VDC (+)

Note: The QSP-2300 output is a voltage that is proportional to the log of the incident irradiance.
To calculate irradiance, use this formula:
Irradiance = Calibration factor * (10^Light Signal Voltage - 10^Dark Voltage)

Dry Calibration Factor:	**3.22E+12**	**quanta/cm²·sec per volt**	**5.34E-06**	**µEinsteins/cm²·sec per volt**
Wet Calibration Factor:	**5.42E+12**	**quanta/cm²·sec per volt**	**9.00E-06**	**µEinsteins/cm²·sec per volt**

Sensor Test Data and Results[2]

Sensor Supply Current (Dark):			3.5	mA					
Supply Voltage:			6	Volts					
Lamp Integrated PAR Irradiance:			9.43E-15	quanta/cm²·sec			0.01566	µEinsteins/cm²sec	
SC3 Immersion Coefficient:			0.594						
Nominal Filter OD	Expected Transmission	Calibrated Trans.	Sensor Voltage	Expected Voltage	Voltage % Error	Measured Trans.	Transmission Error (%)	Test Irrad. (quanta/ cm²·sec)
No Filter	100%	100.00%	3.467	3.467	0%	100.00%	0.0	9.43E+15
0.3	50%	36.10%	3.007	3.024	-1%	34.66%	4.2	3.27E+15
0.5	32%	27.60%	2.897	2.908	0%	26.87%	2.7	2.54E+15
1	10%	9.27%	2.478	2.434	2%	10.22%	-9.3	9.66E+14
2	1%	1.11%	1.608	1.512	6%	1.35%	-17.7	1.30E+14
3	0.10%	0.05%	0.500	0.194	61%	0.07%	-27.4	1.02E+13

Dark Before:	0.003	Volts
Light - No Filter Hldr.:	3.467	Volts
Dark After - NFH:	0.003	Volts
Average Dark	0.00274	Volts

Notes:
1. Annual calibration is recommended.
2) This section is for internal use and for more advanced analysis.

Pressure Sensor

Serial number PO638

SEA-BIRD ELECTRONICS, INC.

1808 136th Place N.E., Bellevue, Washington, 98005 USA

Phone: (425) 643 - 9866 Fax (425) 643 - 9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 0638
CALIBRATION DATE: 05-Dec-06

SBE9plus PRESSURE CALIBRATION DATA
10000 psia S/N 83009

DIGIQUARTZ COEFFICIENTS:

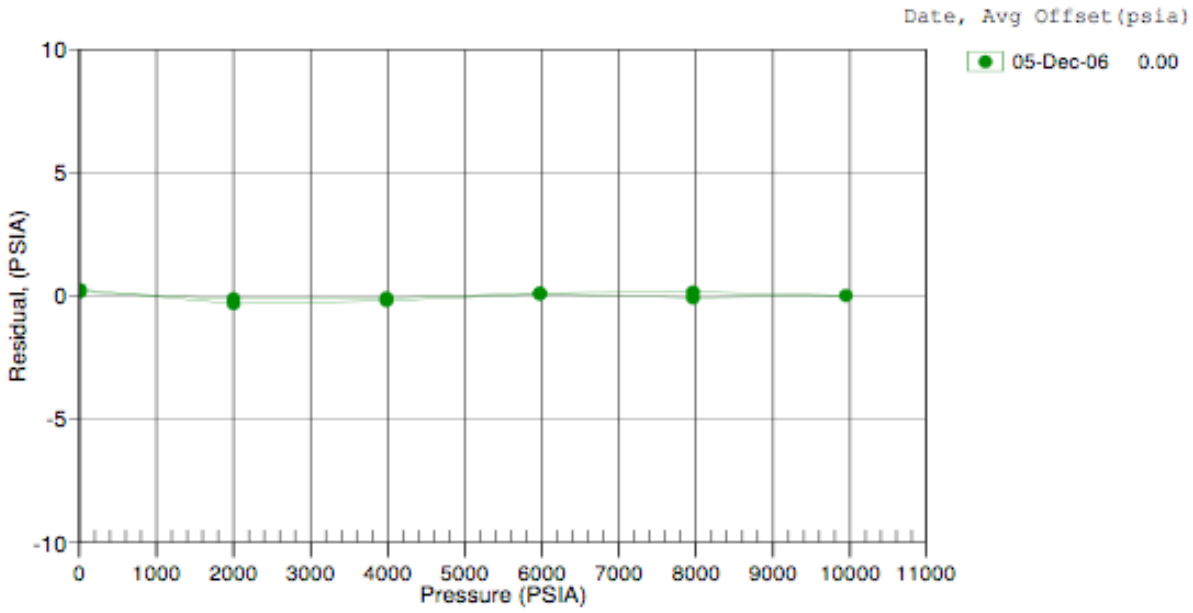
C1 =	-4.129335e+004
C2 =	-2.366132e-001
C3 =	1.120910e-002
D1 =	3.246900e-002
D2 =	0.000000e+000
T1 =	3.014179e+001
T2 =	-1.666793e-004
T3 =	3.283910e-006
T4 =	5.609600e-009
T5 =	0.000000e+000

