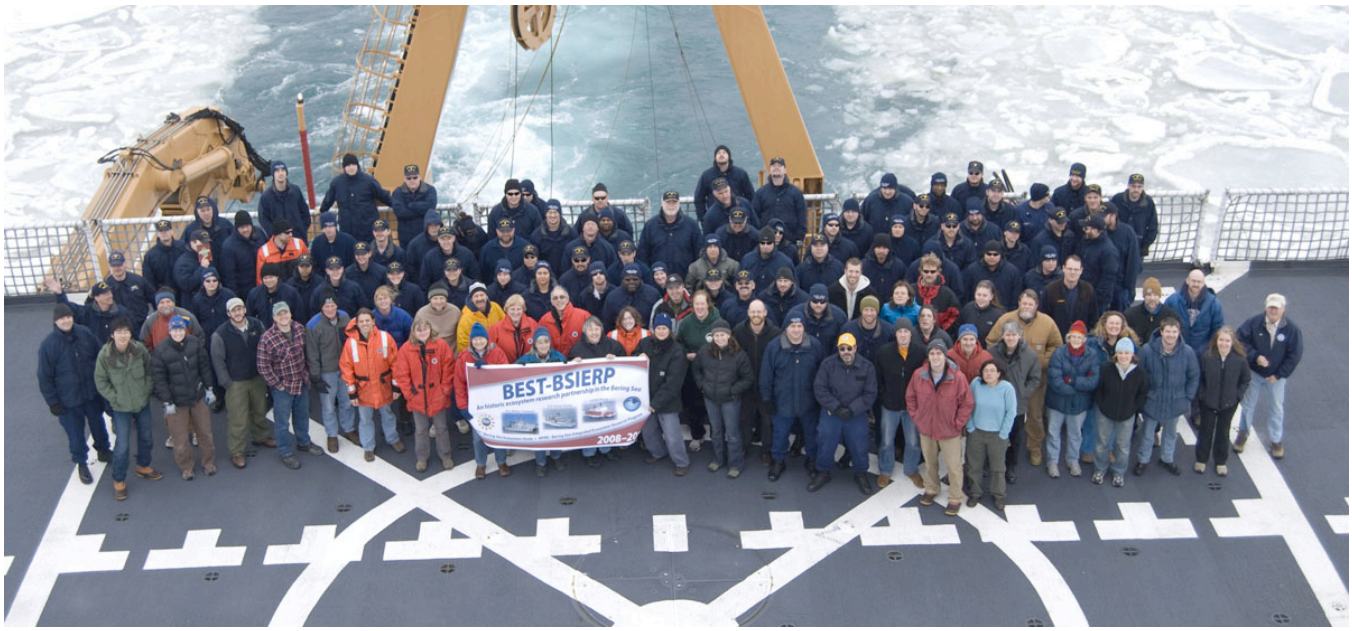
Data Synopsis for HLY0802

March 29 – May 6, 2008
Dutch Harbor to Dutch Harbor

Chief Scientist- Carin Ashjian
Healy Captain- Captain Tedric R. Lindström



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

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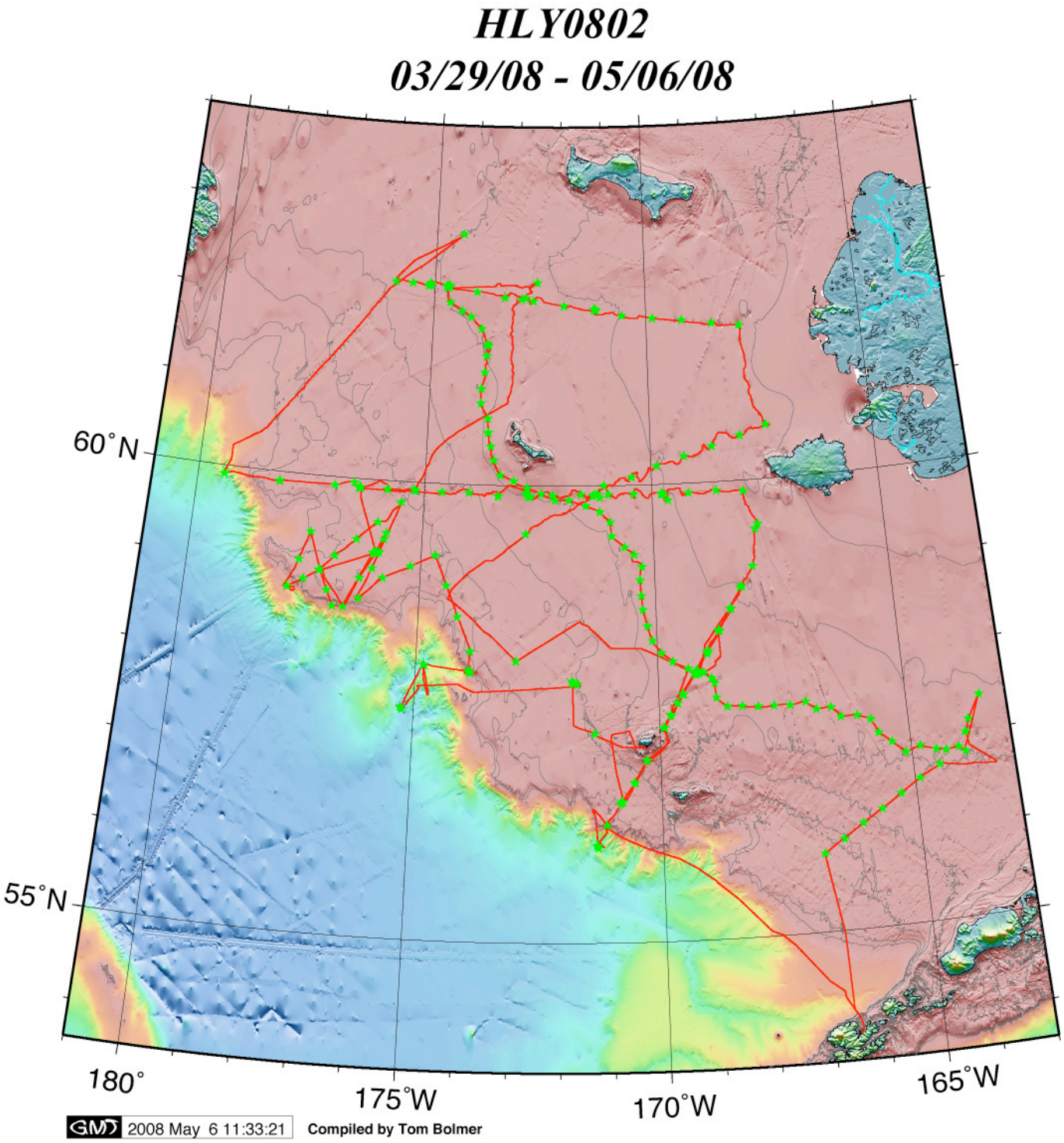
Project Summary

Bering Ecosystem Study and Bering Sea Integrated Research Program Spring Cruise

The overall objective of this cruise is to describe the lower trophic levels of the Bering Sea ecosystem under varying conditions of ice cover in order to better understand ecosystem response to ongoing changes in climate, ice cover (extent of ice cover and timing of ice formation and retreat), and accompanying oceanographic conditions. Thirteen projects are supported on cruise HLY0802 on board the USCGC Healy in the Bering Sea during March 31-May 6, 2008. Sampling was conducted across three major east-west transects of the shelf, including repeated sampling along portions of two of those transects, along the 70 m isobath from ~70 miles south of St. Lawrence Island to ~200 m north of Dutch Harbor, AK, and in a region of the outer shelf where an ice-edge bloom was developing. This scheme permitted sampling of different regions of the shelf under varying conditions of ice cover. During the period of the cruise the ice edge retreated over 100 miles to the north and significant changes in the quality and ice algal load of the ice was documented in the different regions. A range of sampling activities was supported including water column sampling using CTD/Niskens, plankton nets, floating sediment traps, and a Video Plankton Recorder, benthic sampling using Van Veen Grabs, Multicore, and a benthic camera, and on-ice sampling both directly from the ship via personnel deployment on the ice and from helicopter landings on more remote ice floes. Underway sampling of basic hydrographic, meteorological, and bathymetric parameters also was conducted.

Cruise Track



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Berringer, Mike ETC
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Buford, Aimee BM2
Carr, Michael LTJG
Carter, John FS2
Cole, Tyler SN
Conroy, William BM3
Coombe, Jeffrey MK2
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Daem, Steven ET2
Davidson, Ash BM1
Davis, Jonathon ET2
Dull, Steven FS2
Dunning, Lara BM3
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Ford, Angela SN
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Gonzalez, Fernando MK2
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Hurtado, Daniell EM1
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Yeckley, Andy BM3
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Science Components and their major sampling activities

Project	*PIs*	*On-Ship Team*	*Sampling Activites*
Sea Ice Algae, a Major Food Source for Herbivorous Plankton and Benthos in the Eastern Bering Sea	Rolf Gradinger, Katrin Iken, Bodil Bluhm	Rolf Gradinger, Katrin Iken, Sarah Manes, Rebecca Neumann	On-ice sampling, vertical nets, Van Veen grabs, CTD and water sampling, ice sampling by helicopter
Mesozooplankton-microbial food web interactions in a climatically changing sea ice environment	Evelyn Sherr, Barry Sherr, Carin Ashjian, Robert Campbell	Evelyn Sherr, Carin Ashjian, Robert Campbell Celia Ross, Donna Van Keuren	Vertical nets, water from CTD, Video Plankton Recorder
Role of Ice Melting in Providing Available Iron to the Surface Water of the Eastern Bering Sea Shelf	Jingfeng Wu	Ana Aguilar-Islas, Rob Rember	On-ice sampling, Fe samplers on CTD wire, helicopter based ice sampling
A Service Proposal to Examine Impacts of Sea-ice on The Hydrographic Structure and Nutrients Over the Eastern Bering Sea Shelf	Terry Whitledge and Rolf Sonnerup	Nancy Kachel, David Kachel, Carol Ladd, Calvin Mordy, Jeremy Malczyk, Dan Naber, Ned Cokelet, Dylan Righi, Jeremy Mathis, Rolf Sonnerup, Peter Proctor, David Strausz	CTD sampling, nutrient and chlorophyll analysis, oxygen analysis, underway sampling, on-ice sampling
The Trophic Role of Euphausiids in the eastern Bering Sea: Ecosystem Responses to Changing Sea-ice Conditions	Evelyn Lessard and Rodger Harvey	Evelyn Lessard, Rodger Harvey, Tracy Shaw, Megan Bernhardt, Rachel Pluethner	Bongo nets, CTD and water sampling, on ice sampling
Nitrogen supply for new production and its relation to climatic conditions on the eastern Bering Sea Shelf	Raymond Sambrotto and Daniel Sigman	Kris Swenson, Peng Wang	CTD and water sampling, on ice sampling and incubations, small plankton net, underway water sampling
Denitrification and global change in Bering Sea shelf sediments	Allan Devol and David Shull	Allan Devol, David Shull, Heather Whitney, Emily Davenport	Multicore benthic sampling, water sampling from CTD, on ice sampling
The Impact of Changes in Sea Ice Extent on Primary Production, Phytoplankton Community Structure, and Export in the eastern Bering Sea	Brad Moran and Mike Lomas	Pat Kelly, Jonathon Whitefield, John Casey	CTD and water sampling, on-ice sampling, floating sediment traps

Project	***PIs***	***On-Ship Team***	***Sampling Activites***
Benthic Ecosystem Response to Changing Ice Cover in the Bering Sea	Jackie Grebmeier and Lee Cooper	Ed Davis,Boris Sirenko	Van Veen Grabs, CTD and water sampling
Epi-benthic survey	Jackie Grebmeier and Lee Cooper	Ed Davis, Boris Sirenko	Benthic camera
North Pacific Pelagic Seabird Observer Program	Kathy Kuletz and David Irons	Kathy Kuletz, Liz Labunski, Robert Ambrose	seabird and marine mammal observations while underway
Echolocation and estimation of fish and krill	Alex De Robertis	Alex De Robertis	Multi-frequency acoustic detection and identificatin of krill and fish
Bering Ecosystem Study Data Management Support	Jim Moore, Greg Stossmeister, and Steve Williams	Janet Scannell, John Allison	Event and data organization, web serving, and archiving
Assessment of mesozooplankton population and biomass in the eastern Bering Sea for spring and summer of 2008, 2009, and 2010	Ken Coyle and Alexei Pinchuk	Alexei Pinchuk	CalVET nets and MOCNESS plankton net sampling system

Project Names, Grants and Summaries

BEST: Sea Ice Algae, a Major Food Source for Herbivorous Plankton and Benthos in the Eastern Bering Sea (NSF ARC-0732767)
PIs: Rolf Gradinger, Bodil Bluhm, Katrin Iken (UAF)
Abundance, biomass, community composition and productivity of sea ice algae and phytoplankton. Salinity, temperature, and nutrient concentrations in ice cores and under-ice water, ice thickness, snow cover and light regime. Sedimenting material, stable isotope ratios ($d^{13}C$, $d^{15}N$) and algal community composition. On-ice sampling with ice augers, ice-tethered sub-ice sediment traps, plankton nets, benthic grabs. Occasional small boat and helicopter.

BEST: Mesozooplankton-microbial food web interactions in a climatically changing sea ice environment (NSF ARC-0732301, -0732362, -0732382)
PIs: Evelyn Sherr and Barry Sherr (OSU), Robert Campbell (URI), Carin Ashjian (WHOI)
Mesozooplanton/microzooplankton grazing rates and grazing impacts; high resolution vertical and horizontal distribution of plankton from Video Plankton Recorder. Plankton nets, CTD, Video Plankton Recorder

BEST: Role of Ice Melting in Providing Available Iron to the Surface Water of the Eastern Bering Sea Shelf (NSF ARC-0612538)
PI: Jingfeng Wu (UAF)
Iron concentration in sea ice and seawater. Trace metal clean sampling vanes on CTD wire. Sampling on ice.

BEST - A Service Proposal to Examine Impacts of Sea-ice on The Hydrographic Structure and Nutrients Over the Eastern Bering Sea Shelf (NSF ARC-0732430, -0732640)
PIs: Whitledge (UAF), Sonnerup (U. Washington), (Stabeno (NOAA))
Hydrography, nutrients, and chlorophyll. CTD sampling.

BEST: The Trophic Role of Euphausiids in the eastern Bering Sea: Ecosystem Responses to Changing Sea-ice Conditions (NSF ARC-0732389, -0732667)
PIs: Evelyn Lessard (UW), Rodger Harvey (U Maryland)
Age structure and diet history of important euphausids; euphausiid grazing rates and growth and trophic lipid markers. CTD, plankton nets, on ice sampling.

BEST: Nitrogen supply for new production and its relation to climatic conditions on the eastern Bering Sea Shelf. NSF ARC-0612427, -0612198
PIs: Raymond Sambrotto (LDEO-Columbia), Daniel Sigman (Princeton)
New (nitrate) and regenerated nitrogen production; nitrogen isotope ratios. CTD.

BEST: Denitrification and global change in Bering Sea shelf sediments (NSF ARC-0612436, -0612380)
PIs: Allan Devol (U. Washington), David Shull (Western Washington U.)
Profiles and fluxes of oxygen, nitrate, ammonium, phosphate and silicate in the sediment; measurement of ^{222}Rn and ^{210}Pb. Benthic coring with multicore; AUV work under ice.

