LMG04-02

Cruise Data Report

Feb 12 – March 24, 2004

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Introduction

The LMG data acquisition systems continuously log data from a suite of instrumentation throughout the cruise. This document describes the format of that data and its location on the distribution CDs. It also contains important information that describes how this data was processed and points out instrument failures or other known problems with acquisition.

The data collected during this cruise is distributed on a CD-ROM written in ISO9660 level-1 format. This data format has very strict requirements on filenames and organization. However, it is readable by virtually every computing platform.

All of the data has been archived with the Unix "tar" command and/or compressed using Unix "gzip" compression. Tar files have a ".tar" extension and Gzipped files have a ".gz" extension. Tools are available on all platforms for uncompressing and de-archiving these formats. On Macintosh, Stuffit Expander with DropStuff will open a tar archive and uncompress gzipped and Unix compressed files. For Windows9X, WinZip, a shareware utility included on this CD (remember, it is shareware) will open these files.

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

Archive Data Extraction

It is often useful to know exactly how an archive was produced when expanding its contents. Tar files were created using the following commands:

```
tar cvLf archive-file files-to-be-archived
```

To create a list of the files in the archive:

```
tar tvf  archive-file  > contents.list
```

To extract the files from the archive:

```
tar xvf  archive-file file(s)-to-extract
```

G-zipped files will have a ".gz" extension on the filename. These files can be decompressed after de-archiving, using:

```
gunzip filename.gz
```

CD Directory Structure

ADCP/GENTOO:
    gentoo.tar

ADCP/PINGDATA:
    BOOT.LOG
    EXIT.CNF
    PINGDATA.###
    START.CNF
    UE4.CNF

BACTERIA:
    bacteria.tar

CAL/CTD:
    RPSCCTD.tar

CAL/MET:
    Met.tar

CAL/MOCNESS:
    Mocness.tar

CAL/SVP:
    SVP.tar

CAL/UW:
    UW.tar

CHL:
    ChlFluor.tar

CTD/RPSC/Process:
    RPSCProc.gz

CTD/RPSC/Raw:
    RPSCRaw.gz

CTD/RPSC/Scripts:
    Scripts.gz

CTD/RPSC/Setup:
    CONFIG
    CONFIG.htm
    CONFIG.prn
    CONFIG.XLS

CTD/RPSC/Setup/CONFIG:
    filelist.xml
    preview.wmf

CTD/TMC/Process:
    TMCProc.gz

CTD/TMC/Raw:
    TMCRaw.gz

CTD/TMC/SCRIPTS:
    Scripts.gz

CTD/TMC/Setup:
    CONFIG
    CONFIG.htm
    CONFIG.prn
    CONFIG.XLS

CTD/TMC/Setup/CONFIG:
    filelist.xml
    preview.wmf

EVENTS:
    Eventlog.xls
    Eventlog.htm
    Stations.png
    Stations.ppt

FLOWCYTO:
    FlowCyto.txt

HEWES:
    Hewes.tar

INCUBATE:
    Van.gz

ISOBARS:
    Isobars.tar

JGOF:
    lmgjgof.tar

MOCNESS:
    Mocness.tar

NUTRIENT:
    Nutrient.tar

OPC:
    OPC.tar

OPTICS:
    Optics.tar

OXYGEN:
    Oxygen.xls
    Oxygen.htm
    OxyMan.tar

PCO2:
    lmgpco2.tar

QC_PLOTS:
    lmgqc.tar

REPORT:
    REPORT.DOC
    REPORT.txt
    REPORT.htm
    SciRep.tar

RVDAS:
    lmgnav.tar
    lmguw.tar

SALINITY:
    Salinity.xls
    SaltLog.jpg

TCO2:
    TCO2_Log.jpg

TRACEMET:
    TraceMet.tar

UTILITY/MAC:
    ALADDIN

UTILITY/WINDOWS/ACROBAT:
    rp500enu.exe

UTILITY/WINDOWS/ALADDIN:
    ALEX50.EXE

UTILITY/WINDOWS/WINZIP:
    WINZIP70.EXE

XBT:
    DAT.ZIP
    LOG.ZIP
    NAV.ZIP
    SFILES.ZIP
    XBTLog.xls

XCTD:
    C3_00001.edf
    C3_00001.RDF
    C3_00002.edf
    C3_00002.RDF
    C3_00003.edf
    C3_00003.RDF
    C3_00004.edf
    C3_00004.RDF
    C3_00005.edf
    C3_00005.RDF
    C3_00006.edf
    C3_00006.RDF
    C3_00007.edf
    C3_00007.RDF
    XCTDLog.jpg

Distribution Contents

ADCP

ADCP/

The ADCP DAS data files are named pingdata.xxx (xxx representing a file number). Note that these extensions do NOT represent Julian day numbers. Please refer to the file's creation date. The ADCP DAS computer creates a new pingdata file when the current one reaches a size of 320K. The ping files logged on Gentoo, the Linux processing computer, however are created new each day.

Some ADCP data is also transmitted to RVDAS. East and North vectors for ship's speed relative to the reference layer and ship's heading are archived in the navigational data section of RVDAS.

Bacteria:

BACTERIA/

This directory contains Data collect on bacterial incubations.

Calibration

CAL/

The tar files in the Cal directory contain images of calibration sheets for each of the following systems: Sound Velocity Probe, Meteorological System, Underway System, GUV, and CTD. The CTD directory contains two sudirectories; one named RPSC which contains sensor calibration and setup information for the RPSC maintained CTD and another subdirectory named TMC for the University of Hawaii TMC CTD.