AD590M, AD590B, SLOPE AND OFFSET:

AD590M =	1.27959e-002
AD590B =	-9.20630e+000
Slope =	0.99959
Offset =	0.3996 (dbars)

PRESSURE (PSIA)	INST OUTPUT(Hz)	INST TEMP(C)	INST OUTPUT (PSIA)	CORRECTED INST OUTPUT (PSIA)	RESIDUAL (PSIA)
14.756	33184.50	19.9	14.434	15.013	0.257
2002.227	33972.30	20.2	2002.140	2001.912	-0.315
3989.078	34739.90	20.2	3989.913	3988.877	-0.201
5975.995	35488.70	20.3	5977.918	5976.073	0.078
7963.068	36219.70	20.4	7965.646	7962.993	-0.075
9950.533	36934.30	20.5	9954.010	9950.549	0.016
7962.780	36219.70	20.9	7965.594	7962.942	0.162
5975.625	35488.60	21.0	5977.582	5975.738	0.113
3988.618	34739.80	21.0	3989.576	3988.540	-0.078
2001.699	33972.20	21.1	2001.809	2001.581	-0.118
14.755	33184.50	21.4	14.340	14.920	0.165

Residual = corrected instrument pressure - reference pressure



Fluorometer

Serial number 088234

CERTIFICATE OF CALIBRATION

All test equipment and standards used are of known accuracy and are traceable to national standards. Details of test equipment and standards relevant to this certificate are available upon request.

Chelsea Technologies Group

55 Central Avenue
West Molesey
Surrey KT8 2QZ
United Kingdom
Tel: +44 (0)20 8481 9000
Fax: +44 (0)20 8941 9319
sales@chelsea.co.uk
www.chelsea.co.uk

Date of issue	06 March 2007
Description	Mk III Aquatracka (Chlorophyll-a)
Serial Number	088234
Part No	3598C

REPORT

The fluorimeter was exposed to various concentrations of Chlorophyll-a dissolved in acetone in addition to pure water and pure acetone. The following formula was derived from the readings to relate instrument output to chlorophyll-a concentration.

$$\text{Conc.} = (0.00779 \times 10^{\text{Output}}) - 0.0211$$

Where -

Conc. = fluorophor concentration in µg/l
Output = Aquatracka output in volts

The above formula can be used in the range 0 - 100 microgrammes per litre to an uncertainty of 0.02 microgrammes per litre plus 5% of value.

Notes

The above formula has been derived using Chlorophyll-a dissolved in acetone. No guarantee is given as to the performance of the instrument to biologically active chlorophyll in sea-water.