BEST: The Impact of Changes in Sea Ice Extent on Primary Production, Phytoplankton Community Structure, and Export in the eastern Bering Sea (NSF ARC-0732680, -0732359)
PIs: Brad Moran (URI), Mike Lomas (BBIOS)

Gross and net primary production using traditional ^{14}C, ^{13}C methods, and triple oxygen isotope technique and dissolved oxygen concentrations. Water column fluxes of particulates along the slope. Sinking rates of particulates. CTD and floating sediment traps.

BSIERP Project: Epi-benthic survey (NPRB project)
PIs: Jackie Grebmeier, Lee Cooper (U. Maryland)
Distribution of epibenthic megafauna using benthic camera.

BEST: Benthic Ecosystem Response to Changing Ice Cover in the Bering Sea NSF ARC-0802290
PIs: Jackie Grebmeier and Lee Cooper
Benthic infaunal community composition and biomass. Delta O-18 in seawater. CTD and benthic grabs.

North Pacific Pelagic Seabird Observer Program (NPRB Project 637)
PIs: Kathy Kuletz, David Irons (USFWS)
Seabird abundance and composition relative to oceanography. Visual observations.

Echo Location and Estimation of Fish and Krill
PI: Alex De Robertis (NOAA)
Multifrequency acoustics using fish finder.

Bering Ecosystem Study Data Management Support (NSF ARC-0808853)
PIs: Jim Moore, Greg Stossmeister, Steve Williams (NCAR/EOL)
Develop an on-line field catalog including project documentation and data browsing capabilities during the cruise. The catalog is continually updated throughout the cruise and is expected to contain: map plots of ship and station locations, ice observation summaries and photos, periodic chief scientist reports, event log, a station summary table, preliminary analyses by onboard scientists, and access to preliminary bottle and CTD data. After the cruise the field catalog will be moved to a more permanent location on EOL's website and sensitive data will be password protected to limit distribution to BEST-BSIERP PIs only. EOL will also provide archival services for all data collected during this cruise.

Assessment of Mesozooplankton Population and Biomass in the Eastern Bering Sea for Spring and Summer of 2008, 2009 and 2010.
PIs: Ken Coyle and Alexei Pinchuk (UAF).
Determine the mesozooplankton species composition, abundance, and biomass of the eastern Bering Sea during each of two cruises per year for three BEST field seasons using MOCNESS (in open water only) and CalVET plankton nets

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 log and record data for archiving.

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 (2008) 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,$SBCTR,2007,4,13,06:49:09.437,57.158792,-165.664322 ,69.15,60*00
All times are reported in UTC. Each file type has it's own NEMA string name ($SBCTR as an example). 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. S an example the second DVD for HLY0802 will be named ***hly0802_media-vol02***. 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.
SCS_Data*:*	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.
LDS_Data*:*	This directory contains serial data collected by the Lamont LDS 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. A description of these directories is below.

./1_Minute_Averaged_Data:

HLY0801_distance.csv.gz	Distance along track from port.
HLY0801_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 shp, shx and dbf GIS files.

./SCS_Data:

/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
/flomet_a	Flow meter data just upstream of the A TSG and Fluorometer.
/flomet_b	Flow meter data just upstream of the B TSG and Fluorometer.
/fluro_a	Flurometer for A TSG sensor.
/fluro_b	Flurometer for B TSG sensor.
/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_mk27	Heading data in NMEA HDT format from the Sperry MK27gyro compass
/gyro_mk39	Heading data in NMEA HDT format from the Sperry MK39 gyro compass

/ibs_waypoints	Waypoints from the Healy's Integrated Bridge System
/isus	ISUS Nitrate Sensor small file
/isus3v	ISUS Nitrate Sensor 3V full file
/knudsen	Depth data in a proprietary PKEL format received from Knudsen 320 B/R serial output
/met3a_sen	Meterology data from the top of the Jackstaff.
/oxygen_a	Oxygen values from A TSG.
/oxygen_b	Oxygen values from A TSG.
/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
/pressure_sen	Pressure sensor in the Uncontaminated Seawater System before the Bio Chem Lab which measures header pressure in PSI.
/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 for SAMOS.
/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
/solar_radiometers	Solar Radiometer data for SW and IW.
/sperry_speedlog	ground/water speed data from the Sperry Speed Log
/surface_par	Photosynthetic Active Radiation volts and Microeinstens/m2 se from the surface par sensor
/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_a	Thermosalinograph and fluorometer data from the A TSG instruments in the Bio/Chem Lab.

/tsg_b	Thermosalinograph and fluorometer data from the B TSG the instruments in the Bio/Chem Lab.
/winch_data	Line out and speed data from the winch system.
/wind_sen_a	Wind data from the Jack Staff.
/wind_sen_b	Wind data from the Yard.

./Extra files in the directory SCS_Data:

ACQLOG.LOG	Contains the data as to what occurred with SCS data. It shows when data collection was started and stopped.
Incidents_YYYYMMDD-TTTTTT.DTM	Contains any incident data, which were triggered in SCS.
sensor_YYYYMMDD-TTTTTT.scf	Contains the configuration file for data collection as configured by SCS.

./LDS_Data:

/adu5	Contains the data from the ADU5 GPS.
/aggps	Contains the data from the AG GPS.
/bgm221	Contains the data from the BGM221 Gravimeter.
/bgm222	Contains the data from the BGM222 Gravimeter.
/events	Contains the logs of event for different systems.
/mk27	Contains the data from the MK27 Gyro.
/mk30	Contains the data from the MK30 Gyro.
/posatt	Contains the attitude data from the POSMV GPS.
/posnav	Contains the navigation data from the POSMV GPS.
/posreform2sb	Contains the navigation data from the POSMV GPS reformatted for the SeaBeam.
/sbctr	Contains the center beam data from the SeaBeam.
/sbsv	Contains the surface sound velocity data for the SeaBeam.
/tsg_met	Contains the all data from SIO TSG and Met sensors.

./Raw:

/ctd	CTD data in directories by Cast number.
/xbt	Expendable Bathythermograph data. (not on HLY0802)

./Meta_Data:

/elog	Contains the technician's narrative of important events, which occurred both to the network and to individual sensors.
/Bridge_Logs	
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.
/WHOisWHO	Contains files of Science Party Members and addresses.

./ice_observations:

Directories of the Ice Observations taken during the cruise.

First DVD Contents by directory:

SCS_Data:
aft_a_frame
air_temp_f
ashtech_attitude
ashtech_gga
ashtech_gll
ashtech_hdt
dew_point_f
flomet_a
flomet_b
fluro_a
fluro_b
glonass_gga
glonass_gll
gyro_mk27
gyro_mk39
ibs_waypoints
isus
isus3v
knudsen
met3a_sen
oxygen_a
oxygen_b
pcode_aft_gga
pcode_aft_gll
pcode_aft_vtg
pcode_aft_zda
pcode_bridge_gga
pcode_bridge_gll
pcode_bridge_vtg
posmv_gga
posmv_gst
posmv_hdt
posmv_pashr
posmv_vtg
posmv_zda
pressure_sen
rmyoung_air
rmyportwind
rmystbdwind
samos_data
seabeam_center
solar_radiometers
sperry_speedlog
stbd_a_frame
surface_par
surface_temp
sv2000
true_wind_port
true_wind_stbd
tsg_a
tsg_b
wind_sen_a
wind_sen_b
Raw:
adcp150
adcp75
ctd
knudsenraw
xbt
Images:
Satellite_Images
Satellite_Images/dmsp
Satellite_Images/hrpt
LDS_Data:
AloftConnCam
FantailCam
adu5
aggps
bgm221
bgm222
events
mk27
mk30
posatt
posnav
posreform2sb
sbctr
sbsv
seabeam
tsg_met
1_Minute_Averaged_Data*:*
Shapefile
Meta_Data:
Bridge_Logs
Elog
WHOisWHO

Directories on the second and subsequent DVDs:

LDS_Data*:* This directory contains serial data collected by the Lamont LDS data collection system in different directories. Directory names are labeled by the instrument name and string type of the data collected. DVDs contain as much data for a given time interval that can fit on the DVD. Then, a new DVD is started. 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. DVDs contain as much data for a given time interval that can fit on the DVD. Then, a new DVD is started. A description of the data contained in this directory is below.

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

./LDS_Data:

/AloftConCam	This directory contains picture files from Aloft Con separated by directories named by Year and Day of Year (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 from Aft Con separated by directories named by Year and Day of Year (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.
/seabeam	Contains the data from the SeaBeam.

./Raw:

/adcp75	75 KHz ADCP data
/adcp150	150 Khz ADCP data
/knudsenraw	Knudsen 320B/R data

./Satellite_Images:

/dmsp
/hrpt

Second DVD Contents by directory:

An example list of subdirectories and files here may be different from the actual DVD.

./LDS_Data:

./AloftConnCam
./ 2008087
2008-087-174500.jpg
2008-087-175000.jpg
……
./ 2008096
……
2008-096-235000.jpg
2008-096-235500.jpg
./FantailCam
./2008087
2008-087-174500.jpg
2008-087-175000.jpg
./2008096
……
…2008-097-000000.jpg
…2008-097-000500.jpg
./seabeam
sb20080892300.mb41.gz
sb20080900000.mb41.gz
…..
sb20080971200.mb41.gz
sb20080971300.mb41.gz

Raw:

./adcp150 ***NOT done on HLY0802***
./adcp75
HLY0802004_000000.ENR.gz
HLY0802004_000000.ENS.gz
2008_089_2354_HF_000.sgy.gz
2008_089_2354_LF_000.sgy.gz
…..
./knudsenraw
2008_089_2354_000.kea.gz
2008_089_2354_000.keb.gz
2008_089_2354_HF_000.sgy.gz
2008_089_2354_LF_000.sgy.gz
…..

./Satellite_Images:

./dmsp
./20080327
200803270014.f-12.1km_vis.jpeg
200803270014.f-12.4km_ir.jpeg
…...
./200700817
…..
200804060618.f-16.4km_ir.jpeg
200804060618.f-16.4km_vis.jpeg
./hrpt
./20080326
200803260048.noaa-18.1km_ir_ch5.jpeg
200803260048.noaa-18.1km_vis_ch1.jpeg
…..
./20070817
…..
200804061429.noaa-18.4km_vis_ch1.jpeg
200804061429.noaa-18.4km_vis_ch2.jpeg

Merged Data

LDEO Averaged One Minute Data File

The data are summarized into an averaged one (1) minute data file by the LDEO technician. 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.

HLY0801_track.csv

6944,2008/03/18 16:08,62.7178957,-174.0047168,213.6,10.1,216.3,71.5,-1.731,-1.275,26.5602,33.093,0.699,0.070,0.000,0.014,1.704,0.170,0.589,0.059,2.93,3.30,0.16,278.38,257.36,257.33,3.31,-15.87,94.39,1017.99,0.00,276.49,1.76,1.86,5.20,225.43,1.87,8.82,4.44,7.841,-1.275,0.000,,0.000,0.000,2,-276,-7,0,1,-182,-1,0

6945,2008/03/18 16:09,62.7155853,-174.0082005,204.9,10.3,204.6,71.0,-1.731,-1.276,26.5577,33.091,0.625,0.062,0.000,0.014,1.650,0.165,0.570,0.057,3.00,3.40,0.64,277.30,257.3

9,257.45,3.31,-15.88,94.30,1018.03,0.00,284.64,2.73,2.19,4.86,235.55,2.71,2.45,3.64,7.842,-1.276,0.000,,0.000,0.000,2,-275,-7,0,1,-183,-1,0

6946,2008/03/18 16:10,62.7128363,-174.0101985,196.9,10.6,197.2,67.1,-1.726,-1.278,26.5468,33.078,0.624,0.062,0.000,0.014,1.632,0.163,0.555,0.055,2.94,3.30,1.20,278.48,257.45,257.44,3.31,-15.89,94.21,1018.02,0.00,274.01,2.81,349.11,5.50,245.37,3.28,343.65,3.96,7.812,-1.278,0.000,,0.000,0.000,2,-274,-7,0,1,-185,-1,0

Field	***DATA***	***Example***	***UNITS***
01	ID	6944	sample count
02	date	2008/03/18 16:08	date & time UTC (year/month/day hour:minute)
03	lat	62.7178957	POSMV Latitude (decimal degrees)
04	lon	-174.0047168	POSMV Longitude (decimal degrees)
05	cog	213.6	POSMV Course Over Ground (angular distance from 0 (North) clockwise through 360, 1 minute average)
06	sog	10.1	POSMV Speed Over Ground (Knots, 1 minute average
07	heading	216.3	POSMV ship heading(angular distance from 0 (North) clockwise through 360, 1 minute average)
08	depth	71.5	Seabeam centerbeam depth(meters, 1 minute average)
09	SST	-1.731	SBE3s RemoteTemperature, Sea Chest intake (Celsius, 1 minute average)
10	TSG_InTemp	-1.275	SBE45 internal temperature (Celsius, 1 minute average)
11	TSG_Cond	26.5602	SBE45 Water Conductivity (millisiemens/centimeter, 1 minute average)
12	TSG_Sal	33.093	SBE45 Water Salinity (PSU, 1 minute average)
13	SCF-FL	0.699	SCF Fluorometer (Ug/l, 1 minute average)
14	SCF-FL-V	0.070	SCF Fluorometer (Volts, 1 minute average)
15	SCF-Turb	0.000	SCF Turbidity (NTU, 1 minute average)
16	SCF-Turb-V	0.014	SCF Turbidity (Volts, 1 minute average)
17	SCUFA-FL	1.704	SCUFA Fluorometer (Ug/l, 1 minute average)
18	SCUFA-FL-V	0.170	SCUFA Fluorometer (Volts, 1 minute average)
19	SCUFA-Turb	0.589	SCUFA Turbidity (NTU, 1 minute average)
20	SCUFA-Turb-V	0.059	SCUFA Turbidity (Volts, 1 minute average)
21	tsg_flow_A	2.93	Flowmeter in-line with PSTSGA, PSOXA, PSFLA (LitersPerMinute, 1 minute average)
22	tsg_flow_B	3.30	Flowmeter in-line with PSFLB (LitersPerMinute, 1 minute average)
23	SWR	0.16	Short Wave Radiation (W/M^2, 1 minute average)
24	LWR	278.38	Long Wave Radiation (W/M^2, 1 minute average)
25	LWR_Dome_T	257.36	LWD Dome Temperature (Deg K, 1 minute average)
26	LWR_Body_T	257.33	LWD Body Temperature (Deg K, 1 minute average)
27	PAR	3.31	Surface PAR (uE/Sec/M^2, 1 minute average)
28	MET3A_Temp	-15.87	MET3A Air Temperature (Deg C, 1 minute average)
29	MET3A_RH	94.39	MET3A Relative Humidity (%, 1 minute average)
30	MET3A_Baro	1017.99	MET3A Barometric Pressure (millibars, 1 minute average)
31	MET3A_Precip	0.00	MET3A Precipitation (mm, 1 minute average)
32	JS_WndDirR	276.49	Jackstaff Relative wind direction (deg, 1 minute average)
33	JS_WndSpdR	1.76	Jackstaff Relative wind speed (m/s, 1 minute average)
34	JS_WndDirT	1.86	Jackstaff True wind direction (deg, 1 minute average)

Field	*DATA*	*Example*	*UNITS*
35	JS_WndSpdT	5.20	Jackstaff True wind speed (m/s, 1 minute average)
36	MM_WndDirR	225.43	Main Mast Relative wind direction (deg, 1 minute average)
37	MM_WndSpdR	1.87	Main Mast Relative wind speed (m/s, 1 minute average)
38	MM_WndDirT	8.82	Main Mast True wind direction (deg, 1 minute average)
39	MM_WndSpdT	4.44	Main Mast True wind speed (m/s, 1 minute average)
40	SBE_Oxy	7.841	SBE-43 Oxygen(ml/l, 1 minute average)
41	SBE_Oxy_T	-1.275	SBE-43 Oxygen Temperature(Deg C, 1 minute average)
42	Optode_Oxy	0.000	Optode Oxygen(ml/l, 1 minute average)
43	Optode_Oxy_T		Optode Oxygen Temperature(Deg C, 1 minute average)
44	Isus_1	0.000	Isus Aux 1(Volts, 1 minute average)
45	Isus_2	0.000	Isus Aux 2(Volts, 1 minute average)
46	WinchAft	2	Aft A-Frame Winch number
47	TensionAft	-276	Aft A-Frame Winch Wire tension(Pounds, 1 minute average)
48	WireOutAft	-7	Aft A-Frame Winch Wire out (Meters, 1 minute average)
49	SpeedAft	0	Aft A-Frame Winch Wire speed(Meters/minute, 1 minute average)
50	WinchSbd	1	Starboard A-Frame Winch number
51	TensionSbd	-182	Starboard A-Frame Winch Wire tension(Pounds, 1 minute average)
52	WireOutSbd	-1	Starboard A-Frame Winch Wire out (Meters, 1 minute average)
53	SpeedSbd	0	Starboard A-Frame Winch Wire speed(Meters/minute, 1 minute average)

File Formats of Data Collected Underway

The formats of the Under way data files that were collected on this cruise are in a separate document named HLY0802_Sensors. This is now a separate document due to it's large size. The file HLY0802_Sensors.htm is in the Meta_Data on the first DVD. This file is also in a PDF file. To use this html file you will need to have the directory HLY0802_Sensors_files in the same directory as the html file.
Also in the Meta_Data directory are some PDF files for data that was collected but not part of the normal science routine.