CTD

CTD/

The ctd data was collected and processed on a windows 98 computer, using Seasave Win32 – Version 5.25a and SBE Data Processing – Version 5.21.

For more information and software visit the web site at www.seabird.com.

CTD/RPSC & CTD/TMC

The CTD directories for the RPSC and University of Hawaii TMC CTD systems, respectively

CTD/(RPSC)or(TMC)/Setup/

In the Setup directory there is a Config file in html, excel, and text form which contain information of which sensors where used and what freq or volt the where connected to. The file also contains a table with the vertical distance in meters from the pressure port that each sensor was mount. The distances are positive as pressure increases.

CTD/(RPSC)or(TMC)/Scripts/

This directory contains the batch file and psu files that we used for post processing the data. The data was processed with the standard seabird processing method. This is just a preliminary processing which was done to verify that the sensors were functioning properly during the cruise. The raw data should be re-processed using the pre and post cruise sensor calibrations.

CTD/(RPSC)or(TMC)/Raw

The raw.gz file is a tar archive file that has been compressed with gzip, for more information on this see the above *Introduction* section. This archive contains the raw file collect at each CTD cast, which is represented by a set of four files containing a bottle-firing file (.bl), a configuration file (.CON), a data file (.dat) and a header file (.hdr).   Casts are named with the following G402xxxc.ext, where G is for the LMG, 402 is the cruise 0402, # is the station number, c is the cast letter, and ext is the extention (bl, con, dat,

HDR). For example; the raw files associated with the cast "b" at Station 2 on this cruise are: G402002b.bl, G402002b.CON, G402002b.dat, G402002b.HDR. The raw data files(*.dat) are binary files.

CTD/(RPSC)or(TMC)/Process

The process.gz file is a tar archive file that has been compressed with gzip. For more information on this see the above *Introduction* section. This archive contains the processed data files for each CTD cast, the processing method used is briefly described in the above section *CTD/Scripts/.* Also see the above section *CTD/Data/raw* for a description of the file naming convention used. Each processed cast is represented here by a set of eleven files:

G402002b.con	A copy of the configuration file for the cast.
G402002b.cnv	The converted file for the whole cast.
dG0402002b.cnv	The converted file for the down cast.
uG0402002b.cnv	The converted file for the up cast.
dG0402002b.asc	An ASCII formatted file for the down cast without a header.
uG0402002b.asc	An ASCII formatted file for the up cast without a header.
G402002b_nobin.asc	An ASCII formatted file for the whole cast without binning
dG0402002b.hdr	The header for the down cast.
uG0402002b.hdr	The header for the up cast.
G402002b.btl	Water sampler bottle summary file.
G402002b.ros	The header for the up cast.

Chlorophyll

CHL/

This directory contains information and data from the chlorophyll samples from the RPSC and TMC rosette.

Event Log

EVENTS/

This directory contains the cruise event log and station maps

Flow Cytometry

FLOWCYTO/

This Directory contain data from the Flow Cytometry.

Chris Hewes Directory

HEWES/

This directory contains the cruise database, and data of Chris Hewes.

Incubation Van

INCUBATE/

 Directory containing environmental data for the Incubation Experiment Van. The Air Temperature on the van was log with a HOBO temperature sensor. Also water temperature was monitored HOBO sensor. There daily text file of the data and graphs in this directory.

Isobar Charts

Isobars/

Analysis of mean sea level pressure from the National Center for Environmental Prediction's Medium Range Forecast Model. Updated every 12 hours.

JGOFS Data Set

JGOF/

The JGOFS data set consists of a single file produced each day named jg<julian_day>.dat.gz where <julian_day> is the day the data was acquired. The ".gz" extension indicates that the individual files are compressed before archiving. The daily file consists of 22 separate columnar fields in text format, which are described below. The JGOFS data set is obtained primarily by applying calibrations to raw data and decimating to whole minute intervals. However, several fields are derived measurements from more than a single raw input. *Note: Null, unused, or unknown fields are filled with 9's in the JGOFS data.*

Additionally, 3 separate QC plots are generated daily by the ET using the JGOFS data set. These plots include TSG and Bathymetry data, meteorological data, and navigation data. The files are called ocean<julian_day>.ps, met<julian_day>.ps, and nav<julian_day>.ps respectively.

Field	Data	Units
01	GMT date	dd/mm/yy
02	GMT time	hh:mm:ss
03	PCOD latitude (negative is South)	Ddd.dddd
04	PCOD longitude (negative is West)	Ddd.dddd
05	Ships speed	Knots
06	GPS HDOP	-
07	Gyro Heading	Degrees (azimuth)
08	Course over ground	Degrees (azimuth)
09	Mast PAR	μEinsteins/meters^2 sec
10	Sea surface temperature	°C
11	Not used	-
12	Sea surface salinity	PSU
13	Sea depth (uncorrected, calc. sw sound vel. 1500 m/s)	meters
14	True wind speed (port windbird)	meters/sec
15	True wind direction (port windbird)	degrees (azimuth)
16	Ambient air temperature	°C
17	Relative humidity	%
18	Barometric pressure	mBars
19	Sea surface fluorometry	volts (0-5 FSO)
20	Not used	-
21	PSP	W/m^2
22	PIR	W/m^2

MOCNESS

MOCNESS/

1-meter

The MOCNESS data resides in the Mocness.tar archive. The data set from each cast is made up of three files. The filenames consist of the station number and an extension: .pro .raw or .tab. The type of data in each file is listed below.