The zero offset has been determined in the laboratory using purified water from a reverse osmosis/ion exchange column. It is possible that purer water may be found in clean deep ocean conditions. Under these conditions, the offset shown in the above formula should be replaced by the antilogarithm of the Aquatracka output in the purest water found, multiplied by the scale factor.

Instrument Locations on the Healy

Layout plot of instrument locations

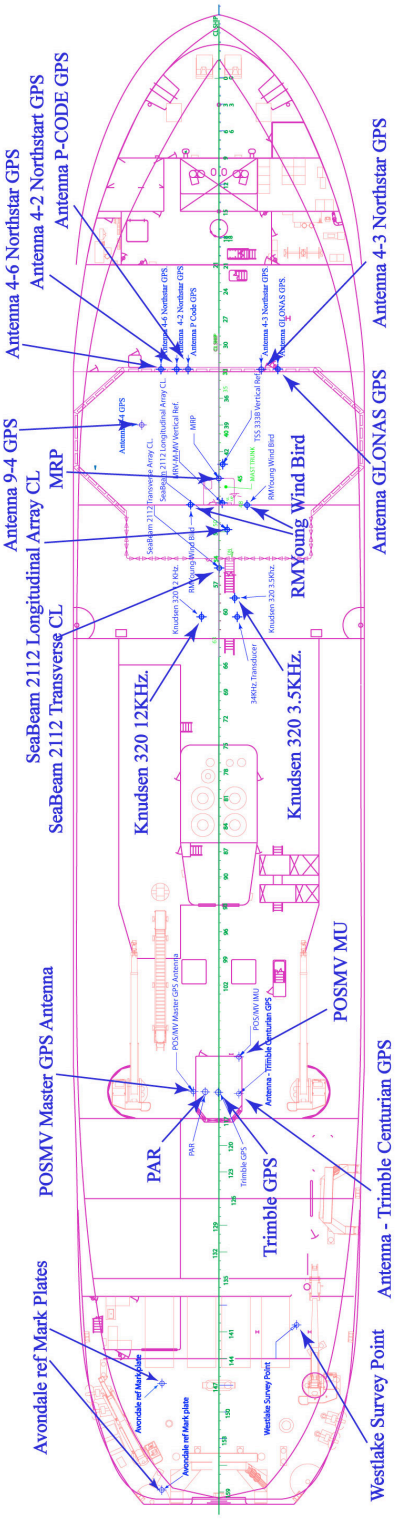


Table of Survey measurements

Consolidated Survey Data						
	Elements of:					
		Avondale Survey				
		Westlake Survey				
		Lamont Survey				
	All Measurements in *Meters* relative to MRP unless otherwise stated					
	X = fore & aft with + foreward					
	Y = port & starboard with + to starboard					
	Z= vertical with + upwards					
				X	Y	Z
Item	***Survey***	***Description***		***North***	***East***	***Elevation***
1	Avondale	**MRP**	See discussion Westlake Final Report	34.30	0.00	9.15
2	Westlake	**MRP**	by Definition	0.00	0.00	0.00
3	Westlake	**Seabeam 2112**				
		Transverse Array	Centerline	-7.679	0.030	9.242
		Longitudinal Array	Centerline	-4.386	0.711	9.238
4	Westlake	**Transducers**				
		Starboard - Forward to Aft				
		Transducer -	Bathy 2000 3.5 kHz	-10.252	1.362	9.243
		Transducer -	Bathy 1500 34 kHz *	-11.866	1.559	9.245
		Transducer -	Doppler Speed Log	-12.168	0.414	9.245
		Transducer -	Spare Transducer Well	-13.081	1.449	9.237
5	Westlake	**Port - Forward to Aft**				
		Transducer -	VM 150	-9.726	-1.395	9.230
		Transducer -	Ocean Surveyor 75 kHz	-10.819	-1.290	9.230
		Transducer -	Bathy 2000 12 kHz	-11.859	-1.492	9.234
		Transducer -	Spare Transducer Well	-13.078	-1.394	9.235
6	Westlake	Gyros				
		Starboard Gyro	Centerline	4.741	0.207	-19.604