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 (UTC, Z). You should look for more complete details for these events in the ELOG accounts.

Date	*Time (UTC)*	*Event*
03/27/08	17:45	Start LDS for HLY0804
03/29/08	20:04	New SVP for Seabeam from ARGO Float
03/29/08	20:53	Start SCS ACQ, start SAMOS
03/29/08	23:13	Replaced antenna 3 for Ashtech 3DGPS
03/29/08	23:51	SeaBeam into Survey mode
03/29/08	23:53	Knudsen started with 3.5Khz
03/29/08	23:59	ADCP75 started using trigger from SeaBeam
03/30/08	01:21	SeaBeam using external SSV
03/30/08	01:00	Science Seawater and underway sensors online
03/30/08	02:47	SRD-500 turned off. Transducer out of the water
03/30/08	09:13	Change ADCP 75 trigger mode to accept Alex's new time scheme
03/30/08	09:20	ADCP 75 Gyro Heading frozen
03/30/08	12:18	New SVP from Argo Buoy R4900799_038 for Seabeam
03/30/08	12:26	Gyro-synchro converter reset for ADCP Gyro
03/31/08	02:21	Flow Meter A was clogged 2112 – 0210Z
03/31/08	03:12	New SVP from CTD 1
03/31/08	03:35	Knudsen to pinger mode, not seeing anything
03/31/08	06:10	Knudsens swapped, now pinger mode is working
03/31/08	07:30	Knudsens to 3.5 mode, not working

Date	*Time (UTC)*	*Event*
03/31/08	08:09	Knudsens shutdown to swap Knudsens
03/31/08	08:54	Knudsens still not seeing bottom with original unit
03/31/08	16:18	Freed Flowmeter B from Blockage
03/31/08	18:23	SeaBeam SSV to Manual
03/31/08	18:31	Flowmeter A blockage cleared, blocked 1702-1821Z
03/31/08	19:35	SeaBeam SSV to External
03/31/08	21:35	Knudsen shutdown for repairs
03/31/08	22:32	Knudsen backup, 3.5 ok 12Khz not looking good
04/01/08	03:42	New SVP from CTD 4, deep from CTD 1
04/01/08	12:41	New SVP from CTD 5
04/02/08	01:15	New SVP from CTD 10, deep from CTD 1
04/02/08	18:29	Knudsen down for repairs
04/02/08	19:55	Knudsen backup, very weak on both 3.5 and 12Khz
04/02/08	21:08	SeaBeam SSV to Manual
04/02/08	21:12	Winch display problems, using lesser of 2 evils – Totco
04/02/08	21:20	SeaBeam SSV back to external
04/02/08	23:59	Knudsen backup and working, problem solved
04/03/08	04:45	TSG and other sensors getting clogged by ice
04/03/08	05:29	TSG and other sensors ice clog gone
04/03/08	07:18	SeaBeam SSV to Manual
04/03/08	09:51	Sea water flow clogged again
04/03/08	10:20	Sea water flow back, sensors working
04/03/08	19:05	Sea water flow clogged for station
04/03/08	21:24	SCS ACQ stop and restart to add ISUS data
04/03/08	22:05	Sea water flow clogged again
04/04/08	01:49	Sea water flow back, sensors working
04/04/08	02:05	Sea water flow clogged again
04/04/08	19:39	Test with Gyros and ADU5, will be on and off
04/04/08	23:29	Test with Gyros and ADU5 done
04/05/08	04:46	SCS ACQ stop and restart
04/05/08	13:48	ADCP 75 Gyro heading stuck
04/05/08	17:25	Gyro-synchro reset, ADCP 75 Gyro heading back

Date	*Time (UTC)*	*Event*
04/05/08	22:35	Sea water has been clogged on and off for the last few hours
04/05/08	22:58	All Sonars blocked by ice at this station
04/06/08	01:48	All Sonars working again
04/06/08	19:32	All Sonars blocked by ice at this station
04/06/08	19:34	New 8mm tape (#2) for SeaBeam, previous was ejected some time
04/07/08	00:00	Only Knudsen and Seabeam are blocked by ice
04/07/08	04:05	Sonars all see bottom now
04/07/08	22:35	new SVP from CTD 44, used ARGO R4901067_15 & CTD 1 for deep
04/08/08	07:34	new SVP from CTD 45, used ARGO R4901067_15 & CTD 1 for deep
04/08/08	09:56	new SVP from CTD 46, used ARGO R4901067_15 & CTD 1 for deep
04/08/08	16:54	ADU5 down for tests with Gyros
04/08/08	18:04	ADU5 back up
04/08/08	18:42	New SVP from CTD 49, used ARGO R4901067_15 & CTD 1 for deep
04/08/08	18:56	ADU5 and Gyros down for maintenance
04/08/08	22:00	ADU5 starts putting out garbage
04/08/08	23:00	SIO MET feed to SCS down for the next 7 minutes
04/09/08	01:23	SCS stopped and started to create a Fahrenheit Temperature file
04/09/08	08:14	Put ADU5 and Gyros back to normal
04/09/08	09:02	New SVP from CTD 51, used ARGO R4901067_15 & CTD 1 for deep
04/09/08	14:35	New SVP from CTD 53, used ARGO R4901067_15 & CTD 1 for deep
04/09/08	18:43	Knudesn depth limit caused no data collected last 20 minutes
04/09/08	22:16	MK39 Gyro shifted to inertial mode for testing
04/10/08	09:30	ADCP75 Gyro heading stuck
04/10/08	09:35	Knudesn depth limit caused no data collected since 0400Z
04/10/08	10:56	Gyro-synchro converter reset, ADCP 75 heading back
04/10/08	18:42	Note SeaBeam 8mm tape ejected, won't take a tape, will not use tapes any more
04/10/08	19:16	reload SVP hly0801_01001.svp SeaBeam
04/10/08	20:16	ADU5 down to work on MK39 Gyro
04/10/08	23:13	ADU5 back running again
04/10/08	23:16	MK39 on inertial with input GPS switch from Northstar to ADU5
04/11/08	07:51	New SVP from CTD 56, used CTD 54 for deep
04/11/08	09:47	ADCP75 Gyro heading stuck

Date	*Time (UTC)*	*Event*
04/11/08	10:32	New SVP from CTD 57, used CTD 54 for deep
04/11/08	14:51	Gyro-synchro converter reset, ADCP 75 heading back
04/11/08	15:54	New SVP from CTD 58, used SVP based on CTD 57 for deep
04/11/08	21:06	Note large offset in SCS time stamp and Knudsen KEL data, Been there for years!
04/11/08	23:07	Power outage SB2112 needed to restarted with older MO DISC
04/12/08	00:26	SeaBeam running with proper pitch and roll biases
04/12/08	00:32	SeaBeam and centerbeam LDS loggers stopped and restarted to log data
04/21/08	06:53	SeaBeam SSV set to Manual of 1437
04/13/08	20:44	ISUS Nitrate offline for 3 minutes to clean
04/13/08	23:43	New SVP from CTD 74, used SVP based on CTD 62 for deep
04/14/08	08:13	manually sync Knudsen clock to the Knudsen PC
04/14/08	13:11	Lost some data due to wrong data window on Knudsen, reset
04/16/08	09:11	new SVP from CTD 82, used ARGO R4900597_102 for deep
04/16/08	19:18	Stop and start Knudsen
04/17/08	05:11	ADU5 reset since no data output for last few hours
04/17/08	06:54	new SVP from CTD 89, used ARGO R4900806_040 and Levitus for deep
04/17/08	14:08	Knudsen depth window set wrong since 1100Z
04/17/08	17:53	ADCP lost Gyro heading
4/17/08	17:55	ADU5 GPS is all over the place. Needs to be reset?
04/17/08	18:18	ADCP Gyro heading working again
04/17/08	19:15	new SVP from CTD 90, used ARGO R4900806_040 CTD 46
04/17/08	22:50	new SVP from CTD 91, used ARGO R4900806_046 and Levitus for deep
04/18/08	13:29	new SVP from CTD 93, used ARGO R4900806_046, CTD91, and Levitus for deep
04/18/08	23:53	New Sensor for TSG added. Pressure sensor
04/19/08	21:51	new SVP from CTD103
04/19/08	22:55	Stop and restart SCS to add Pressure sensor
04/20/08	00:52	new SVP from CTD104
04/20/08	03:28	new SVP from CTD105
04/20/08	05:50	Speed log back in the water
04/20/08	05:52	Gyro MK 39 using speed log. Out of damping mode
04/20/08	08:06	Flouorometer files and directories in SCS renamed in SCS restart.
04/20/08	08:07	new SVP from CTD106

Date	*Time (UTC)*	*Event*
04/20/08	11:20	new SVP from CTD105
04/20/08	13:06	new SVP from CTD104
04/20/08	16:38	Speed log back in the water around 15:15Z
04/21/08	00:45	SCS stopped and restarted to rename Fluorometer files back to what they were
04/21/08	06:42	new SVP from CTD 107, used ARGO R4900597_102 for deep
04/21/08	15:56	new SVP from CTD 110, used ARGO R4900597_102 for deep
04/22/08	00:38	New SVP changing the last SVP at the top
04/22/08	01:16	New SVP used ARGO R4900597_102
04/22/08	03:20	used SVP from 00:38 again
04/22/08	03:54	SVP from ARGO R4900597_102 again
04/22/08	12:02	New SVP used CTD 112
04/22/08	13:27	Put sub bottom into pinger mode
04/22/08	13:43	SeaBeam to Idle Mode
04/22/08	15:40	SeaBeam to Survey Mode
04/22/08	15:40	Sub Bottom recording data again
04/22/08	15:41	There was no data for ADCP while SeaBeam in Idle
04/22/08	17:25	Put sub bottom into pinger mode
04/22/08	18:29	SeaBeam to Idle Mode
04/22/08	18:59	SeaBeam to Survey Mode ADCP and fish finder getting data again
04/22/08	18:59	Sub Bottom recording data again
04/22/08	19:11	MK39 Gyro set to damp manual mode
04/22/08	19:12	speed log out of the water
04/22/08	19:58	New SVP from CTD 113 with CTD 112 for deep
04/23/08	02:43	New SVP from CTD 114
04/22/08	12:50	New SVP from CTD 116 with CTD 114 for deep
04/23/08	13:07	note ADCP gyro heading stuck
04/23/08	13:29	ADCP gyro heading working
04/23/08	21:13	New SVP from CTD 120 with CTD 114 for deep
04/23/08	23:36	New SVP from CTD 121 with CTD 114 for deep
04/24/08	01:05	Adjusted angle of Aloft Con camera. Tilted for last few days
04/24/08	01:26	New SVP from CTD 122 with CTD 114 for deep
04/24/08	08:35	New SVP from CTD 125 with Levitus for deep

Date	*Time (UTC)*	*Event*
04/24/08	12:16	New SVP from CTD 126 with Levitus for deep
04/24/08	15:35	New SVP from CTD 127 with Levitus for deep
04/24/08	17:35	ADCP gyro Heading stuck
04/24/08	18:06	ADCP gyro Heading working
04/24/08	19:28	New SVP from CTD 128 with Levitus for deep
04/24/08	21:23	Reset MK39 Gyro deep
04/25/08	03:10	Switch MK39 GPS input from ADU5 to Northstar
04/25/08	03:45	Taking MK39 Gyro down intermittently for testing
04/25/08	03:46	Taking ADU5 down to switch antennas
04/25/08	05:47	New SVP from CTD 132
04/25/08	06:46	ADCP gyro Heading stuck
04/25/08	07:43	Replace ADU5 with new one from stock
04/25/08	14:28	ADCP gyro still Heading stuck
04/25/08	16:58	New SVP from CTD 136 with CTD 112 for deep
04/25/08	19:10	New SVP from CTD 126 and ARGO float R4900597_103 for deep
04/25/08	22:50	New SVP from CTD 138 with CTD 112 for deep
04/25/08	22:55	TSG, Fluorometer and Oxygen down for cleaning
04/25/08	23:04	SeaBeam SSV to Manual mode with 1446
04/25/08	23:22	ADCP gyro still Heading stuck
04/25/08	23:22	ADCP gyro Heading Working
04/26/08	00:25	TSG, Fluorometer and Oxygen up after cleaning
04/26/08	00:28	SeaBeam SSV back to external
04/26/08	02:02	New SVP from CTD 139 with CTD 138 for deep
04/26/08	03:54	New SVP from CTD 140 with CTD 138 for deep
04/26/08	04:40	MK39 out of manual damp mode
04/26/08	05:13	New SVP from CTD 141 with CTD 138 for deep
04/26/08	07:26	New SVP from CTD 142
04/26/08	08:12	ADCP gyro Heading stuck
04/26/08	12:44	New SVP from CTD 144
04/26/08	16:20	ADCP gyro Heading Working
04/26/08	18:09	New SVP from CTD 146 and ARGO float R4900597_103 for deep
04/26/08	21:15	Reload SVP from CTD 139 with CTD 138 for deep

