LMG0603

Sweeney

Cruise Data Report

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Table of Contents

INTRODUCTION **1**

ARCHIVE DATA EXTRACTION **2**

CD DIRECTORY STRUCTURE **3**

DISTRIBUTION CONTENTS **4**

ADCP 4

CALIBRATION 4

CTD 4

CTD/ *4*

CTD/Config.xls *4*

CTD/Setup.tar *4*

CTD/Data/ctd.tar/raw *4*

CTD/Data/ctd.tar/process *4*

ISOBAR CHARTS 5

DATA AND SCIENCE REPORT 6

SITREP 6

SCIENCE 6

WAYPOINTS 6

QC PLOTS 6

JGOFS DATA SET 7

RVDAS 7

Meteorological and Light Data *8*

Navigational Data *8*

Geophysical Data *8*

Oceanographic Data *8*

DATA FILE NAMES AND STRUCTURES **9**

LKNU 9

LNDS 9

LMET 9

LTSG 10

TSGFL 10

LPCO 10

LGUV 11

SVP1 11

LADC 12

LASH 12

LGYR 13
TGPS 13
LPCD 15
LFLR 16
LOXY 16
LMG SENSORS 18
SHIPBOARD SENSORS 18
CTD SENSORS 18
ACQUISITION AND PROCESSING INFORMATION 19
PROCESSING SPECIFICS 19
ERRORS AND EVENTS 19

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 may affect how this data is processed such as 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All of the data has been archived with the Unix “tar” command and/or compressed using Unix “gzip” compression.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 Windows, WinZip, a shareware utility included on this CD (remember, it is shareware) will open these files.

In some cases to adhere to the ISO9660 format the .tar extension was removed. When we tarred the files then gzip the tar archive the name of the file became *File*.tgz. This name does not follow the 8.3 naming convention of the ISO9660 format. On Windows and Mac Platforms Winzip and Stuffit Expander handles this just fine. When they expand the *File*.gz the expanded file becomes *File*.tar, which both software packages can handle. On Unix platforms gunzip expands *File*.tgz but it does not append the .tar extension. So you may not recognize the file as a tar archive, but OS does recognize it as a tar archive. If you use the file command it will return saying it is a tar file. The below tar command will un-archive the file just fine.

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 cvf 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:
lmg0603.tgz

./Cal:
CTD_CALS.pdf
InstCoef.txt
MET_CALS.tar
SVP_CALS.tar
UW_CALS.tar
xrvdaslg.txt