		Port Gyro	Centerline	4.746	-0.207	-19.609
7	Westlake	**Antennas**				
		REF DWG TBD	Antenna 9-4 * - GPS Antenna (4.1.5)	4.587	-6.622	-24.000
			Antenna 4-6 * - Northstar GPS (4.1.1)	9.374	-4.970	-23.406
			Antenna 4-2 * - Northstar (4.1.2)	9.362	-3.617	-23.451
			P CODE GPS Antenna *	9.368	-2.645	-23.609
			Antenna 4-3 * - Northstar (4.1.4)	9.355	3.638	-23.363
			GLONAS GPS Antenna *	9.379	5.066	-23.515
			Antenna base (4A)	-53.872	-0.011	-22.025
			Antenna base (4B)	-49.758	0.038	-22.010
			Antenna base (4C)	-49.785	1.629	-22.020
			Antenna base (4D)	-49.771	-1.546	-22.008
			Trimble Centurion**	-52.726	-1.717	-21.113
			Time Server **	-52.671	1.838	-21.115
8	Westlake	**Vertical Ref**				
			MRV-M-MV -			
			Measured at Top of mounting bracket			
			Center (mid-point) - calculated	-2.100	0.291	-0.775
			TSS 333B - Marine Motion Sensor -			
			scribe atop mounting plate			
			Center of TSS 333B	1.210	0.329	-0.013
9	LDEO	**POS/MV**				
		From	**TO**	**X**	**Y**	**Z**
		IMU	Port Antenna (Master)	-2.9719	-3.9140	-5.5310
		MRP	IMU	-49.5710	1.7110	-16.7990
		MRP	Transmit array	-4.3860	0.7110	9.2380
		MRP	Port Antenna (Master)	-52.5429	-2.2030	-22.3300
10	Westlake	**Fan Tail**				

	Raw					
			Aft/Port	-86.737	-4.906	-3.617
			Forward/Port	-77.600	-4.881	-3.589
			Forward/Starboard	-72.590	6.676	-3.653

HLY0702 Media Index

The times here are close but not exact. Different files open and close at different times. Use this table to guide you but look at the data itself to be sure how the data is included from one DVD to the next.

HLY0702 Media Files Index

File Name	Dates	Start time	End time	Comments
Media Vol 1	16 May - 18 May 07	18:00	17:00	
Media Vol 2	16 May - 27 May 07	18:00	19:00	
Media Vol 3	27 May -08 June 07	19:00	01:00	
Media Vol 4	08 June -17 June 07	01:00	09:00	
Media Vol 5	17 June - 18 June 07	09:00	16:00	

Example list of the DVD directories

First DVD

This is a listing of the first DVD's directories from HLY0702 during the cruise.