.pro   processed data in space delimited tabular format

.raw   raw cast data in ASCII text format

.tab   statistical summary in space-delimited tabular format

Processed filename *.pro

        This file contains the processed data for each tow, written in ASCII to disk in a simple configuration, which consists of:

Rows 1-5   header information about sensors and the tow

Row 6   the column headings (discussed below): time   pres echo   temp theta sal   sigma angle flow   hzvel   vtvel   vol   net fluor ptran oxycurrent oxytemp oxygen   lat   lon

Succeeding rows   data for each column heading with each value separated by 2 spaces.

time   Julian day, hours and minutes expressed as decimal

pres   depth (m)

temp   temperature degrees C

theta   potential temperature, formulae from Fofonoff and Millard 1983

sal   salinity ppt

sigma   potential density, formulae from Fofonoff and Millard 1983

angle   angle 0-90

flow   flow counts 0000-9999

hzvel   horizontal velocity (knots)

vtvel   vertical velocity (m/min)

vol   seawater volume filtered (m3)

net   net number

fluor   fluorescence (0-5 volts)

ptran   extinction coefficient (0-5 volts)

oxycurrent   0-5 volts

oxytemp   0-5 volts internal to the probe

oxygen   dissolved oxygen (ml/l)

lat   latitude decimal degrees

lon   longitude decimal degrees

Raw filename *.raw

This file contains the raw data from the underwater unit. These "*.raw" files can be used in the playback mode to re-process the data (see page 33 MOCNESS instructions), and also serve as the backup in case there are problems with the processed data file.

For each tow, data is written (as it appears in the acquisition window) in ASCII to disk in a simple configuration, which consists of:

| Rows 1-5 | header information about sensors and the tow |
| Succeeding rows | raw data string formatted thusly: #MN- N1 N2 AA FFFF PPPPP PTPT TTTTTT CCCCCC BBB $GPGLL |

The fields are as follows and are discussed individually below.

N1	net count, counts of left response switch, 00-99
N2	net count, counts of right response switch, 00-99
AA	net angle in degrees, 00-99
FFFF	flow counts, 0000-9999. Reset to 0000 with every net response or increment net # button command
PPPPP	pressure value, converted to decibars by the deck computer
PTPT	a decimal number derived from the temperature sensor in the pressure sensor which is used to improve the pressure calibration
TTTTTT	averaged SeaBird temperature period. The frequency from the SeaBird temperature sensor is measured and processed in the NCU to generate the value TTTTTT, a 6-digit decimal number. This number is scaled as follows: (frequency of the temp. sensor)=K/(TTTTTT) where K=1,258,291,200. Software in the deck computer uses this frequency value along with the individual sensor's calibration file to calculate temperature.
CCCCCC	averaged SeaBird conductivity period, handled exactly like the temperature frequency and the same scaling factor should be used
BBB	battery voltage (divide value by 10)
$GPGLL	latitude and longitude in decimal degrees

Tab filename *.tab

The statistical summary for a given *.pro file. For each net, the following parameters are included:

pmin,pmax,pavg	minimum, maximum and average depth of net
tmin,tmax,tavg	minimum, maximum and average temperature of net
smin,smax,savg	minimum, maximum and average salinity of net
amin,amax,aavg	minimum, maximum and average angle of net
spmin,spmax,spavg	minimum, maximum and average horizontal velocity (kt) of net
armin,armax,aravg	minimum, maximum and average vertical velocity (m/sec) of net
#obs	total number of observations while net was open
vol	total seawater volume filtered for net

Captured screens, filenames *.bmp

This file is bitmap image of the acquisition software captured at any point during a MOCNESS "flight". The files on this CD reflect the acquisition window at the end of each "flight", immediately prior to ending acquisition.

Nutrients

NUTRIENT/

Nutrient determinations of water samples taken during LMG04-02 are organized under the heading "NutrientAnalysis". This folder contains four subfolders: "Alpkemmanuals", "Alpkemoutput", "NutrientSpreadsheets", and "qa_qc". The "Alkemoutput" folder contains the raw data output by the Alpkem Flow Solutions system. These files were exported to spreadsheet format and saved as excel files under the folder "NutrientSpreadsheets". Nutrient determinations were conducted on an Alpkem Flow Solutions segmented flow autoanalyzer. Operation and standardization of the system is described in detail in the Flow Solutions manual under the file "Alpkemmanuals".

Each CTD or TMC cast is contained within "NutrientSpreadasheets" labeled with the corresponding event number (eventxxx.xls). Sheet 1 of the Excel spreadsheet lists nutrient concentrations (Nitrate, Nitrite, Phosphate, Ammonium, Silicate) corresponding to depth of sample and Niskin bottle number as well as station information (e.g. event number and cast number, location, time of cast, depth of cast and total depth, date and operator). The tab labeled "graphs" contains an abbreviated table of nutrient concentrations and depths (used in the Nut_Log spreadsheet) as well as preliminary graph of each ion with depth. This folder also contains summary files of incubation experiments (incexpt.xls) and the Drake Passage and AMLR frozen sample results (DP_AMLR.xls).

Linearity checks were conducted weekly for each of the ions as well as before the change of low nutrient seawater supplies (11 March 04). Results of each linearity check are contained in the "qa_qc" folder. Analysis integrity was checked by injection of low and mid range standards at the start and completion of each run. Repeat injections of random samples at the beginning and end of each run were also used as a method of quality control. This process was repeated on most casts.