./CTD:
CONFIG.XLS
CTDLogs.pdf
ctd.tar
Setup.tar

./Isobars:
isobars.tar

./JGOF:
lmgJGOF.tar

./PCO2:
lmgPCO2.tar

./QCPlots:
lmgQC.tar

./Report:
REPORT.DOC
REPORT.htm
REPORT.rtf

./RVDAS:
lmgnav.tar
lmguw.tar

./Science:
science.tar
```

```
./SITREPS:
Sitreps.tar

./TSG:
lmgTSG.tar

./Utility:
ACROBAT
WINZIP

./Utility/ACROBAT:
rp500enu.exe

./Utility/WINZIP:
WINZIP70.EXE

./Waypts:
waypoint.txt
```

Distribution Contents

ADCP

/Adcp/

This directory contains a tar file of gentoo's proc directory. Which contains a database of the averaged ping data, Matlab m-files used in processing the data, and daily graphs of the currents. For more information contact Teri Chereskin at tchereskin@ucsd.edu .

Calibration

/Cal/

The tar files in the Cal directory contain images of calibration sheets for each of the following systems: Sound Velocity Probe(SVP_CALS.TAR), Meteorological System(MET_CALS.TAR), Underway System(UW_CALS.TAR), and CTD_CALS.pdf.

Refer to the instrmnt.cof file along with the specific instrument calibration sheets, both located in this directory, for information on how the RVDAS data was collected and processed.

CTD

CTD/

The ctd data was collected and processed on a computer running Windows 98, using Seasave Win32 – Version 5.31a and SBE Data Processing – Version 5.31a

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

CTD/Config.xls

In the Setup directory there is a excel spreadsheet Config.xls 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 mounted. The distances are positive as pressure increases.

CTD/Setup.tar

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. It also contains the display file that where used during the cast.

CTD/Data/ctd.tar/raw

The ctd.tar file is a tar archive file that contains the raw directory. This directory 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 g501SSS.ext, where g is for the LMG, 501 is the cruise 05-01, SSS is the station number. For example; the raw files associated with the Cast 1on this cruise are: g501001.bl, g501001.con, g501001.dat, g501001 .hdr. The raw data files(*.dat) are binary files.

CTD/Data/ctd.tar/process

The ctd.tar file is a tar archive file that contains the process directory. This directory 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 ten files:

GXXXCCC.con	A copy of the configuration file for the cast.
GXXXCCC.cnv	The converted file for the whole cast.
GXXXCCC.ros	The rosette file that contains the scan lines for each bottle trip.
GXXXCCC.btl	The bottle file that contains the avg, standard deviation, min, and max for a select set of variables for each bottled fired during the upcast.
DGXXXCCC.cnv	The converted file for the down cast.
DGXXXCCC.asc	An ASCII formatted file for the down cast without a header.
DGXXXCCC.hdr	The header for the down cast.
UGXXXCCC.cnv	The converted file for the up cast.
UGXXXCCC.asc	An ASCII formatted file for the up cast without a header.
UGXXXCCC.hdr	The header for the up cast.

Note: On Cast 12, 15, 19, 21 the computer shutdown unexpectedly. In order to proceed with the cast a second set of files were started. This problem was eventually found to be a problem with the USB to serial converter being used. After disabling it in Windows Device Manager, we did no see the problem again. Also on cast 21 the secondary temperature sensor imploded on the upcast at 4700m.

- **Cast 12** failed at the bottom, 1927m. The downcast files are named g603012.xxx. For the upcast, a 'u' was appended and files are named g603012u.xxx. The exception is the bottle file. All bottles were tripped on the upcast, but the u was removed from bottle file name and it was renamed g603012.btl for consistency with all other bottle files.
- **Cast 15** failed at 1283m on the downcast. A "b" was appended to the file name g603015 and the cast proceeded to the bottom. Information on the downcast is in both the g603015.xxx and g603015b.xxx files. For information on the upcast refer to the g603015b.xxx files. All bottles were tripped on the upcast, g603015b.xxx files; again, the bottle file was renamed g603015.btl.