Date	*Time (UTC)*	*Event*
04/26/08	22:14	Reload SVP from CTD 138 with CTD 112 for deep
04/27/08	01:34	New SVP from CTD 126 with CTD 147 for deep
04/27/08	03:43	New SVP from CTD 148 with CTD 147 for deep
04/27/08	09:01	New SVP from CTD 150 with CTD 147 for deep
04/27/08	20:28	ADU5 going down for trouble shooting
04/27/08	20:36	New SVP from CTD 155
04/27/08	22:19	ADU5 back up
04/28/08	16:19	It looks like at 14:30Z science seawater was turned off, no flow
04/28/08	19:09	Seawater flowing again at about 18:40Z after change faucets
04/28/08	22:04	All Sonars blocked starting at about 21:30Z
04/29/08	05:03	All Sonars getting data again after we left station
04/29/08	05:57	Sea water blocked again about 05:45Z
04/29/08	12:41	New SVP from CTD 159 and Levitus
04/30/08	01:26	At 16:20L gyro removed from ADCP for tests, reconnected at about 17:05L
04/30/08	07:48	ADCP Gyro heading frozen
04/30/08	10:33	ADCP Gyro working, gyro syncro converter reset at 10:30Z
04/30/08	16:36	All Sonars blocked, at ice station
04/30/08	16:48	Stop and start ADCP VMDas, to close files for rsynching
05/01/08	01:10	All Sonars getting data again after we left station
05/01/08	01:57	stop and start SCS, some data files not being written
05/02/08	01:39	SIOMET computer rebooted somehow, lost 29 minutes of SIOMET data
05/02/08	11:01	New SVP hly0802_159.svp from CTD 186 and CDT 159 for deep
05/02/08	22:12	Knudsen stopped pinging. Can't write to Seaventure
05/02/08	23:45	Knudsen rebooted and running. Can write to Seaventure
05/03/08	00:19	Map-3 and 4 crashed. Rebooted and can't mount Seaventure
05/03/08	02:37	stop and restart Knudsen EchoControl
05/03/08	03:39	Seaventure was rebooted at 00:00Z. Too many processes and couldn't maintain mounts.
05/03/08	05:22	New SVP from CTD 196
05/03/08	06:03	New SVP from CTD 197
05/03/08	17:50	ADCP 75 Gyro heading frozen
05/03/08	18:23	Gyro heading synchro converter reset, heading working
05/03/08	19:59	stop and restart Knudsen recording. Cleared strange error message

Date	*Time (UTC)*	*Event*
05/03/08	21:01	stop and restart SCS to toggle permissions
05/03/08	22:10	New SVP from CTD 204
05/03/08	22:36	stop at 22:08 and restart SCS now
05/03/08	23:34	stop at 23:31 and restart SCS now
05/03/08	23:44	stop at 23:43 and restart SCS now
05/04/08	08:09	Knudsen stopped pinging and no Seaventure mount
05/04/08	08:49	Knudsen restarted logging on the PC
05/04/08	09:25	stop and restart SCS
05/04/08	09:37	Knudsen stop recording and restart and can write to Seaventure now
05/04/08	11:30	From 8:18 – 9:34 SCS was not logged on Seaventure but will be updated
05/04/08	12:34	New SVP from CTD 213
05/04/08	13:30	New SVP from CTD 214
05/04/08	18:02	New SVP from CTD 216
05/04/08	23:11	New SVP from CTD 221
05/05/08	05:27	New SVP from CTD 226
05/05/08	08:05	New SVP from CTD 228 and ARGO float R4988843_021 for deep
05/05/08	09:43	New SVP from CTD 229 and SVP for CTD 228 for deep
05/05/08	14:18	New SVP from CTD 231 and SVP for CTD 228 for deep
05/05/08	15:59	New SVP from CTD 232 and SVP for CTD 228 for deep
05/05/08	17:24	New SVP from CTD 230 and SVP for CTD 228 for deep
05/05/08	23:25	New SVP from CTD 236 and ARGO float R4988843_021 for deep
05/06/08	04:34	New SVP from CTD 239 and ARGO float R4988843_021 for deep
05/06/08	05:21	New SVP from CTD 240 and ARGO float R4988843_021 for deep
05/06/08	05:23	The speed log was just turned off. It was running for several hours
05/06/08	06:56	New SVP from CTD 241 and ARGO float R4988843_021 for deep
05/06/08	16:38	Stop ADCP 75
05/06/08	16:43	Stop Knudsen
05/06/08	16:46	SeaBeam to Idle
05/06/08	16:49	Stop SCS
05/06/08	16:50	Stop LDS
05/06/08	16:52	Science Seawater stopped
05/06/08	16:55	Science Data Acquisition is stopped for end of cruise arrival in Dutch Harbor.

Comments that might help when using the data

The SCS system has stopped recording every now and then. If this is the case. you should look for the corresponding data in the LDS_Data directories. The data may have been recorded there.

The Knudsen data written into SCS_Data/Knudsen has an inconsistent time in the data. The time that the SCS writes to the start of the file should be used. The Knudsen internal clock adds about 22.8 seconds to the3 internal clock each day near 00:00. But this is reset when the recording program is started up. Use only the SCS time stamp for time in this data and it should be fine.

There is an extra directory is on the last DVD that has the Turbidity/Transmissometer data from the Science Sea Water system in it. The format for that data is in a PDF file that describes the data. The PDF file is the only place that this data is described.

The SeaBeam data is raw and unedited. This data needs MAJOR editing and care to use. The Knudsen sub bottom data is perhaps more accurate but it uses only the single Speed of Sound Velocity Profile of 1500 meters/second.

Information to calibrate the Optotech Oxygen Sensor from the Bio Chem lab is in a directory on the first DVD in the Meta_Data directory.

Underway Sensors and Calibrations

Sensors and Calibrations

HLY0802 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 612011	BP01643	02/22/08	Collected
Air Temp/Rel. Hum.	RM Young 41382V	13352	02/22/08	Collected
Helo shack PAR	BSI QSR-2200	20270	01/09/07	Collected
Shortwave Radiation	Eppley labs - PSP	35032F3	08/01/07	Collected
Longwave Radiation	Eppley labs - PIR	34955F3	08/17/07	Collected
Barometer	Paroscientific MET3A	101757	06/27/07	Collected
Bow Temperature	Paroscientific MET3A	101757	06/27/07	Collected
Precipitation	Paroscientific MET3A	101757	06/27/07	Collected
Relative Humidity	Paroscientific MET3A	101757	06/27/07	Collected
Jack Staff Ultrasonic Anemometer	RM Young 85004	00703	09/20/07	Collected
Yard Arm Stb Ultrasonic Anemometer	RM Young 85004	00704	09/20/07	Collected
Underway Ocean				
TSG A	SeaBird SBE45	0215	08/01/07	Collected
TSG B	SeaBird SBE45	3107	01/16/08	Collected
Remote Sea Temp	SeaBird SBE3S	4063	12/13/07	Collected
Fluorometer B	Turner SCUFA	0600	12/15/07	Collected
Fluorometer A	Seapoint SCF	SCF2957	12/15/07	Collected
Oxygen Sensor A	SeaBird SBE-43	1307	09/28/07	Collected
Oxygen Optode- B	Aanderaa Optode 3835	719	11/21/07	Collected
Nitrate Sensor	MBARI ISUS v3	141	10/11/07	Collected
Flowmeter A	Flocat C-ES45-B003	09061005	01/07/08	Collected
Flowmeter B	Flocat C-ES45-B003	02030692	01/07/08	Collected
AC-S Spectral Attenuation and Absorption Meter	Wetlabs	053	010/10/8	Colected
Sonars				
Knudsen- subbottom	320 B/R	K2K-00-0013	N/A	Collected
ADCP 150 kHz	Broad Band (BB150)	80	N/A	Not Collected
ADCP 75 kHz	Ocean Surveyor	172	N/A	Collected
Multibeam	Seabeam 2112	?	N/A	Collected
Speed log	Sperry	?	N/A	Collected some

Sensor	Description	Serial #	Last Calibration Date	Status
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)	Rockwell	?	N/A	Collected
Glonass	?	?	N/A	Collected
GYRO 1	Sperry MK39 PN 03956-1982416-2	340	?	Collected
GYRO 2	Sperry MK27A 4800880-1	025	N/A	Collected

HLY0802- CTD Sensors

Sensor	Comments	Serial #	Last service/ Calibration Date	Status
CTD fish	SBE 911plus	639	01/18/08	
Pressure Sensor #1	Digiquartz with TC	83012	01/18/08	Collected
Temperature #1	SBE3- Primary	2855	01/21/08	Collected
Temperature #2	SBE3- Secondary	2796	01/27/08	Collected
Conductivity #1	SBE4- Primary	2568	01/18/08	Collected
Conductivity #2	SBE4- Secondary	2561	01/18/08	Collected
Pump	SBE5 Primary	3115	01/08	NA
Pump	SBE5 Secondary	3112	01/08	NA
Deck Unit	SBE 11-Plus V2	0417	12/07	NA
Altimeter	PSA916	843	01/08	Collected
Oxygen	SBE43	458	12/12/07	Collected
Fluorometer	Chelsea-Aquatrack3	088234	03/07	Collected
Transmisometer	Wetlabs	CST-390DR	01/08	Collected
PAR	Bioshperical QSP2300	70115	01/07	Collected
Carousel	SBE32- 12 place	347	01/08	NA

HLY0802 Sensor Calculations

The coefficients for temperature, conductivity, fluorometer and turbidity sensors can be found in the calibrations sheets below in the Appendix.

Calculating Temperature – ITS-90

T = decimal equivalent of bytes 1-4
Temperature Frequency: f = T/19 +2100
Temperature = $1/\{g + h[ln(f_0/f)] + i[ln^2(f_0/f)] + j[ln^3(f_0/f)]\} - 273.15$ (°C)

Calculating Conductivity – ITS-90

C = decimal equivalent of bytes 5-8
Conductivity Frequency f = sqrt(C*2100+6250000)
Conductivity = $(g + hf^2 + if^3 + jf^4)/[10(1 + \delta t + \varepsilon p)]$ (siemens/meter)
t = temperature (°C); p = pressure (decibars); δ = Ctcor; ε = CPcor

Calculating Fluorometry Voltage

f = decimal equivalent of bytes 15-17
Fluorometry Voltage = f/819

Calculating Transmittance

V_{dark} = 0.058 V
V_{ref} = 4.765 V
t = decimal equivalent of bytes 18 – 20
Transmissometer Voltage (V_{signal}) = t/819
% Transmittance = (V_{signal} – V_{dark}) / (V_{ref} - V_{dark})

Calculating PAR for surface PAR

raw data = mV
calibration scale = 6.08 V/(μEinstiens/cm ^{2}sec)
offset (V_{dark}) = 0.3 mV
(*raw* mV - V_{dark})/scale x 10^4 cm^2/m^2 x 10^{-3} V/mV= μEinstiens/m^2sec
or
(*data* mV – 0.3 mV) x 1.65 (μEinstiens/m^2sec)/mV = μEinstiens/m^2sec

Calculating Pyrgeometer Values

V = Eppley PIR Thermopile voltage

S = Sensitivity (Calibration factor from Eppley Cal sheet)

S = 3.32

J = Stefan-Boltzmann Constant

J = 5.6697e-8

B = [absorption constant (for Eppley Black paint formula) 0.985 / dome glass IR transmission 0.5]

B= 3.5 for Stock Eppley PIR

Tb = Eppley Body Temperature in degrees Kelvin

Td = Eppley Dome Temperature in degrees Kelvin

Tb and Td calculated as follows:

T = 1/ (a + ln(Vo/Irt)*(b + c*(ln(Vo/Irt)**2)));

Irt = (Vref-Vin)/R1

On Healy R1 = 82500 Vref = 5.0

a= 0.0010295 b= 0.0002391 c = 1.568e-7

$$W/M2 = V/S + (J * Tb^4) + (B*J*(Tb^4 - Td^4))$$

Calibrations

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

Meteorology & Radiometers

R.M. Young Wind Bird, Starboard

Serial # L001

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

Serial # L001

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

Barometer

Serial # BP01643

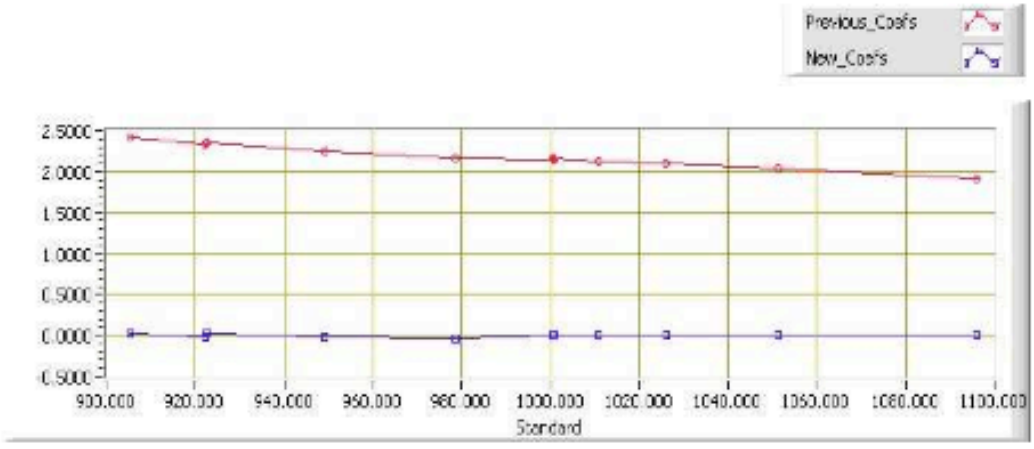
Baro Pres Calibration Report
STS/ODF Calibration Facility

SENSOR SERIAL NUMBER: BP01643
CALIBRATION DATE: 22-Feb-08
SENSOR ID: BPR80
Mfg: RM Young Model: 612011
Previous Cal Date: 01-Jan-00
Calibration Tech: CM
CALIBRATION AT 25.0 DegC

A= 5.98528E+1
B= 8.02635E+2

Calibration Standard: Mfg: Paroscientific Model: 765-16B s/n: 101778
Polynomial Order = 1
Xcalc = A*X+B

SENSOR VOLTS	STANDARD DATA	SENSOR New_Coefs	SPRT-INST Prev_Coefs	SPRT-INST New_Coefs
4.901	1095.960	1095.953	1.920	0.007
4.151	1051.090	1051.086	2.028	0.004
3.731	1025.970	1025.963	2.092	0.007
3.475	1010.640	1010.645	2.118	-0.005
3.306	1000.490	1000.479	2.159	0.011
3.314	1000.990	1000.986	2.151	0.004
2.939	978.480	978.517	2.165	-0.037
2.445	948.980	949.001	2.254	-0.021
2.004	922.570	922.555	2.355	0.015
1.998	922.190	922.205	2.326	-0.015
1.713	905.210	905.180	2.413	0.030



Air Temperture / Relative Humidity

Serial # 13352

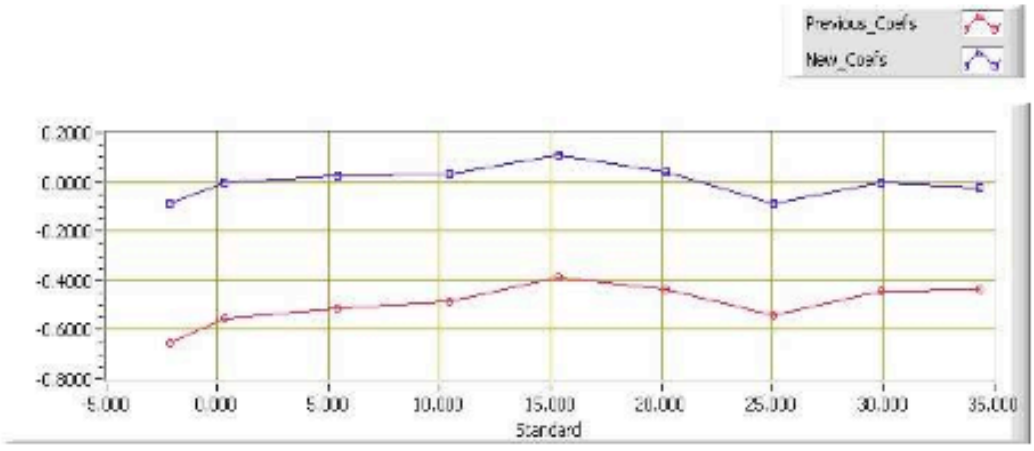
Air Temperature Calibration Report
STS/ODF Calibration Facility