OPC

OPC/

The OPC was tow along with the 1-meter MOCNESS. The data collected from these tows are in the OPC.tar archive. The first tow the OPC did not work with the MOCNESS due to the FSK voltage being to low. This was adjusted up to 0.2Vpp and it work fine the the following deployments.

Optics

OPTICS/

Oxygen Titrator

OXYGEN/

Oxygen concentrations were determined on a Langdon Amperometric oxygen titrator (see Manual included in this disc). Prior to each series of analysis the titrator was standardized with a solution of KIO_3 (standard solution concentrations are listed in the calculation workbook). At least three standards were titrated until agreement reached ± 2 μL. A reagent blank determination was conducted at the start of the cruise and used throughout. Titrations performed on the Langford Amperometric system were logged during operation and the titration data was entered and converted in the LMG04_02 data file. This file consists of a workbook composed of multiple sheets. The separate sheets contain information for conversion of endpoint determination such as a list of formulas, bottle volume determination, standard and blank calculation and statistics and a comparison of standards over time.

Unfortunately the oxygen analyzer experienced problems during the cruise. Overtitration of samples and standards became a frequent problem. Correspondence with Dr. Chris Langdon allowed for resetting the titration rate and re-establishment of analysis. This occurred at the later half of the cruise.

PCO2

PCO2/

The tar archive in this directory contain daily files of merged PCO2 data. The PCO2 data was merged with other data from the JGOF data set.

QC Plots

QC_Plots/

Postscript files of data stored each day on RVDAS for quality control analysis during the cruise. There are 3 types of files, named metXXX.ps, navXXX.ps, and oceanXXX.ps, where XXX is represents the Julian day. Met files are a summary of the data from the meteorological instruments, Nav files are a summary of navigational data, and Ocean files are a summary of the underway seawater and bathymetry data.

Data and Science Report

Report/

Copies of this report in MS Word, HTML, and text formats. The SciRep.tar file contains cruise science reports of the Principal Investigator.

RVDAS

rvdas/

RVDAS (Research Vessel Data Acquisition System) was developed at Lamont-Doherty Earth Observatory of Columbia University and has been used on the R/V Maurice Ewing for several years. It was adapted for use on the Nathaniel B. Palmer and her sister ship, the R/V Laurence M. Gould.

Below you will find detailed information on the data included. Be sure to read the "Significant Acquisition Events" section below for important information about data acquisition during this cruise.

Meteorological and Light Data

Measurement	File ID	Collect. Status	Rate	Instrument
Air Temperature	lmet	continuous	1 sec	R. M. young 41372VC
Relative Humidity	lmet	continuous	1 sec	R. M. young 41372VC
Wind Speed/Direction	lmet	continuous	1 sec	R. M. young 5106
PIR (LW radiation)	lmet	continuous	1 sec	Eppley PIR
PSP (SW radiation)	lmet	continuous	1 sec	Eppley PSP
Photosynthetically-Available Radiation	lmet	continuous	1 sec	BSI QSR-240
Barometer	lmet	continuous	1 sec	R. M. young 61201
GUV & PUV	lpuv	continuous	1 sec	GUV2511 & PUV2510

Navigational Data

Measurement	File ID	Collect. Status	Rate	Instrument
Attitude GPS	lash	continuous	1 sec	Ashtec ADU-2
P-Code GPS	lpcd	continuous	1 sec	Trimble 20636-00SM
Gyro	lgyr	continuous	0.2 sec	Anschutz Gyro
Trimble GPS	tgps	continuous	1 sec	NT200

Geophysical Data

Measurement	File ID	Collect. Status	Rate	Instrument
Bathymetry	lknu	variable	Varies	Knudsen 320B/R

Oceanographic Data

Measurement	File ID	Collect. Status	Rate	Instrument
Salinity	ltsg	continuous	15 sec	SeaBird 21
Sea S Temperature	ltsg	continuous	15 sec	SeaBird 3-01/S
Fluorometry (analog)	ltsg	continuous	15 sec	Turner 10-AU-005
ADCP	ladc	continuous	1 sec	RD Instruments

Data File Names and Structures

RVDAS data is divided into two broad categories, **_Underway_** and **_Navigation_**. The groups are abbreviated "uw" and "nav". Thus, these two tar files, lmguw.tar and lmgnav.tar exist under the top-level rvdas directory. The instruments are broken down as shown. Each data file is g-zipped to save space on the distribution. Not all data types are collected everyday or on every cruise.

RVDAS data files are named following the convention: [FileID].dDDD.

- The FileID is a 4-character code representing the system being logged, for example: lmet (for meteorology)
- DDD is the Julian day of the data collection

Underway Data	File ID
Metrological	lmet
Knudsen	lknu
Thermosalinograph	ltsg
ADCP	ladc
Sound Velocity Probe	lsvp
GUV & PUV	lpuv

Navigation Data	File ID
Gyro Compass	lgyr
P-CODE GPS	lpcd
Ashtech ADU2 GPS	lash
Trimble NT2100 GPS	tgps
PCO2 System	lpco

Data is received by the RVDAS system via RS-232 serial connections. The data files that comprise the rvdas data set are described below. A time tag is added to each line of data received and the data is written to disk.

```
YY+DDD:HH:MM:SS.SSS [data stream from instrument]
```

Where, YY: two-digit year, DDD: Julian Day, HH: 2 digit hours, MM: 2 digit minutes SS.SSS: seconds. All times are UTC.