./Datalog
./Datalog/aft_a_frame
./Datalog/air_temp_f
./Datalog/ashtech_attitude
./Datalog/ashtech_gga
./Datalog/ashtech_gll
./Datalog/ashtech_hdt
./Datalog/Compress
./Datalog/dew_point_f
./Datalog/EventData/OneMinuteTemplate
./Datalog/EventData
./Datalog/glonass_gga
./Datalog/glonass_gll
./Datalog/gyro
./Datalog/ibs_waypoints
./Datalog/knudsen
./Datalog/par
./Datalog/par_derived
./Datalog/pcode_aft_gga
./Datalog/pcode_aft_gll
./Datalog/pcode_aft_vtg
./Datalog/pcode_aft_zda
./Datalog/pcode_bridge_gga
./Datalog/pcode_bridge_gll
./Datalog/pcode_bridge_vtg
./Datalog/posmv_gga
./Datalog/posmv_gst
./Datalog/posmv_hdt
./Datalog/posmv_pashr
./Datalog/posmv_vtg
./Datalog/posmv_zda
./Datalog/rmyoung_air
./Datalog/rmyportwind
./Datalog/rmystbdwind
./Datalog.samos_data
./Datalog/sbd_a_frame
./Datalog/seabeam_center
./Datalog/sperry_speedlog
./Datalog/sv2000
./Datalog/true_wind_port
./Datalog/true_wind_stbd
./Datalog/tsg_aft
./Datalog/tsg_flow
./Datalog/tsg_fwd
./Datalog/winch_data
./Meta_Data
./Meta_Data/elog
./Meta_Data/Bridge_Logs
./Meta_Data/Systems_Calibration_Data
./Meta_Data/Systems_Calibration_Data/CTD_Sensors
./Meta_Data/Systems_Calibration_Data/Underway_Sensors
./Meta_Data/Systems_Calibration_Data/Underway_Sensors/MET_Sensors
./Meta_Data/Systems_Calibration_Data/Underway_Sensors/Ocean_sensors
./Meta_Data/HLY0702_Sensors_files
./bathymetry
./Raw
./Raw/ctd
./Raw/ctd/HLY0702_00101_NEC5
./Raw/ctd/HLY0702_00102_NEC5
./Raw/ctd/HLY0702_00201_SEC5
./Raw/ctd/HLY0702_00301_SIL5
./Raw/ctd/HLY0702_00401_SWC5
./Raw/ctd/HLY0702_00501_VNG1
./Raw/ctd/HLY0702_00601_NWC5
./Raw/ctd/HLY0702_00602_NWC5
……
./Raw/ctd/Salts
./Raw/ctd/current-cfg
./Raw/ctd
./Raw/pos_mv/events
./Raw/pos_mv
./Raw/tsg_fwd
./1_Minute_Trk_Data
./ice_observations

Second DVD

This is a listing of the second and subsequent DVD's directories from HLY0702 during the cruise./Images

./Images/AloftConnCam
./AloftConnCam/2007136
./AloftConnCam/2007137
./AloftConnCam/2007138
./AloftConnCam/2007139
./AloftConnCam/2007140
./AloftConnCam/2007141
./AloftConnCam/2007142
./AloftConnCam/2007143
./AloftConnCam/2007144
./AloftConnCam/2007145
./AloftConnCam/2007146
./AloftConnCam/2007147
./Images/FantailCam
./FantailCam/2007136
./FantailCam/2007137
./FantailCam/2007138
./FantailCam/2007139
./FantailCam/2007140
./FantailCam/2007141
./FantailCam/2007142
./FantailCam/2007143
./FantailCam/2007144
./FantailCam/2007145
./FantailCam/2007146
./FantailCam/2007147
./Images/Satellite_Images
./Images/Satellite_Images/dmsp
./Satellite_Images/dmsp/20070514
./Satellite_Images/dmsp/20070515
./Satellite_Images/dmsp/20070518
./Satellite_Images/dmsp/20070519
./Satellite_Images/dmsp/20070520
./Satellite_Images/dmsp/20070521
./Satellite_Images/dmsp/20070522
./Satellite_Images/dmsp/20070523
./Satellite_Images/dmsp/20070524
./Satellite_Images/dmsp/20070525
./Satellite_Images/dmsp/20070526
./Satellite_Images/dmsp/20070527
./Images/Satellite_Images/hrpt
./Satellite_Images/hrpt/20070514
./Satellite_Images/hrpt/20070515
./Satellite_Images/hrpt/20070516
./Satellite_Images/hrpt/20070517
./Satellite_Images/hrpt/20070518
./Satellite_Images/hrpt/20070519
./Satellite_Images/hrpt/20070520
./Satellite_Images/hrpt/20070521
./Satellite_Images/hrpt/20070522
./Satellite_Images/hrpt/20070523
./Satellite_Images/hrpt/20070524
./Satellite_Images/hrpt/20070525
./Satellite_Images/hrpt/20070526
./Satellite_Images/hrpt/20070527
./Raw
./Raw/knudsenraw
./Raw/seabeam
./Raw/adcp75