SENSOR SERIAL NUMBER: 13352
CALIBRATION DATE: 22-Feb-08
SENSOR ID: HRH17
Mfg: RM Young Model: 41382V
Previous Cal Date: 01-Jan-2000
Calibration Tech: CM

A= 1.01413E+2
B= -5.07642E+1

Calibration Standard: Mfg: Seabird Model: SBE35 s/n: 0006
Polynomial Order = 1
Xcalc = A*X+B

SENSOR	STANDARD DATA	SENSOR New_Coefs	SPRT-INST Prev_Coefs	SPRT-INST New_Coefs
0.480	-2.122	-2.035	-0.652	-0.087
0.504	0.337	0.338	-0.557	-0.001
0.554	5.421	5.398	-0.513	0.023
0.603	10.448	10.418	-0.485	0.030
0.651	15.345	15.235	-0.386	0.110
0.699	20.190	20.154	-0.439	0.036
0.748	25.029	25.113	-0.539	-0.084
0.796	29.914	29.920	-0.442	-0.006
0.840	34.361	34.382	-0.439	-0.021



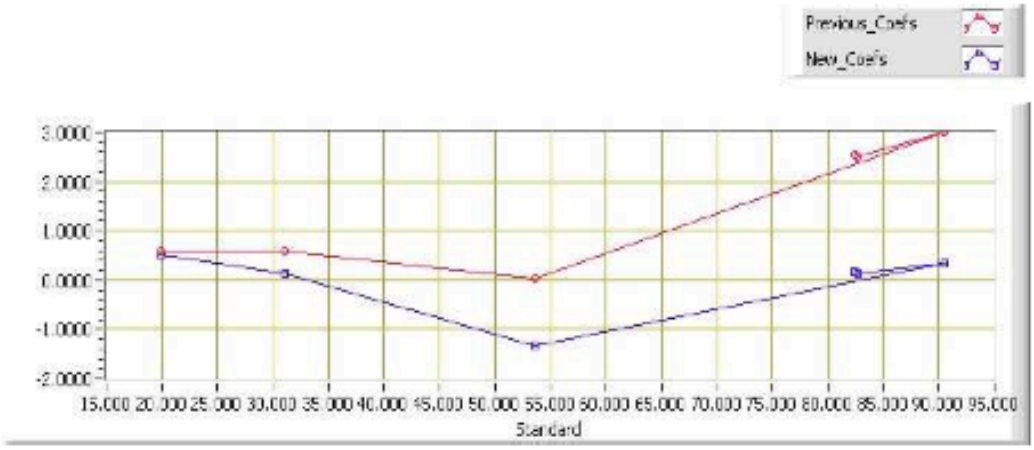
HUMIDITY Calibration Report
STS/ODF Calibration Facility

SENSOR SERIAL NUMBER: 13352
CALIBRATION DATE: 24-Feb-08
SENSOR ID: HRH17
Mfg: RM Young Model: 41382V
Previous Cal Date: 01-Jan-2000
Calibration Tech: CM

A= 1.04836E+2
B= -6.79727E-1

Calibration Standard: Mfg: GE Sensing Model: Humilab s/n: 0240507
Polynomial Order = 1
Xcalc = A*X+B

SENSOR	STANDARD DATA	SENSOR New_Coefs	SPRT-INST Prev_Coefs	SPRT-INST New_Coefs
0.791	82.450	82.266	2.539	0.184
0.794	82.710	82.560	2.516	0.150
0.866	90.460	90.108	2.994	0.352
0.530	53.570	54.904	0.020	-1.334
0.301	31.000	30.876	0.599	0.124
0.192	19.920	19.396	0.579	0.524



PAR
Serial # 20270

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/cm²sec

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

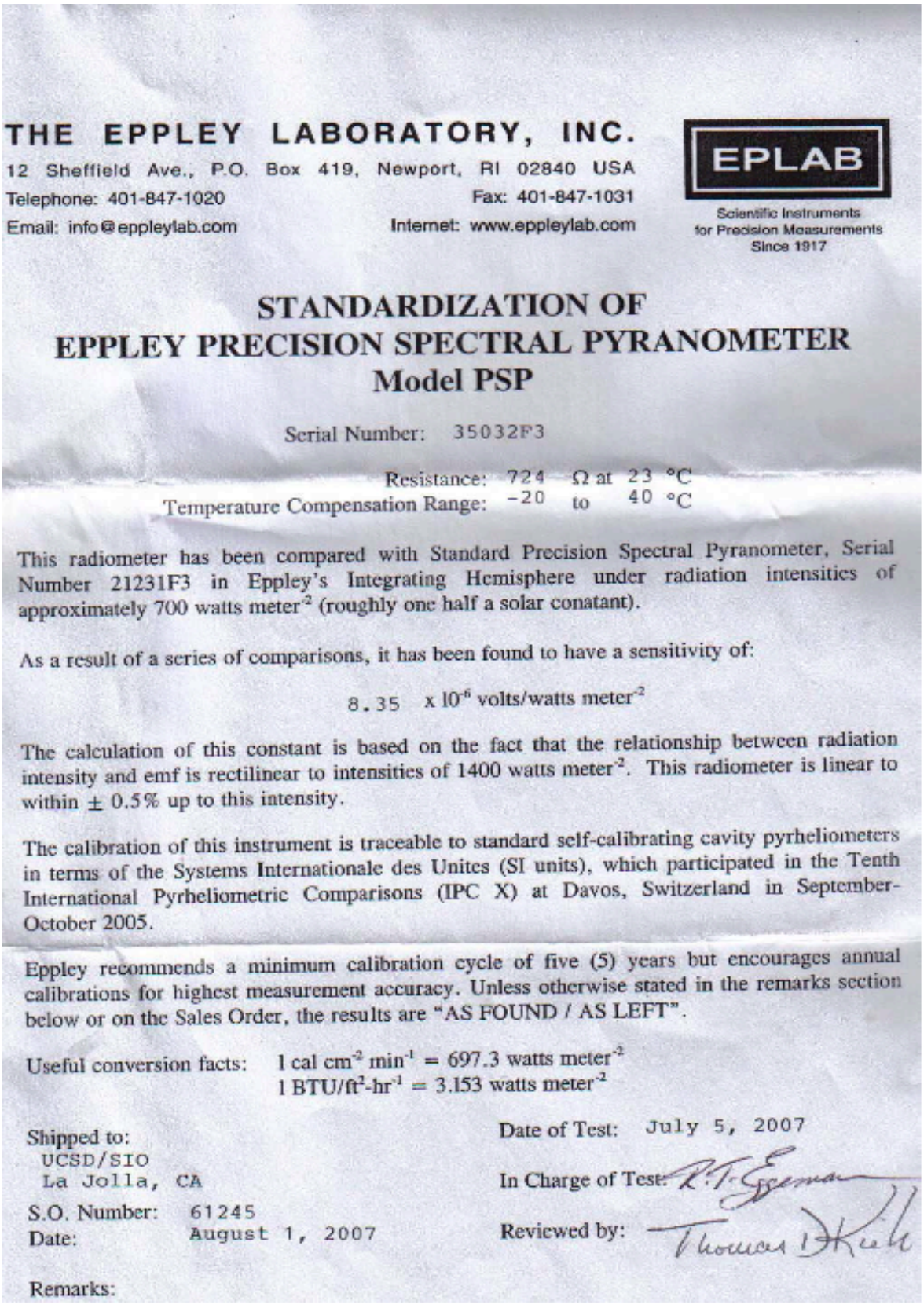
Dry:	1.00E-17	V/(quanta/cm²sec)
	6.04E+00	V/(uE/cm²sec)

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

Shortwave Radiation Pyranometer

Serial # 35032F3



THE EPPLEY LABORATORY, INC.
12 Sheffield Ave., P.O. Box 419, Newport, RI 02840 USA
Telephone: 401-847-1020 Fax: 401-847-1031
Email: info@eppleylab.com Internet: www.eppleylab.com

EPLAB
Scientific Instruments for Precision Measurements Since 1917

STANDARDIZATION OF EPPLEY PRECISION SPECTRAL PYRANOMETER Model PSP

Serial Number: 35032F3

Resistance: 724 Ω at 23 °C
Temperature Compensation Range: -20 to 40 °C

This radiometer has been compared with Standard Precision Spectral Pyranometer, Serial Number 21231F3 in Eppley's Integrating Hemisphere under radiation intensities of approximately 700 watts meter^{-2} (roughly one half a solar conatant).

As a result of a series of comparisons, it has been found to have a sensitivity of:

8.35 x 10^{-6} volts/watts meter^{-2}

The calculation of this constant is based on the fact that the relationship between radiation intensity and emf is rectilinear to intensities of 1400 watts meter^{-2}. This radiometer is linear to within ± 0.5% up to this intensity.

The calibration of this instrument is traceable to standard self-calibrating cavity pyrheliometers in terms of the Systems Internationale des Unites (SI units), which participated in the Tenth International Pyrheliometric Comparisons (IPC X) at Davos, Switzerland in September-October 2005.

Eppley recommends a minimum calibration cycle of five (5) years but encourages annual calibrations for highest measurement accuracy. Unless otherwise stated in the remarks section below or on the Sales Order, the results are "AS FOUND / AS LEFT".

Useful conversion facts: 1 cal cm^{-2} min^{-1} = 697.3 watts meter^{-2}
1 BTU/ft^2-hr^{-1} = 3.153 watts meter^{-2}

Shipped to:
UCSD/SIO
La Jolla, CA

Date of Test: July 5, 2007

In Charge of Test: R. T. Eppley

S.O. Number: 61245
Date: August 1, 2007

Reviewed by: Thomas D Kirk

Remarks:

Longwave Radiation Pyrgeometer

Serial # 34955F3

THE EPPLEY LABORATORY, INC.
12 Sheffield Ave., P.O. Box 419, Newport, RI 02840 USA
Telephone: 401-847-1020 Fax: 401-847-1031
Email: info@eppleylab.com Internet: www.eppleylab.com

EPLAB
Scientific Instruments for Precision Measurements Since 1917

STANDARDIZATION OF EPPLEY PRECISION INFRARED RADIOMETER Model PIR

Serial Number: 34955F3

Resistance: 708 Ω at 23 °C
Temperature Compensation Range: -20 to 40 °C

This pyrgeometer has been compared against Eppley's Blackbody Calibration System under radiation intensities of approximately 200 watts meter^{-2} and an average ambient temperature of 25°C as measured by Standard Omega Temperature Probe, RTD#1.

As a result of a series of comparisons, it has been found to have a sensitivity of:

3.32 x 10^{-6} volts/watts meter^{-2}

The calculation of this constant is based on the fact that the relationship between radiation intensity and emf is rectilinear to intensities of 700 watts meter^{-2}. This radiometer is linear to within ±1.0% up to this intensity.

The calibration of this instrument is traceable to the International Practical Temperature Scale (IPTS) through a precision low-temperature blackbody.

Eppley recommends a minimum calibration cycle of five (5) years but encourages annual calibrations for highest measurement accuracy. Unless otherwise stated in the remarks section below or on the Sales Order, the results are "AS FOUND / AS LEFT".

Shipped to:
UCSD/SIO
La Jolla, CA

S.O. Number: 61272
Date: August 17, 2007

Date of Test: May 31, 2007

In Charge of Test: P.T. Eppley

Reviewed by: Thomas J. Kub

Remarks:

Jack Staff MET Station

Serial # 101757

Paroscientific, Inc.
Pressure Instrument Configuration

SN: 101757 Part Number: 1539-004 Model: MET3A Port:

Calibration Date: 27-Jun-07 Report No: 7238 Technician: WMR

Pressure Range: 500 to 1100 hPa Temperature Range: -50 to -60

Customer: Scripps Inst. of Oceanography Report Date: 27-Jun-07

Address : 8825 Biological Grade Sales Order: 24367

La Jolla, CA 92037 USA S/R Number :

Configuration

BL: 0	PT: N
BR: 9600	QD: -
DD: -	QO: -
DL: -	SL: -
DM: -	SN: 101757
DO: -	ST: -
DP: -	SU: -
ID: 01	TI: -
IM: -	TR: 00952
LL: -	TU: -
LH: -	UF: 1.000000
MC: Y	UL: -
MD: 0	UM: -
MN: -	UN: 3
OP: -	US: -
PP: -	VR: M1.02
PI: -	ZI: -
PL: -	ZS: -
PO: -	ZL: -
PR: 00238	ZV: -
PS: -	

Calibration Coefficients

U0:	5.766908	µsec
Y1:	-4015.975	deg C / µsec
Y2:	-17065.37	deg C / µsec²
Y3:	-140256.4	deg C / µsec³
C1:	94.87589	psi
C2:	3.545282	psi / µsec
C3:	-114.9551	psi / µsec²
D1:	0.0345157	
D2:	0.0000000	
T1:	28.00064	µsec
T2:	0.837535	µsec / µsec
T3:	16.78157	µsec / µsec²
T4:	-150.7085	µsec / µsec³
T5:	-129.729	µsec / µsec⁴
TC:	0.6782145	
PA:	0.0000000	
PM:	1.0000000	

Met3/3A Coefficients

R1:	-0.551136	R2:	0.84
F1:	-264.3591	F2:	3.152
G1:	12.56743	G2:	0.00216
H1:	RHT894	H2:	0.0036
K1:	01842	K2:	0.00511
M1:	1	M2:	1
Z1:	0	Z2:	0

Paroscientific, Inc.
4500 148th Ave. N.E. Redmond, WA 98052
Phone: (425)883-8700 Fax: (425)867-5407
Web:http://www.paroscientific.com
Email: support@paroscientific.com

Prepared by

PARO TEST 17

Digiquartz® Technology

Page 1 of 1

Paroscientific, Inc.
4500 148th Avenue N. E. Facsimile: (425) 867-5407
Redmond, WA 98052-5194 Email:salessupport@paroscientific.com
Telephone: (425) 883-8700 Internet:http://www.paroscientific.com

CERTIFICATE OF CALIBRATION

TRANSDUCER MODEL: MET3A

SERIAL NUMBER: 101757

The Paroscientific transducer(s) identified above has been calibrated and tested with one or more of the following primary pressure and temperature standards. All have traceability to the National Institute of Standards and Technology.