The delimiters used to separate fields in the raw data files are usually spaces and commas, but other delimiters are used (::, =, @) and occasionally there is no delimiter. Care should be taken when reprocessing the data that the fields separations are clearly understood. An example data

lknu

```
99+099:00:18:19.775 hf,305.2,lf,304.3
```

Field	Data	Units
1	RVDAS Time Tag	
2	hf – high frequency flag (12 kHz)	
3	high fequency depth	meters
4	lf – low frequency flag (3.5 kHz)	
5	low frequency depth	meters

lmet

```
02+314:23:59:50.067 01.2 047 028 01.3 063 042 0988.8 001.7 084 –000.2192 0000.9358 0025.5875
```

Field	Data	Units
1	RVDAS Time Tag	
2	Port Wind Speed	m/s
3	Port Wind Direction	deg
4	Port Wind Direction (standard deviation)	deg
5	Starboard Wind Speed	m/s
6	Starboard Wind Direction	deg
7	Starboard Wind Direction (standard deviation)	deg
8	Barometer	millibars
9	Temperature	°C

Field	Data	Units
10	Relative humidity	%
11	PSP (long wave radiometer)	Volts
12	PIR (short wave radiometer)	Volts
13	PAR (photo-synthetically available radiation, 400 - 700 nm)	Volts

ltsg

```
02+310:23:57:30.200        8542    -1.2580   34.1740   -1.2030    3.435    0.349  27.361205
```

Field	Data	Units
1	RVDAS Time Tag	
2	Scan number	
3	Internal water temperature	°C
4	Salinity	PSU
5	External water temperature	°C
6	Transmissometer signal	Volts
7	Fluorometer signal (analog)	Volts
8	Conductivity	mS/cm

lpco

```
02+319:23:59:13.748 2002319.99851    7154.27    26.49    1033.6    325.79    6.74    329.3
53.76    0    Equil
```

Field	Data	Units
1	RVDAS Time Tag	
2	Julian date file string	Julian
3	IR voltage reading	mV
4	Cell temperature	°C
5	Barometer	millibars
6	VCO2	mL
7	Equilibrator temperature	°C
8	PCO2	millibars
9	Gas flow	mL/min
10	Solenoid position ID	number
11	Measured gas	name

lpuv

```
03+354:15:56:13.346 122003 155612 -.00007 4.632E-4 8.417E-5 1.027E-4 3.824E-2 -4.492E-6 5.196E-4
5.2E-1 2.793E-3 23.876 -.804 26.812 26.852 -1.238 3.525 .000099 2.581E1 5.058E1 1.442E1 2.73E0
6.136E1 1.406E-1 6.187E1 39.989
```

	GUV only				GUV and PUV		
Field	Data	Units		Field	Data	Units	
1	RVDAS Time Tag			1	RVDAS Time Tag		
2	GUV Computer Date	mmddyy		2	GUV Computer Date	mmddyy	
3	GUV Computer Time	hhmmss		3	GUV Computer Time	hhmmss	
4	Ed0Gnd - GUV	Volts		4	EdZGnd -PUV	Volts	
5	Ed0320 - GUV	$\mu W/cm^2 nm$		5	EdZ305 -PUV	$\mu W/cm^2 nm$	
6	Ed0340 - GUV	$\mu W/cm^2 nm$		6	EdZ313 -PUV	$\mu W/cm^2 nm$	
7	Ed0313 - GUV	$\mu W/cm^2 nm$		7	EdZ320 -PUV	$\mu W/cm^2 nm$	
8	Ed0305 - GUV	$\mu W/cm^2 nm$		8	EdZ395 -PUV	$\mu W/cm^2 nm$	
9	Ed0380 - GUV	$\mu W/cm^2 nm$		9	EdZ340 -PUV	$\mu W/cm^2 nm$	
10	Ed0PAR - GUV	$\mu E/cm^2 sec$		10	EdZPAR -PUV	$\mu E/cm^2 sec$	

11	Ed0395 - GUV	$\mu W/cm^2nm$
12	Ed0Temp - GUV	°C

11	LuZChl -PUV	$\mu E/srm^2sec$
12	EdZ380 -PUV	$\mu W/cm^2nm$
13	WTemp -PUV	°C
14	Depth -PUV	m
15	EdZTemp -PUV	°C
16	LuZTemp -PUV	°C
17	Tilt -PUV	Degrees
18	Roll -PUV	Degrees
19	Ed0Gnd - GUV	Volts
20	Ed0320 - GUV	$\mu W/cm^2nm$
21	Ed0340 - GUV	$\mu W/cm^2nm$
22	Ed0313 - GUV	$\mu W/cm^2nm$
23	Ed0305 - GUV	$\mu W/cm^2nm$
24	Ed0380 - GUV	$\mu W/cm^2nm$
25	Ed0PAR - GUV	$\mu E/cm^2sec$
26	Ed0395 - GUV	$\mu W/cm^2nm$
27	Ed0Temp - GUV	°C

lsvp

`00+348:01:59:52.128  1539.40`

Field	Data	Units
1	RVDAS Time Tag	
2	Sound velocity	m/s

ladc

`00+019:23:59:59.099 $PUHAW,UVH,-1.48,-0.51,250.6`

Field	Data	Units
1	RVDAS Time Tag	
2	$PUHAW	
3	UVH (E-W, N-S, Heading)	
4	Ship Speed relative to reference layer[1] velocity[2], East vector	knots
5	Ship Speed relative to reference layer[1] velocity[2], North vector	knots
6	Ship heading	degrees

[1]The reference layer is an average velocity measured in a number of depth "bins". On the LMG, the bins are eight meters deep and bins 3-10 define the reference layer. Hence, the reference layer is the water column from 16-80 meters beneath the ship.