SBE 21 SEACAT Thermosalinograph Data Output Formats

This is extracted from page 33 of the SBE 21 SEACAT Thermosalinograph User's Manual (SeaBird Manual Version #022, 03/30/07).
The SBE 21 outputs data in raw, hexadecimal form as described below.
The inclusion of some output parameters is dependent on the system configuration - if the specified sensor is not enabled (see *Command Descriptions* above), the corresponding data is not included in the output data stream, shortening the data string.
• SBE 21 Format (**F1**) - ttttccccrrrrrruuuvvvwwwxxx (use this format if you will be using SEASAVE to acquire real-time data and/or SBE Data Processing to process the data)
• SBE 16 Format (**F2**) - #ttttccccrrrrrruuuvvvwwwxxxnnnn (custom format)
where
tttt = primary temperature
cccc = conductivity
rrrrrr = remote temperature (from SBE 38 or SBE 3 remote sensor)
uuu, vvv, www, xxx = voltage outputs 0, 1, 2, and 3 respectively
# = attention character
nnnn = lineal sample count (0, 1, 2, etc.)
Data is output in the order listed, with no spaces or commas between parameters. Shown with each parameter is the number of digits.
Calculation of the parameter from the data is described below (use the decimal equivalent of the hex data in the equations).
1. Temperature
    temperature frequency (Hz) = (tttt / 19) + 2100
2. Conductivity
    conductivity frequency (Hz) = square root [(cccc * 2100) + 6250000]
3. SBE 3 secondary temperature (if **SBE3=Y**)
    SBE 3 temperature frequency (Hz) = rrrrrr / 256
4. SBE 38 secondary temperature (if **SBE38=Y**)
    SBE 38 temperature *psuedo* frequency (Hz) = rrrrrr / 256
5. External voltage 0 (if 1 or more external voltages defined with **SVx**)
    external voltage 0 (volts) = uuu / 819
6. External voltage 1 (if 2 or more external voltages defined with **SVx**)
    external voltage 1 (volts) = vvv / 819
7. External voltage 2 (if 3 or more external voltages defined with **SVx**)
    external voltage 2 (volts) = www / 819
8. External voltage 3 (if 4 external voltages defined with **SVx**)
    external voltage 3 (volts) = xxx / 819

Example: SBE 21 with SBE 38 and two external voltages sampled,
example scan = ttttccccrrrrrruuuvvv = A80603DA1B58001F5A21
• Temperature = tttt = A806 (43014 decimal);
    temperature frequency = (43014 / 19) + 2100 = 4363.89 Hz
• Conductivity = cccc = 03DA (986 decimal);
    conductivity frequency =
square root [986 *2100) + 6250000] = 2884.545 Hz
• SBE 38 = rrrrrr = 1B5800 (1,792,000 decimal)
    temperature *pseudo* frequency (Hz) = (1,792,000 / 256) = 7000 Hz
• First external voltage = uuu = 1F5 (501 decimal);
    voltage = 501 / 819 = 0.612 volts
• Second external voltage = vvv = A21 (2593 decimal);

voltage = 2593 / 819 = 3.166 volts

Note:

SBE 21 always outputs an even number of voltage characters. If you enable 1 or 3 voltages, it adds a *0* to the data stream before the last voltage, as shown below:

• Remote temperature and 1 voltage enabled –

ttttccccrrrrrr0uuu or

#ttttccccrrrrrr0uuunnnn

• Remote temperature and 3 voltages enabled –

ttttccccrrrrrruuuvvv0www

#ttttccccrrrrrruuuvvv0wwwnnnn

Notes:

• Sea-Bird's software (SEASAVE and SBE Data Processing) uses the equations shown to perform these calculations; it then uses the calibration coefficients in the configuration (.con) file to convert the raw frequencies and voltages to engineering units. Alternatively, you can use the equations to develop your own processing software.

• See *Notes on SBE 38 Remote Temperature Data Output Format* below for details on how Sea-Bird handles SBE 38 data.