Bell and Howell Primary Pressure Standard

Pneumatic Absolute or Gauge Dead Weight Tester Part Number: 6-201-0001, S/N 4034 and S/N 1014

___ Piston/Cylinder: 6-001-0002, P2-919/C2-1523,
Weight Set 1: 6-002-0002
Range: 1.5 to 50 psi [10 to 345 kPa]
Accuracy: 0.010 percent of reading

✓ Piston/Cylinder: 6-001-0002, P2-652/C2-1378,
Weight Set 2: 6-002-0002
Range: 1.5 to 50 psi [10 to 345 kPa]
Accuracy: 0.010 percent of reading

___ Piston/Cylinder: 6-001-0001, P1-949/C1-922 ,
Weight Set 2: 6-002-0002
Range: 0.3 to 5 psi [2 to 34 kPa]
Accuracy: 0.015 percent of reading

DH Primary Pressure Standard

Pneumatic Absolute or Gauge Dead Weight Tester Part Number: PG7601 S/N 161

___ Piston/Cylinder: S/N 305, Mass Set: S/N 2052
Range: 0.7 to 50 psi [5 to 345 kPa] absolute mode, 0.29 to 50 psi [2 to 345 kPa] gauge mode
Accuracy: 0.002 percent of reading

DH Primary Pressure Standard

Pneumatic Gauge Dead Weight Tester, Model 5203, S/N 5557

___ Piston/Cylinder: S/N 4845, Mass Sets: S/N 2032, S/N 3293
Range: 20 to 1,600 psi [0.14 to 11 MPa]
Accuracy: 0.005 percent of reading

DH Primary Pressure Standard

Oil Operated Gauge Dead Weight Tester, Model 5306, S/N 3505

___ Piston/Cylinder: S/N 3375, Mass Set: S/N 2032
Range: 40 to 20,000 psi [0.3 to 138 MPa]
Accuracy: 0.01 percent of reading above 200 psi [1.4 MPa]
or 0.02 psi [0.14 kPa] at lower pressure

___ Piston/Cylinder: S/N 3511, Mass Set: S/N 2032
Range: 145 to 72,500 psi [1 to 500 MPa]
Accuracy: 0.02 percent of reading above 725 psi [5 MPa]
or 0.145 psi [1 kPa] at lower pressure

Hart Scientific Precision Thermometer (MET3A only)

✓ Black Stack model 1560 S/N 97568, PRT Scanner model 2562 S/N A34523, Temperature Probe Model A1959: S/Ns 4424A-02, 4424A-04, 4424A-05, 4424A-06 and 5177C-02.
Range: -50° to 60° C.
Accuracy: .015°C.

PARO TEST 17

Tested By: _____ DATE 6-27-07

Underway Ocean Flow through Sensors

Seabird ThermoSalinograph

Serial # 0215

Temperature

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: 0215
CALIBRATION DATE: 01-Aug-07

SBE 45 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

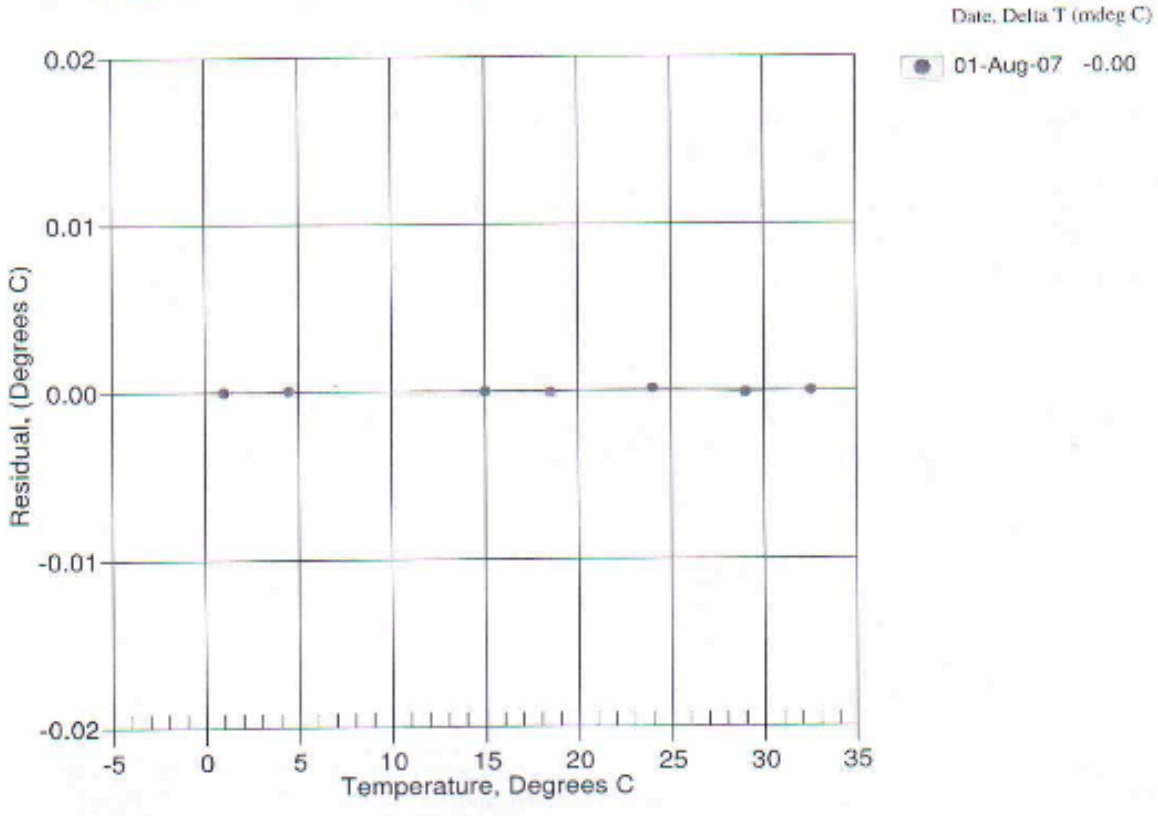
ITS-90 COEFFICIENTS

a0 = -1.277283e-006
a1 = 2.800988e-004
a2 = -2.767325e-006
a3 = 1.635307e-007

BATH TEMP (ITS-90)	INSTRUMENT OUTPUT	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	657810.8	0.9999	-0.0001
4.5000	562392.5	4.5000	0.0000
15.0000	358324.1	14.9999	-0.0000
18.5001	310251.4	18.5000	-0.0001
24.0000	248855.2	24.0001	0.0002
29.0001	204884.7	29.0000	-0.0001
32.4999	179404.2	32.5000	0.0000

Temperature ITS-90 = $1/\{a0 + a1[ln(n)] + a2[ln^2(n)] + a3[ln^3(n)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature



Conductivity

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: 0215
CALIBRATION DATE: 01-Aug-07

SBE 45 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

COEFFICIENTS:

g =	-9.817728e-001	CPcor =	-9.5700e-008
h =	1.408372e-001	CTcor =	3.2500e-006
i =	-2.671624e-004	WBOTC =	2.4202e-005
j =	3.431539e-005		

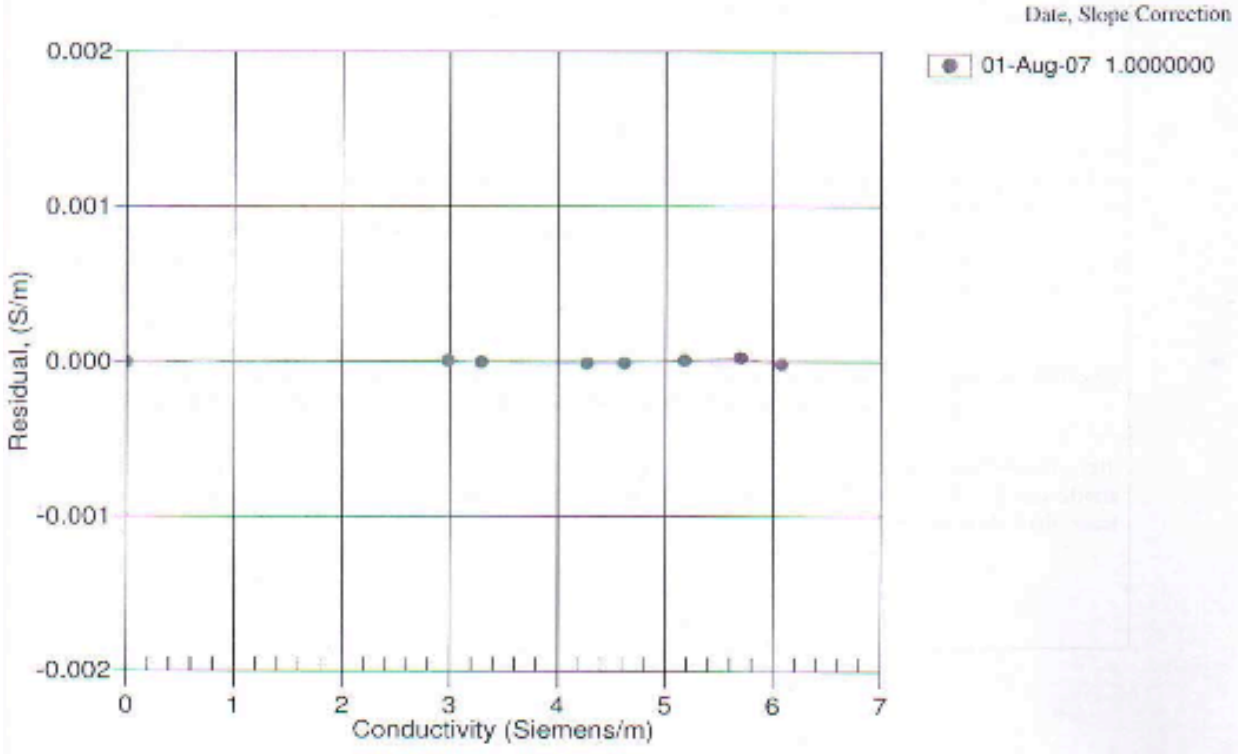
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2641.45	0.00000	0.00000
1.0000	34.8934	2.38132	5303.53	2.38193	0.00001
4.5000	34.8731	3.28955	5504.48	3.28955	-0.00000
15.0000	34.8297	4.27308	6101.73	4.27307	-0.00001
18.5001	34.8207	4.61890	6297.94	4.61889	-0.00001
24.0000	34.8111	5.17793	6602.44	5.17794	0.00001
29.0001	34.8062	5.70086	6874.67	5.70088	0.00002
32.4999	34.8046	6.07417	7062.34	6.07415	-0.00002

f = INST FREQ * sqrt(1.0 + WBOTC * t) / 1000.0

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

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

Residual = instrument conductivity - bath conductivity



Remote Sea Temperature (Sea Chest)

Serial # 4063

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: 4063
CALIBRATION DATE: 13-Dec-07

SBE3 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

g = 4.29921671e-003
h = 6.36406488e-004
i = 2.06912541e-005
j = 1.52019386e-006
f0 = 1000.0

IPTS-68 COEFFICIENTS

a = 3.68121265e-003
b = 5.99688417e-004
c = 1.61521904e-005
d = 1.52164480e-006
f0 = 2721.791

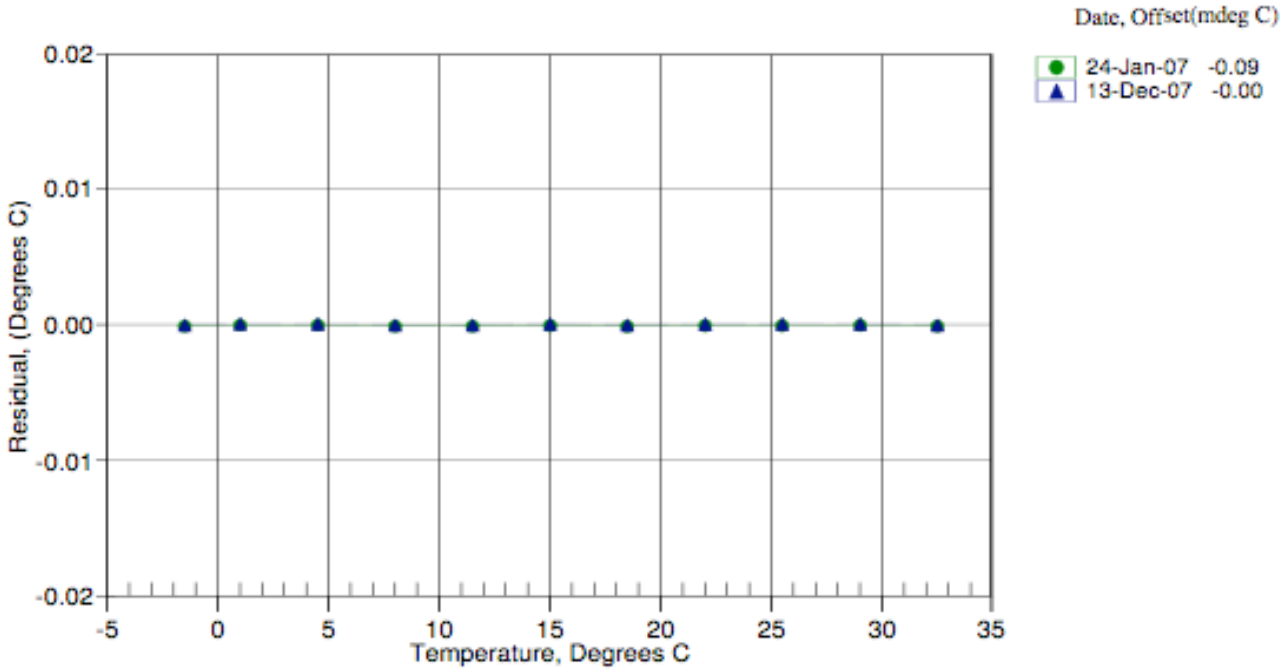
BATH TEMP (ITS-90)	INSTRUMENT FREQ (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
-1.5000	2721.791	-1.5000	-0.00002
1.0000	2878.781	1.0000	0.00003
4.5000	3109.455	4.5000	0.00002
8.0000	3353.176	8.0000	-0.00001
11.5000	3610.316	11.5000	-0.00001
15.0000	3881.236	15.0000	0.00002
18.5000	4166.278	18.5000	-0.00004
22.0000	4465.803	22.0000	0.00000
25.5000	4780.134	25.5000	0.00003
29.0000	5109.596	29.0000	0.00002
32.5000	5454.501	32.5000	-0.00002