[2]The speed ouput is water velocity relative to the ship's hull and is therefore opposite of the actual movement of the ship. For example, if the ship's heading is due north, the North/South reference layer velocity is likely to be negative (southerly).

lash

ATTD: Attitude Data

`01+081:00:00:00.806 $PASHR,ATT,345605.0,165.03,+001.86,-01.96,0.0018,0.0173,0*22`

Field	Data	Units
1	RVDAS Time Tag $PASHR	

Field	Data	Units
2	ATT	
3	GPS Time sec. of the week	seconds
4	heading (rel. to true North)	degrees
5	pitch	degrees
6	roll	degrees
7	Measuremnet RMS error	meters
8	Baseline RMS error	meters
9	attitude reset flag	

```
01+081:00:00:00.966 $GPGGA,235952.00,6051.7937,S,06030.2175,W,1,08,01.0,+00068,M,,M,,*79
```

Field	Data	Units
1	RVDAS Time Tag $GPGGA	
2	UTC time at position	hhmmss.ss
3	Latitude	ddmm.mmm
4	North (N) or South (S)	
5	Longitude	ddmm.mmm
6	East (E) or West (W)	
7	GPS quality (1=GPS 2=DGPS)	
8	Number of GPS satellites used	
9	HDOP	
10	Antenna Height	meters
11	M for Meters	
12	Geoidal height	meters
13	M for meters	
14	age of diff. GPS data	sss
15	differential reference station ID	aaaa

lgyr

```
02+315:23:59:58.194 $PASVW,00.1,A*1D

02+315:23:59:58.414 $IIVHW,287.7,T,,M,,N,,K*71

02+315:23:59:58.616 $HEHDT,287.7,T*25

02+315:23:59:58.821 $HEROT,001.6,A*2C

02+315:23:59:58.984 $HCHDT,,T*07
```

HDT: True Heading

```
01+083:00:00:02.893 $HEHDT,246.3,T*2C
```

Field	Data	Units
1	RVDAS Time Tag $HEHDT	
2	Heading XXXXX = ddd.d	degrees
3	T flag for true heading, checksum	

ROT: Rate of Turn

```
01+083:00:00:03.093 $HEROT,-006.3,A*03
```

Field	Data	Units
1	RVDAS Time Tag $HEROT	
2	Rate of turn	degrees/min
3	Status: A = data valid, checksum	

tgps

GGA: Global Positioning Fix Data

`00+040:00:00:00.985 $GPGGA,000003,6139.961,S,05949.422,W,1,6,001.64,-00036,M,00000,M,,`

Field	Data	Units
1	RVDAS Time Tag $GPGGA	
2	Latitude in degrees with decimal minutes	ddmm.mmm
3	North (N) or South (S)	
4	Longitude in degrees with decimal minutes	ddmm.mmm
5	East (E) or West (W)	
6	GPS quality (1=GPS 2=DGPS)	
7	Number of GPS satellites used	
8	Horizontal dilution of precision (HDOP)	
9	Antenna height above/below mean-sea-level (geoid)	meters
10	Units for antenna height (M = Meters)	
11	Geoidal Separation[1]	
12	Units for Geoidal Separation (M = Meters)	meters
13	Age of differential GPS data, number of seconds since last SC104 Type 1 or 9	
14	Differential reference station ID	

[1]Geoidal Separation: the difference between the WGS-84 earth ellipsoid and mean-sea-level (geoid). A negative value represents mean-sea-level below ellipsoid.

GLL: Geographic Position – Latitiude/Logitude

`00+040:00:00:00.065 $GPGLL,6139.96,S,05949.42,W,000002,A`

Field	Data	Units
1	RVDAS Time Tag $GPGLL	
2	Latitude	ddmm.mmm
3	North (N) or South (S)	
4	Logitude	ddmm.mmm
5	East (E) or West (W)	
6	UTC of position	hhmmss.ss
7	Status: A = Data Valid	

VTG: Track Made Good and Speed over Ground

`00+040:00:00:00.213 $GPVTG,161,T,149,M,009.6,N,017.8,K`

Field	Data	Units
1	RVDAS Time Tag $GPVTG	
2	Track, degrees true	degrees
3	T flag for True	
4	Track, degrees magnetic	degrees
5	M flag for Magnetic	
6	Speed over Ground	knots
7	N flag for Knots	
8	Speed over Ground	kmhr
9	K flag for km/hr	

VHW: Speed Through Water and Heading

`00+040:00:00:00.212 $GPVHW,246,T,234,M,012.3,N,022.8,K`

Field	Data	Units
1	RVDAS Time Tag $GPVHW	
2	Heading, degrees True	degrees
3	T flag for True	
4	Heading, degrees Magnetic	degrees
5	M flag for Magnetic	
6	Speed through water	knots
7	N flag for Knots	
8	Speed through water	km/hr
9	K flag for km/hr	

ZDA: Time and Date

`00+040:00:00:00.285 $GPZDA,000002,09,02,2000,00,00`

Field	Data	Units
1	RVDAS Time Tag $GPZDA	
2	UTC time	hhmmss.ss
3	Day: 01 – 31	dd
4	Month: 01 – 12	mm
5	Year	yyy
6	Local time zone description[1], 00 +/-13 hrs	
7	Local time zone minutes description, same sign as local hours	

[1]Zone description is the number of whole hours added to local time to obtain GMT, values are negative for East longitudes.