- **Cast 19** failed at 3048m on the upcast. A "b" was appended to the file name g603019 and the cast proceeded up. Information on the downcast is in the g603019.xxx files. For information on the upcast refer to both the g603019 and g603019b.xxx files. One bottle was tripped before the system crashed so information on it is in the g603015.xxx files. The rest of the bottles were tripped after the system was restarted, g603015b.xxx files. To add to the confusion, according to the .ros file two bottles were tripped at 2500m, this is incorrect as only one was tripped, ignore the first bottle fired at this depth. To try to minimize some of the confusion, the bottle files were combined and named g603019.btl.
- **Cast 21** failed at 1940m on the upcast also the secondary temperature sensor imploded at 4700m . A "b" was appended to the file name g603021 and the cast proceeded up. Information on the downcast is in the g603021.xxx files. For information on the upcast refer to both the g603021 and g603021b.xxx files. Seven bottles were tripped before the system crashed, g603021.xxx files. The rest of the bottles were tripped after the system was restarted, g603021b.xxx files. Ignore the first seven bottles fired in the g603021b.ros file, this was done to catch the sequence up. Again, the bottle files were combined and named g603021.btl.

Isobar Charts

/Isobars/

This directory contains GIF image files. These file are an analysis of mean sea level pressure from the National Center for Environmental Prediction's Medium Range Forecast Model. They are updated every 6 hours. Naming the convention is as follows yyjjj.hh.gif where yy is the year, jjj is the day number, and hh is the hour.

Data and Science Report

/Report/

Copies of this report in MS Word, HTML, and text formats.

Sitrep

/Sitrep/

Copies of the Daily Situation Report sent to the NSF and other parties during each cruise. They give an overview of ships location, weather, ice and sea conditions, and a description of scientific operations and other events that happened on each particular day, as well as updates on overall ship status.

Science

/Science/

This directory contains tar archive of the data collected by the individual scientists on the cruise. The archive contains the following directories:

/disc_pco2/

/LMG06-03 Bottlefile_summary/

/LMG06-03 Oxygen/

/LMG06-03 Sampling Templates/

/LMG06-03 Autosal LMG06-03 Chlorophyll/

/LMG06-03 Rekilling LMG06-03 Therm Intercalibration/

/TCO2_at_SEA/

WAYPOINTS

/WAYPTS/

Contains the waypoint file used for the cruise; this is read by the DAS system and the selected waypoint is displayed on the CCTV system.

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.

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

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	lguv	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	civilian mode	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
Net Depth Sensor	lnds	variable	~1/3 sec	Omega PX-605
DUSH 11 Winch	ld11	variable	varies	Markey DUSH 11
DUSH 5 Winch	ldu5	variable	varies	Markey DUSH 5
DUSH 4 Winch	ldu4	variable	varies	Markey DUSH 4

Oceanographic Data

Measurement	File ID	Collect. Status	Rate	Instrument
Salinity	ltsg	continuous	6 sec	SeaBird 21
Sea S Temperature	ltsg	continuous	6 sec	SeaBird 3-01/S
Fluorometry (analog)	ltsg	continuous	6 sec	Turner 10-AU-005
ADCP	ladc	continuous	1 sec	RD Instruments
Oxygen	loxy	continuous	10 sec	

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: LMG[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
Meteorological	lmet
Knudsen	lknu
Thermosalinograph	ltsg
ADCP	ladc
Sound Velocity Probe	lsvp
GUV & PUV	lguv
PCO2 System	lpco
Oxygen	loxy

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

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 frequency depth	meters
4	lf – low frequency flag (3.5 kHz)	
5	low frequency depth	meters

lnds