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

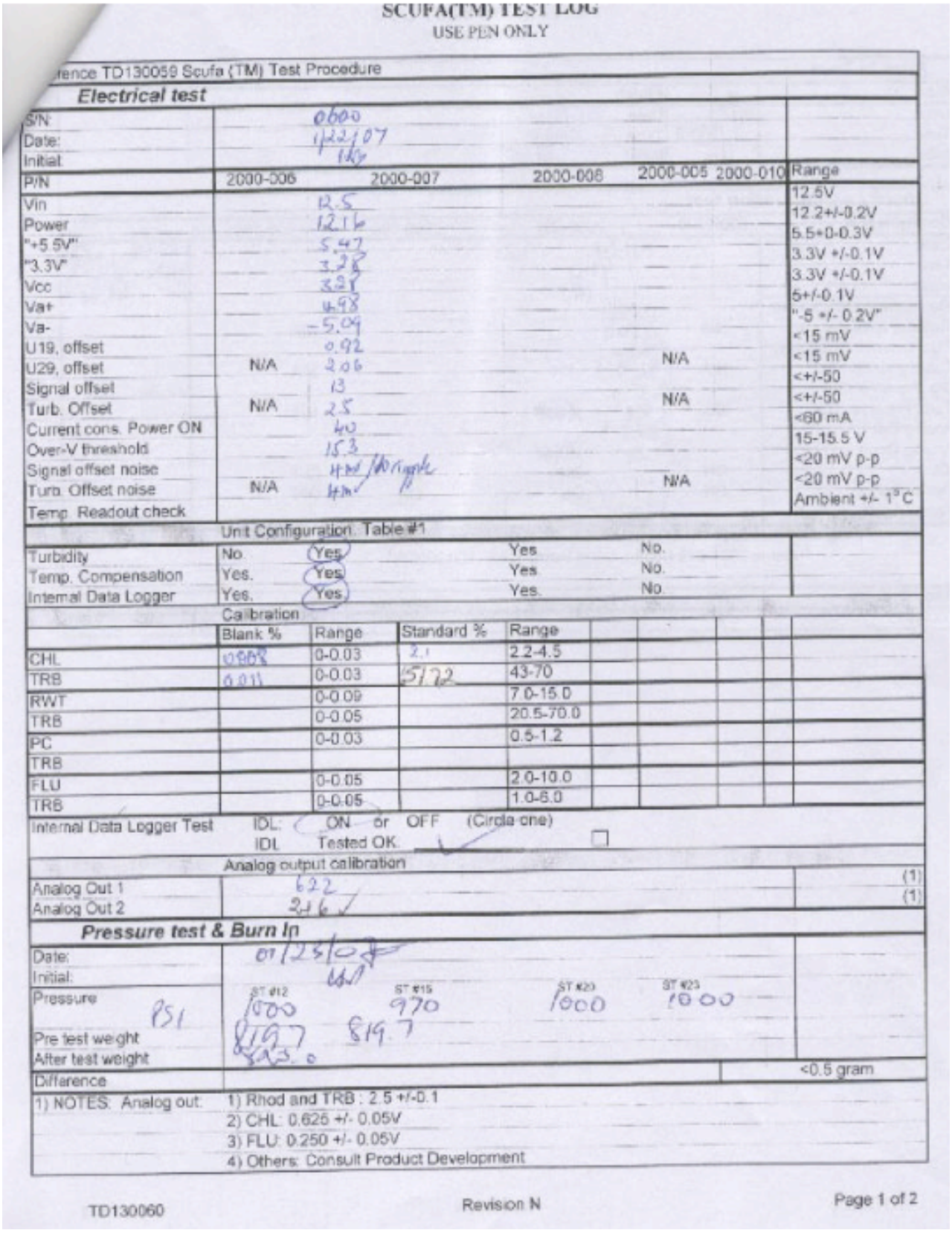
Following the recommendation of JPOTS: T_{68} is assumed to be 1.00024 * T_{90} (-2 to 35 °C)

Residual = instrument temperature - bath temperature



Fluorometer B

Serial # 0600



SCUFA(TM) TEST LOG

USE PEN ONLY

rence TD130059 Scufa (TM) Test Procedure

Electrical test

S/N:	0600					
Date:	1/22/07					
Initial:	HG					
P/N	2000-006	2000-007	2000-008	2000-005	2000-010	Range
Vin	12.5					12.5V
Power	12.16					12.2+/-0.2V
"+5.5V"	5.47					5.5+0-0.3V
"3.3V"	3.28					3.3V +/-0.1V
Vcc	3.28					3.3V +/-0.1V
Va+	4.98					5+/-0.1V
Va-	-5.09					"-5 +/- 0.2V"
U19, offset	0.92					<15 mV
U29, offset	N/A	2.06		N/A		<15 mV
Signal offset	13					<+/-50
Turb. Offset	N/A	2.5		N/A		<+/-50
Current cons. Power ON	40					<60 mA
Over-V threshold	15.3					15-15.5 V
Signal offset noise	4mV/100ripple					<20 mV p-p
Turb. Offset noise	N/A	4mV		N/A		<20 mV p-p
Temp. Readout check						Ambient +/- 1°C

Unit Configuration: Table #1					
Turbidity	No. (Yes)		Yes	No.	
Temp. Compensation	Yes. (Yes)		Yes	No.	
Internal Data Logger	Yes. (Yes)		Yes.	No.	

Calibration									
	Blank %	Range	Standard %	Range					
CHL	0.008	0-0.03	2.1	2.2-4.5					
TRB	0.011	0-0.03	51.22	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		1.0-5.0					

Internal Data Logger Test — IDL: (ON or OFF (Circle one)

IDL Tested OK ☐

Analog output calibration

Analog Out 1	622	(1)
Analog Out 2	2.46 ✓	(1)

Pressure test & Burn In

Date:	01/23/07				
Initial:	HG				
Pressure PSI	ST #12 1000	ST #15 970	ST #20 1000	ST #23 1000	
Pre test weight	819.7	819.7			
After test weight	823.0				
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

SCUFA(TM) TEST LOG

USE PEN ONLY

Burn In Test			
Start		Finish	
Date:	01/23	Date:	01/24
Time:	1000	Time:	9:00
Initial:	MS	Initial:	MS

Check / configuration test					
Configuration	2000-006	2000-007	2000-008	2000-005 2000-010	
Date:		01/24			Ref'd Turb. BLK = 0.013 Turb = 48.92
Time:		9:00			
Initial:		MS			
Fluorescence (Black Rod)		0.021			
Turbidity (Black Rod)	N/A	0.000		N/A	
Fluorescence (Solid Std)		(10.00)			
Tubidity (Solid Std)	N/A	(92.91) 100		N/A	
Sig. Pre-amp. Out		(-5.7)			<+/-50
Turb. Pre-amp. Out	N/A	(5)		N/A	<+/-50
Analog Out 1		(622)			(1)
Analog Out 2		(2.24) 2246			(1)
IDL	ON	ON	ON	OFF	
Temp. Comp.	ON	ON	ON	OFF	
Temp. Readout check		23.7°C			Ambient +/- 1°C BSL

FINAL INSTRUMENT CONFIGURATION (FOR CUSTOM ORDERS ONLY)

Refer to 2000-010 Configuration Instructions (TD130063)

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

SCUFA TEST STATUS

INIT. MB

1. S/N 0600 MODEL # 2000-007 S/O # 5357
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 1/23/07 TIME 10:00
DATE OUT 1/24/07 TIME 9:00

WEIGHT: ☑ (TEST LOG)

POST BURN-IN: ☐ (TEST LOG)

LABEL: ☐

BOX: ☐ 819.7

COMMENTS: _____

TD13006(TD130117 Rev. A

Page 3 of 2

Oxygen Sensor A

Serial # 1307

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: 1307
CALIBRATION DATE: 28-Sep-07p

SBE 43 OXYGEN CALIBRATION DATA

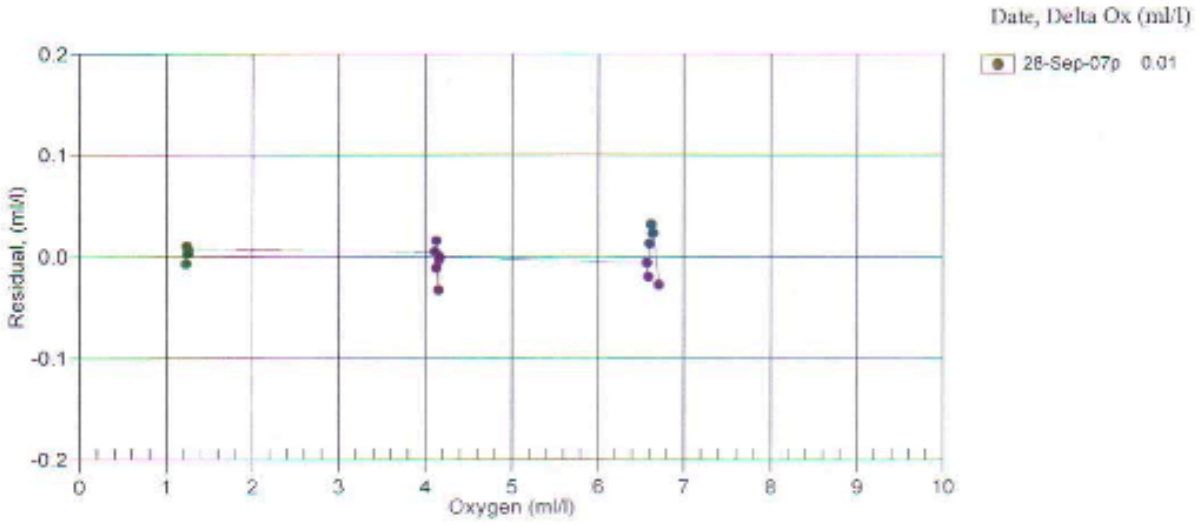
COEFFICIENTS

Soc = 0.3834
Boc = 0.0000
Voffset = -0.4781

TCor = 0.0025
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	0.805	1.22	-0.01
1.24	12.00	0.01	0.898	1.25	0.01
1.24	20.00	0.01	0.966	1.25	0.01
1.24	26.00	0.01	1.016	1.25	0.00
1.25	6.00	0.00	0.848	1.25	0.00
1.25	30.00	0.01	1.057	1.26	0.01
4.11	20.00	0.01	2.086	4.11	0.00
4.13	26.00	0.01	2.254	4.11	-0.01
4.13	12.00	0.01	1.870	4.14	0.02
4.15	2.00	0.00	1.583	4.11	-0.03
4.15	30.00	0.01	2.382	4.15	-0.00
4.15	6.00	0.00	1.705	4.15	-0.00
6.57	30.00	0.01	3.491	6.57	-0.01
6.58	26.00	0.01	3.311	6.56	-0.02
6.60	20.00	0.01	3.061	6.61	0.01
6.62	12.00	0.01	2.712	6.65	0.03
6.64	6.00	0.00	2.447	6.67	0.02
6.71	2.00	0.00	2.273	6.68	-0.03

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



CTD Sensors

Pressure Sensor

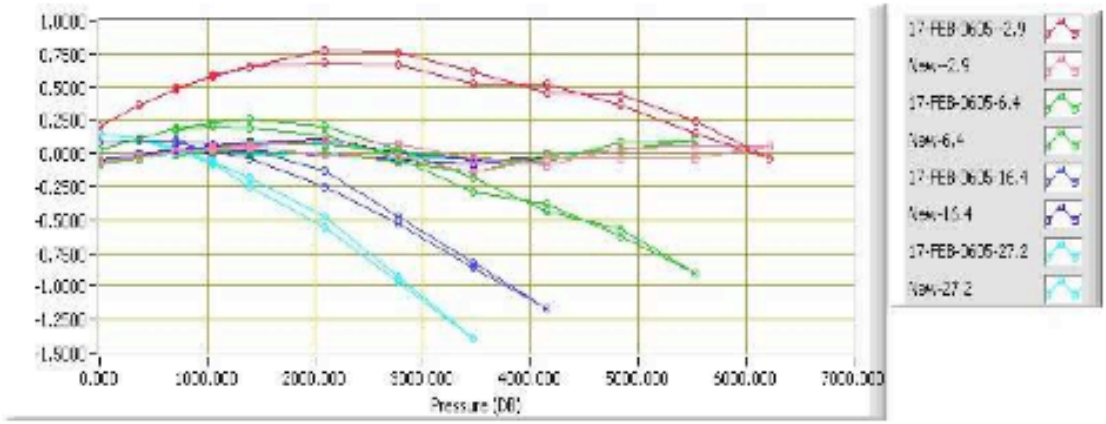
Serial # 83012

Pressure Calibration Report
STS/ODF Calibration Facility

SENSOR SERIAL NUMBER: 639
CALIBRATION DATE: 18-JAN-2008
Mfg: Seabird Model: SBE9P CTD Prs s/n: 83012

C1= -3.841449E+4
C2= 4.630485E-1
C3= 1.014581E-2
D1= 3.051116E-2
D2= 0.000000E+0
T1= 3.019016E+1
T2= -1.746821E-4
T3= 4.517296E-6
T4= -9.087207E-9
T5= 0.000000E+0
AD590M= 1.27551E-2
AD590B= -9.09133E+0
Slope = 1.0
Offset = 0.0

Calibration Standard: Mfg: Ruska Model: 2400 s/n: 34336
t0=t1+t2*td+t3*td*td+t4*td*td*td
w = 1-t0*t0*f*f
Pressure = (0.6894759*((c1+c2*td+c3*td*td)*w*(1-(d1+d2*td)*w)-14.7)



Temperature #1

Serial # 2855

Temperature Calibration Report
STS/ODF Calibration Facility

SENSOR SERIAL NUMBER: 2855
CALIBRATION DATE: 21-JAN-2008
Mfg: Seabird Model: SBE3Plus
Previous Cal Date: 24-Jan-07
Calibration Tech: CM

g= 4.35951439E-3
h= 6.45648951E-4
i= 2.38075037E-5
j= 2.35385504E-6
f0 = 1000.0
Slope = 1.0
Offset = 0.0

Calibration Standard: Mfg: ASL Model: F18 s/n: 245-5149
Temperature ITS-90 = 1/{g+h[ln(f0/f)]+i[ln2(f0/f)]+j[ln3(f0/f)]} - 273.15 (°C)

SBE3 Freq	SPRT	SBE3 New_Coefs	SPRT-SBE3 Prev_Coefs	SPRT-SBE3 New_Coefs
5479.6760	28.1875	28.1875	0.00140	0.00002
5798.0010	31.2142	31.2142	0.00189	-0.00002
5174.8630	25.1737	25.1737	0.00101	0.00002
4839.0220	21.7073	21.7073	0.00066	-0.00000
4563.9390	18.7410	18.7410	0.00045	-0.00003
4313.5900	15.9306	15.9306	0.00036	-0.00000
4062.6960	12.9964	12.9964	0.00029	0.00002
3819.2680	10.0242	10.0242	0.00019	-0.00001
3580.6660	6.9771	6.9771	0.00011	-0.00001
3359.2520	4.0167	4.0167	0.00007	0.00004
3216.0510	2.0264	2.0264	-0.00010	-0.00004
3143.3570	0.9916	0.9916	-0.00010	0.00002
3042.0950	-0.4792	-0.4792	-0.00018	0.00003
3003.6410	-1.0471	-1.0471	-0.00029	-0.00003
2934.0140	-2.0888	-2.0888	-0.00036	-0.00001

Temperature #2

Serial # 2796

Temperature Calibration Report
STS/ODF Calibration Facility

SENSOR SERIAL NUMBER: 2796
CALIBRATION DATE: 21-JAN-2008
Mfg: Seabird Model: SBE3Plus
Previous Cal Date: 27-Jan-07
Calibration Tech: CM

g= 4.30545772E-3
h= 6.41541965E-4
i= 2.26535491E-5
j= 2.15838215E-6
f0 = 1000.0
Slope = 1.0
Offset = 0.0

Calibration Standard: Mfg: ASL Model: F18 s/n: 245-5149
Temperature ITS-90 = 1/{g+h[ln(f0/f)]+i[ln2(f0/f)]+j[ln3(f0/f)]} - 273.15 (°C)

SBE3 Freq	SPRT	SBE3 New_Coefs	SPRT-SBE3 Prev_Coefs	SPRT-SBE3 New_Coefs
5034.9080	28.1869	28.1869	0.00129	-0.00001
5327.3120	31.2134	31.2134	0.00145	0.00001
4754.9570	25.1736	25.1736	0.00117	-0.00003
4446.4900	21.7075	21.7075	0.00113	0.00003
4193.8400	18.7414	18.7414	0.00105	0.00000
3963.9100	15.9311	15.9311	0.00097	-0.00004
3733.4680	12.9969	12.9969	0.00098	0.00001
3509.8970	10.0249	10.0248	0.00098	0.00005
3290.7460	6.9777	6.9777	0.00087	-0.00002
3087.3980	4.0175	4.0175	0.00082	-0.00001
2955.8690	2.0273	2.0273	0.00077	-0.00001
2889.1220	0.9928	0.9928	0.00074	-0.00001
2796.0920	-0.4783	-0.4783	0.00068	-0.00002
2760.7580	-1.0463	-1.0463	0.00070	0.00001
2696.7970	-2.0881	-2.0881	0.00067	0.00003