BWC: Bearing and Distance to Waypoint

`00+040:00:00:00.865 $GPBWC,000003,6209.70,S,05824.00,W,127.2,T,115.3,M,050.1,N,014`

Field	Data	Units
1	RVDAS Time Tag $GPBWC	
2	UTC of bearing	hhmmss.ss
3	Destination waypoint latitude in degrees, decimal minutes	ddmm.mmm
4	Hemisphere Flag: N or S	
5	Destination waypoint longitude in degrees, decimal minutes	ddmm.mmm
6	Hemisphere Flag: E or W	
7	Bearing, degrees true	degrees
8	T flag for True	
9	Bearing, degrees magnetic	degrees
10	M flag for Magnetic	
11	Distance to waypoint in nautical miles	nm
12	N flag for Nautical Miles	
13	Waypoint ID	

lpcd

GGA: GPS Position Fix – Geoid/Ellipsoid

`00+019:23:59:59.301 $GPGGA,235958.409,6849.6944,S,13712.8472,W,1,06,1.2,092.4,M,047.3,M,,*67`

Field	Data	Units
1	RVDAS Time Tag $GPGGA	
2	UTC time at position	hhmmss.sss
3	Latitude	ddmm.mmm
4	North (N) or South (S)	
5	Longitude	ddmm.mmm
6	East (E) or West (W)	
7	GPS quality (1=GPS 2=DGPS 3=P-CODE)	
8	Number of GPS satellites used	
9	HDOP	
10	Antenna Height	meters
11	M for Meters	
12	Geoidal height	meters
13	M for meters	
14	Null field	
15	Checksum	

GLL: GPS Latitude/Longitude

00+019:23:59:59.381 $GPGLL,6849.6944,S,13712.8472,W,235958.409,A*35

Field	Data	Units
1	RVDAS Time Tag $GPGLL	
2	Latitude	degrees
3	North or South	
4	Longitude	degrees
5	East or West	
6	UTC of position	hhmmss.sss
7	staus of data (A = valid)	
8	Checksum	

VTG: GPS Track and Ground Speed

00+019:23:59:59.382 $GPVTG,238.7,T,182.3,M,001.8,N,003.3,K*41

Field	Data	Units
1	RVDAS Time Tag $GPVTG	
2	Heading	degrees
3	degrees True (T)	
4	Heading	degrees
5	degrees magnetic (M)	
6	Ship speed	knots
7	N = knots	
8	Speed	km/hr
9	Checksum	

Salinity

SALINITY/

Salinity determinations were conducted on a Guildline model 8400B Salinometer. Standardization was conducted using I.A.P.S.O. water (Batch p144, collected Sept. 23, 2003) prior to each series of determinations and immediately afterwards. Relevant information is entered in the spreadsheet labeled LMG04_02. The analyzer was run at a temperature of 24°C while the ambient temperature was between 21 and 22°C in the room. The value for Rstrim during the period of determination was at 5970 and remained constant throughout. Zero values did not vary from 0.00002.

TCO2

TCO2/

This Directory contains the log sheet for the Southbound Drake TCO2 transect.

Trace Metal

TRACEMET/

The water sample collect by the TMC rosette was analyzed my Chris Measures for Trace Metals. This directory contains the data and information about the Trace Metals .

Utilities

UTILITY/

This Directory contains utilities for both Mac and Windows to unzip and untar the files on this CD.

XBT

XBT/

During the Southbound Drake crossing Expendable Bathythermographic (XBT) probes were used to obtain water column temperature profiles. These XBT were launched from the auto-launcher off the port aft quarter of the ship.   The data files from these launches are included here in the SFILES.ZIP. The NAV.ZIP file contains the navigation files. The LOG.ZIP contains log files generated by the auto-xbt software. The DAT.ZIP file contains the configuration file used and generated by the auto-xbt software. The logsheet (XBTLog) has been saved as three different formats excel spreadsheet, HTML, and text file. For more information contact Glenn Pezzoli, project coordinator, at gpezzoli@ucsd.edu.

XCTD

XCTD/

During the Southbound Drake crossing, Expendable Conductivity Temperature Depth (XCTD) probes were used to obtain water column conductivity and temperature profiles. These XCTD were the analog type, and where manually launch from tube 1 of auto-launcher. The data files from these launches are included both in binary (RDF.ZIP) and ascii (EDF.ZIP) format. The handwritten logs take during the transect were scanned in and saved as .jpg files (XCTLog.jpg).

LMG Sensors

Shipboard Sensors

Sensor	Description	Serial #	Cal. Date	Status
Port Anemometer	R.M. Young 105106	WM35061	6/26/03	collect
Stbd Anemometer	R.M. Young 105106	WM28392 WM57508	4/14/03 6/26/03	/collect
Barometer	R.M. Young 61201	BP001150	2/26/03	collect
Humidity/Wet Temp (removed 054 18:40 GMT)	R.M. Young 41372VC	06718	09/13/02	collect
Humidity/Wet Temp (installed 054 (18:40 GMT)	R.M. Young 41372VC	06133	09/26/03	collect
Mast PAR	BSI QSR-240	6394	08/01/03	collect
Pyranometer	Eppley PSP	31701F3	10/16/03	collect
Pyrgeometer	Eppley PIR	32031F3	10/21/03	collect
GUV	Biospherical GUV-2511	0203113		collect
TSG	SeaBird SBE21	1789	09/12/03	collect
TSG Remote Temp	SeaBird 3-01/S	1620	3/6/03	collect
Fluorometer	Turner 10-AU-005 Lamp: daylight 10-045, reference filter: 10-052, emission filter: 10-051, excitation filter: 10-050.	6592 RTX	-	collect
Transmissometer	WET Labs 9707017	CST-168R	4/8/03	C/ollect
P-Code GPS	Trimble 20636-00 (SM)	0220035265	-	CIV
Bathymetry	Knudsen 320B/R	-	-	collect

CTD Sensors

Sensor	Description	Serial #	Cal. Date	Status
CTD Fish	Sea-Bird 9Plus-3400m	0312	9/17/03	Collect
CTD Deck Unit	Sea-Bird 11Plus	0288	-	-
Prim. Temp. Sensor	Sea-Bird 3-plus 90252.1	03P2426	5/13/03	collect
Sec. Temp. Sensor	Sea-Bird 3-02/F	031529	5/13/03	collect
Prim. Cond. Sensor	Sea-Bird 4-01/0	0692	5/14/03	collect
Sec. Cond. Sensor	Sea-Bird 4C	042048	5/14/03	collect
Prim. D.O. Sensor	Sea-Bird 43	0200	4/23/03	collect
Sec. D.O. Sensor	Sea-Bird 43	0182	4/23/03	collect
Pri. Transmissometer	WET Labs C-Star (blue beam)	CST-421DB	11/26/03	collect
Sec. Transmissometer	WET Labs C-Star (red beam)	CST-407DR	03/24/03	collect
Fluorometer	Chelsea Aquatracka Mk III	88/2050/93	07/08/03	collect
PAR	Biospherical QSP200L4S	4561	09/11/03	collect

Acquisition and Processing Information

Processing Specifics

Refer to the instrmnt.cof file along with the specific instrument calibration sheets(located in the Cal/ directory of the data distribution), for information on how the RVDAS data was collected and processed.

Errors and Events

This section lists all significant events and known problems with acquisition during this cruise including instrument failures, data acquisition system failures, and other factors affecting this data set.

Date (Julian)	Time (GMT)	Event	Location
044	08:41	RVDAS started	68 W
044	09:05	Seawater flow started	68 W
044	09:34	TSG started	68 W
044	10:34	ADCP and sonar started	68 W
044	11:18	PCO2 started	68 W
045	02:16	ADCP: adjusted time on Gentoo, 12 min fast	
045	19:43	Lost gyrocompass	
046	03:40	TSG stopped, restarted	
047	23:25	Shut down seawater flow	Palmer Station
047	23:26	Shutdown fluorometer	Palmer Station
047	23:30	Shutdown PCO2	Palmer Station
047	23:27	Shutdown TSG	Palmer Station
048	18:50	Changed failed Ashtech antenna	
048	23:38	Departed Palmer	
048	23:41	Started sonar and ADCP	
048	23:50	Started PCO2 and TSG	
049	00:12	SVP turned on	
049	00:24	Power outage, seawater flow off	
049	00:45	Seawater flow started	
049	11:04	Adjusted gas flows on PCO2	
049	11:44	TSG Debubbler , adjusted flow	
051	23:12	GUV restarted	
054	18:18	Met data noisy, turned off Met system, swapped Temp/RH probe	
054	18:40	Turned Met system on	
055	17:09	Adjust PCO2 atmospheric flow	
055	14:45	Gyrocompass repairs completed and system started, began required warm up period	
055	16:43	Gyrocompass back online	
055	18:23	Turned Met system off, swapped RM Young translators	
055	18:54	Met system back online	
055	19:52	DAS stopped, restarted	
058	14:00 - 15:30	Reoriented Ashtech antennas #3 and #4	
061	01:10	Pontus crashed, rebooted	
069	16:04	Shutdown ADCP DAS and restarted	

073	08:40	PAR removed from RPSC CTD	
074	08:30	Transmissometers S/N 407DR and 421DB mounted on TMC rosette	
075	08:30	Turned ADCP bottom tracking on	
076	14:34	Turned Met system off and changed starboard anemometer Replaced with s/nWM5708	
076	14:34	Removed Ashtech antenna #4	
076	15:43	Turned Met system on	
076	19:50	Replaced Ashtech antenna #4	
078	11:32	Seawater flow stopped	Palmer Station
078	11:36	TSG shutt down	Palmer Station
078	11:40	GUV not logging, restarted	Palmer Station
078	12:02	Sonar turned off	Palmer Station
078	12:05	Shutdown PCO2	
080	13:40	Change ADCP pulse length from 8 to 16 ms and restarted ADCP DAS	
080	13:49	Started sonar	Palmer
080	14:10	Started seawater flow	Palmer
080	14:19	Started TSG	Palmer
080	14:36	Started PCO2	Palmer
081	14:00	PCO2 stopped, restarted	
083	20:17	Turned off TSG	68W Data Limit
083	20:20	Turned off Seawater	68W Data Limit
083	20:23	Turned off ADCP	68W Data Limit
083	20:42	Turned off PCO2	68W Data Limit
		--- End of data collection --	68W Data Limit