Conductivity #1

Serial # 2568

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: 2568
CALIBRATION DATE: 18-Jan-08

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

G,H,I,J COEFFICIENTS

g = -1.03659721e+001
h = 1.46463602e+000
i = 3.18405740e-004
j = 6.13207682e-005
CPcor = -9.5700e-008 (nominal)
CTcor = 3.2500e-006 (nominal)

A,B,C,D,M COEFFICIENTS

a = 0.84938479e-001
b = 1.48482000e-000
c = -1.03867295e+001
d = 8.28372679e-002
m = 3.0
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)
2.0000	0.0000	0.00000	2.64369	0.00000	0.00000
-1.0000	34.3237	2.61315	3.08747	2.61312	-0.00003
1.0000	34.3240	2.96209	3.29862	2.96208	0.00002
15.0000	34.4362	4.26824	3.87987	4.26858	0.00004
18.5000	34.3309	4.67078	4.17084	4.67071	-0.00006
29.0000	34.3293	5.71877	4.72469	5.71867	-0.00007
32.5000	34.3198	6.09199	4.91777	6.09201	0.00003

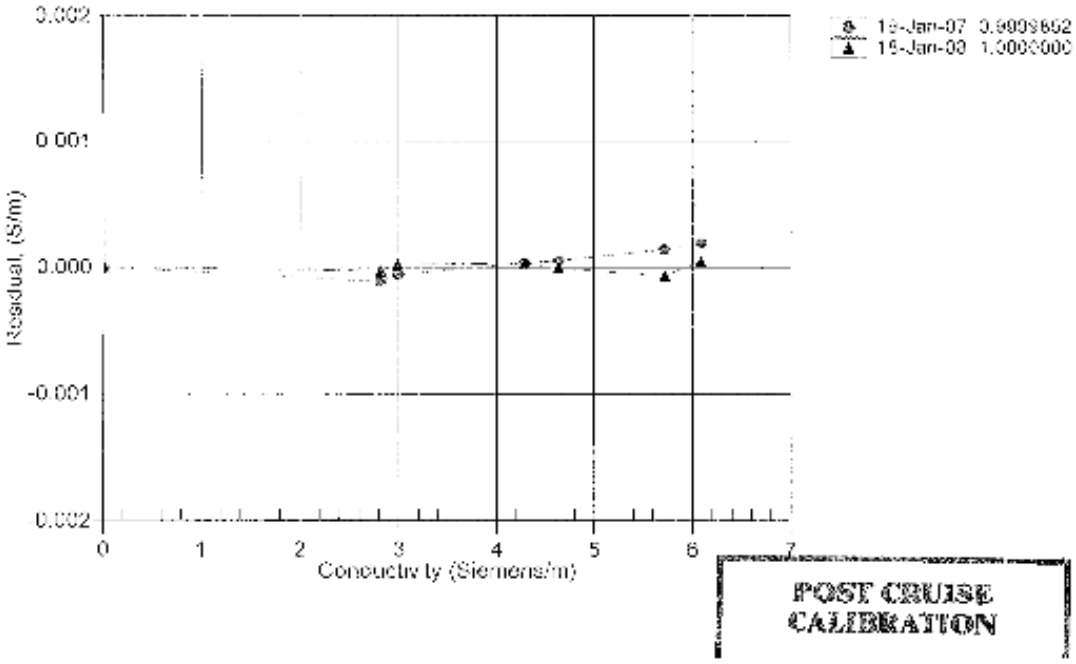
Conductivity = $(g + hf^2 + if^3 + jf^4) / 10(1 + \delta t + \varepsilon p)$ Siemens/meter

Conductivity = $(at^m + bc^3 + c + dc_p) / 10(1 + \varepsilon p)$ Siemens/meter

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

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

Date, Slope Correction



Conductivity # 2

Serial # 2561

SEA-BIRD ELECTRONICS, INC.

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

Phone: (425) 643 - 9866 Fax (425) 643 - 9054 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 2561
CALIBRATION DATE: 18-Jan-08

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

GHIJ COEFFICIENTS

g = -1.0[illegible]e+001
h = 1.03[illegible]e+000
i = -1.0731[illegible]e-003
j = 2.[illegible]e-004
CPcor = -9.5700e-008 (nominal)
CTcor = 3.2500e-006 (nominal)

ABCDM COEFFICIENTS

a = [illegible]e-005
b = 1.[illegible]e+000
c = -1.0[illegible]e+001
d = -[illegible]e-005
m = 4.[illegible]
CPcor = -9.5700e-008 (nominal)

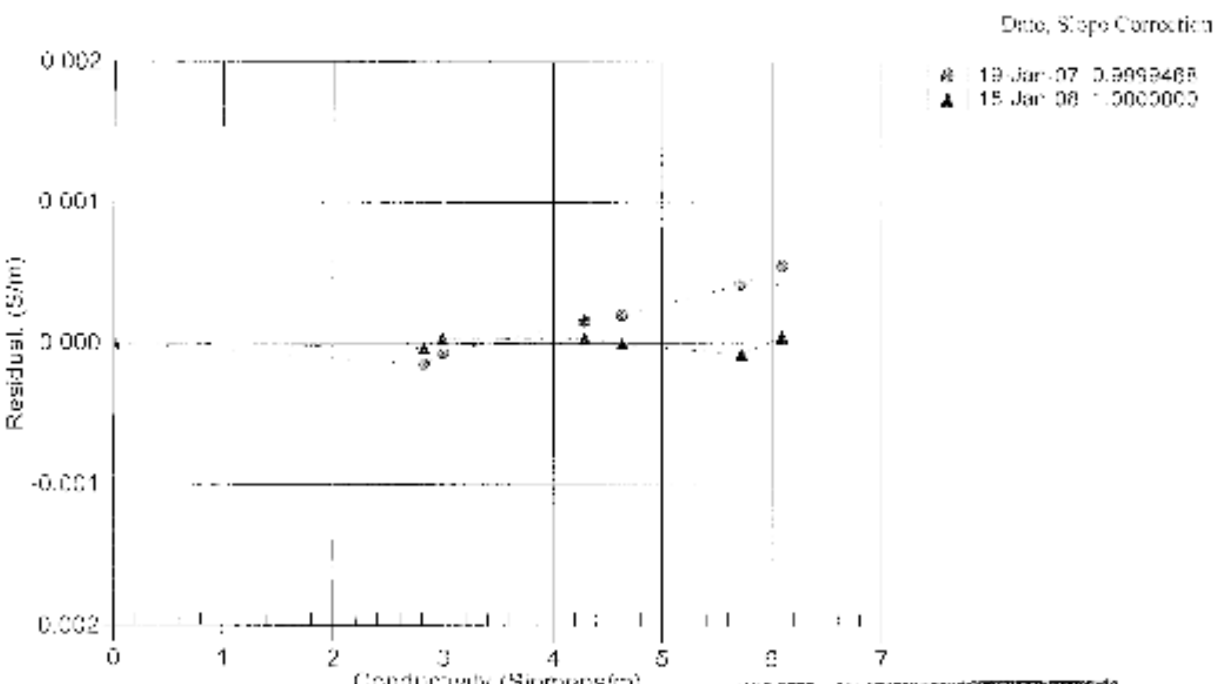
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
0.0000	0.0000	0.00000	2.[illegible]	0.00000	0.00000
-1.0000	34.9[illegible]	2.81[illegible]	4.84880	2.81[illegible]	-0.0000[illegible]
1.0000	34.9[illegible]	2.98506	4.9[illegible]	2.98[illegible]	0.0000[illegible]
15.0000	34.9[illegible]	4.28454	5.715[illegible]	4.28458	0.0000[illegible]
18.5000	34.9330	4.63228	5.90227	4.63228	-0.00000
29.0000	34.9295	5.71[illegible]	6.4[illegible]	5.7[illegible]	0.0000[illegible]
32.5000	34.9195	6.09[illegible]	6.61[illegible]	6.09[illegible]	0.0000[illegible]

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



POST CRUISE CALIBRATION

Oxygen

Serial # 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: 12-Dec-07p

SBE 43 OXYGEN CALIBRATION DATA

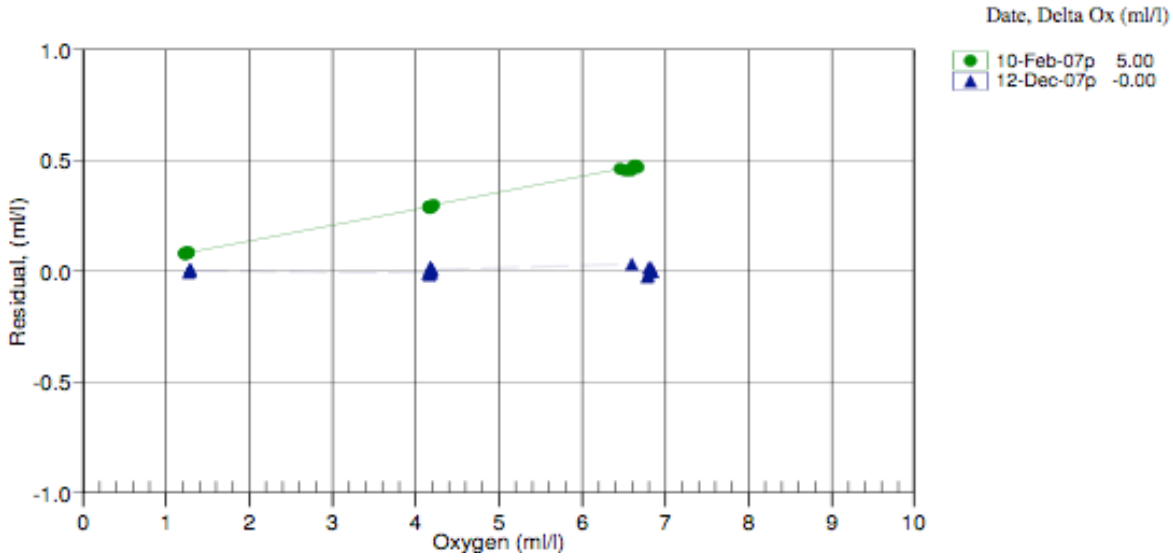
COEFFICIENTS

```
Soc =  0.4060
Boc =  0.0000
Voffset = -0.4927
```

```
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)
1.27	20.00	0.01	0.979	1.27	-0.01
1.28	26.00	0.01	1.037	1.27	-0.01
1.28	12.00	0.01	0.909	1.28	0.00
1.28	2.00	0.00	0.820	1.28	0.00
1.29	6.00	0.00	0.858	1.29	0.01
1.29	30.00	0.01	1.085	1.29	0.00
4.15	26.00	0.01	2.265	4.13	-0.01
4.16	20.00	0.01	2.083	4.15	-0.02
4.17	12.00	0.01	1.847	4.17	0.00
4.18	30.00	0.01	2.419	4.19	0.02
4.19	2.00	0.00	1.556	4.18	-0.01
4.19	6.00	0.00	1.677	4.20	0.01
6.59	30.00	0.01	3.535	6.62	0.03
6.78	20.00	0.01	3.082	6.75	-0.03
6.79	26.00	0.01	3.397	6.77	-0.02
6.80	12.00	0.01	2.706	6.81	0.01
6.82	6.00	0.00	2.420	6.83	0.01
6.84	2.00	0.00	2.234	6.84	-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



Fluorometer

Serial # 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.

Transmisometer

Serial # 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

Serial # 70115

Calibration Date:	01/09/07	**Job No.:**	L9511
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.

Instrument Locations on the Healy

Layout plot of instrument locations

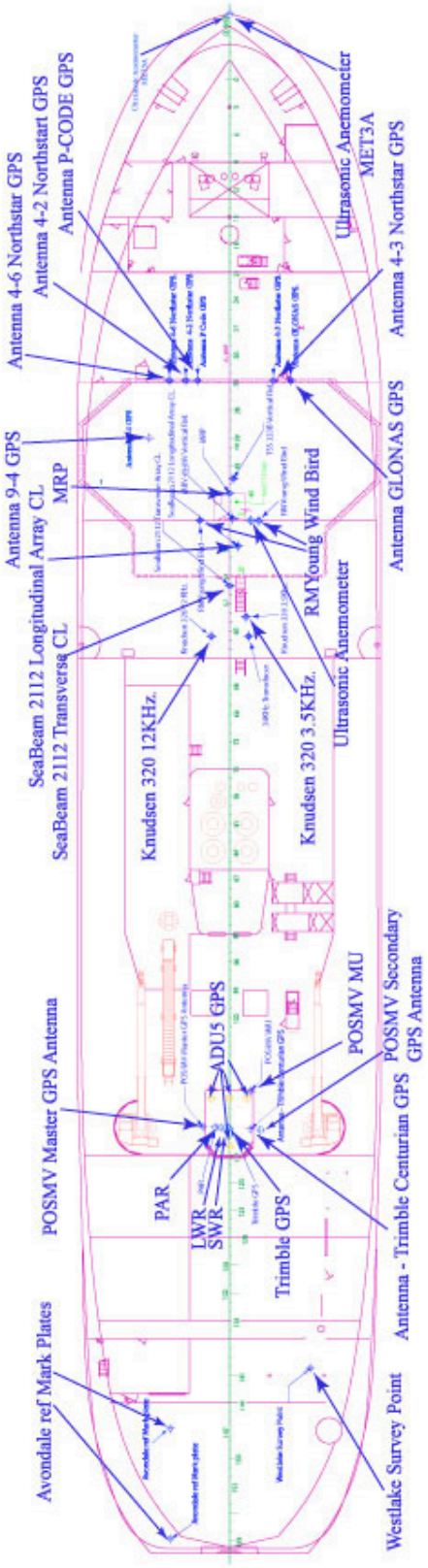


Table of Survey measurements

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

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.

HLY0802 Data DVD Dates

This DVD is the first in a series of DVDs that contain the data from HLY0802 (BEST) from March 29, 2008, to May 6, 2008.

The first DVD has the ASCII data collected underway for Oceanographic, meteorological and navigation sensors for the whole cruise. In the directory Meta_Data are files that describe the data files that are in this data set. In Meta_Data file HLY0802_data.pdf has a description of the data from this cruise. Also the file HLY0802_Sensors.htm(pdf) has the formats of each data type.

The second and subsequent DVDs contain data from the ship's Sonar sensors. This data is the ADCP(s), Knudsen EchoSounder and the SeaBeam data collected underway. This series of disks is written as the cruise progresses and this data becomes large enough to fit on to a DVD. As an example the SeaBeam data for this whole cruise is on all of these DVDs.

For more information about getting a copy of these DVDs or about this cruise please contact:

Chief Scientist: Carin Ashjian
Woods Hole Oceanographic Institution
508-289-3457
cashjian@whoi.edu

Data Archive at LDEO: Bob Arko
arko@ldeo.columbia.edu

DVD Contents by Time:

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.

File Name	*Dates*	*Start time*	*End time*
Media Vol 1	27 March – 06 May 08	17:45	17:00
Media Vol 2	27 March – 06 April 08	17:45	15:00
Media Vol 3	06 April -14 April 08	15:00	08:30
Media Vol 4	14 April -21 April 08	08:30	20:50
Media Vol 5	21 April - 27 April 08	20:50	14:00
Media Vol 6	27 April - 05 May 08	14:00	18:00
Media Vol 7	05 May - 06 May 08	18:00	17:00