```
99+099:00:18:19.775 V01 00199.8
```

Field	Data	Units
1	RVDAS Time Tag	
2	V01 – Sensor 1	label
3	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
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

The LMG uses an SBE 21 Thermosalinograph to collect underway temperature and conductivity data. For further information on the instrument or the data consult Seabird's website at www.seabird.com .

```
04+321:00:01:23.978 06D572EC1801D80DE4

04+321:00:01:23.978 ttttccccrrrrrr0uuu
```

Field	Data	Units
1	RVDAS Time Tag	
2	Internal water temperature – tttt	Hex Value
3	Conductivity - cccc	Hex Value
4	External water temperature - rrrrrr	Hex Value
5	Transmissometer signal - vvv	Hex Value

tsgfl

```
04+321:00:01:23.978 -00.070 -00.089 02.8042 33.75690 0.471306 4.341880
```

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

lpco

For further information on this data, contact Tim Newberger at ***tnewberg@ldeo.columbia.edu***

```
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

Field	Data	Units
6	VCO2	mL
7	Equilibrator temperature	°C
8	PCO2	millibars
9	Gas flow	mL/min
10	Solenoid position ID	number
11	Valve Position ID	number
12	Measured gas	name

lguv

```
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

Field	Data	Units
1	RVDAS Time Tag	
2	GUV Computer Date	mmddyy
3	GUV Computer Time	hhmmss
4	Ed0Gnd - GUV	Volts
5	Ed0320 - GUV	µW/cm^{2}nm
6	Ed0340 - GUV	µW/cm^{2}nm
7	Ed0313 - GUV	µW/cm^{2}nm
8	Ed0305 - GUV	µW/cm^{2}nm
9	Ed0380 - GUV	µW/cm^{2}nm
10	Ed0PAR - GUV	µE/cm^{2}sec
11	Ed0395 - GUV	µW/cm^{2}nm
12	Ed0Temp - GUV	°C

GUV and PUV

Field	Data	Units
1	RVDAS Time Tag	
2	GUV Computer Date	mmddyy
3	GUV Computer Time	hhmmss
4	EdZGnd -PUV	Volts
5	EdZ305 -PUV	µW/cm^{2}nm
6	EdZ313 -PUV	µW/cm^{2}nm
7	EdZ320 -PUV	µW/cm^{2}nm
8	EdZ395 -PUV	µW/cm^{2}nm
9	EdZ340 -PUV	µW/cm^{2}nm
10	EdZPAR -PUV	µE/cm^{2}sec
11	LuZChl -PUV	µE/srm^{2}sec
12	EdZ380 -PUV	µW/cm^{2}nm
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	µW/cm^{2}nm
21	Ed0340 - GUV	µW/cm^{2}nm
22	Ed0313 - GUV	µW/cm^{2}nm
23	Ed0305 - GUV	µW/cm^{2}nm
24	Ed0380 - GUV	µW/cm^{2}nm
25	Ed0PAR - GUV	µE/cm^{2}sec
26	Ed0395 - GUV	µW/cm^{2}nm
27	Ed0Temp - GUV	°C

svp1

```
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	
2	ATT	
3	GPS Time sec. of the week	seconds
4	heading (rel. to true North)	degrees
5	pitch	degrees
6	roll	degrees
7	Measurement 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	Differental 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

Field	Data	Units
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	

flflr

```
04+107:16:48:02.342 0  5450 ::  4/16/04 09:44:17 = 0.632  (RAW)
```

Field	Data	Units
1	RVDAS Time Tag	
2	Zero Field	numeric
3	Sample Number	numeric
4	Fluorometer Date	mm/dd/yy
5	Fluorometer Time	hh:mm:ss
6	Digital output of fluorometer	Volts
7	(RAW)	

loxy

For further information on this data, contact Tim Newberger at ***tnewberg@ldeo.columbia.edu***

```
04+117:23:57:23.504 MEASUREMENT        3830    380  Oxygen:          309.95      Saturation:
83.48   Temperature:       -1.35      DPhase:           33.41      BPhase:           32.22
        RPhase:             0.00      BAmp:     262.09      BPot:     163.00      RAmp:
0.00    RawTem.:          694.92
04+117:23:58:23.508 MEASUREMENT        3830    380  Oxygen:          309.59      Saturation:
83.38   Temperature:       -1.35      DPhase:           33.43      BPhase:           32.23
        RPhase:             0.00      BAmp:     262.14      BPot:     163.00      RAmp:
0.00    RawTem.:          694.95
04+117:23:59:23.512 MEASUREMENT        3830    380  Oxygen:          309.74      Saturation:
83.43   Temperature:       -1.35      DPhase:           33.42      BPhase:           32.22
        RPhase:             0.00      BAmp:     262.07      BPot:     163.00      RAmp:
0.00    RawTem.:          694.83
```

Field	Data	Units
1	RVDAS Time Tag	
2-4	Measurement ID, Model Number, Serial Number	alphanumeric

5	Oxygen heading	text
6	Oxygen Reading	Raw numeric
7	Saturation heading	text
8	Saturation Reading	Raw numeric
9	Temperature heading	text
10	Water Temperature	ºC
11	Dphase heading	text
12	Dphase	Raw numeric
13	Bphase heading	text
14	BPhase	Raw numeric
15	Rphase heading	text
16	Rphase	Raw numeric
17	Bamp heading	text
18	Bamp	Raw numeric
19	Bpot heading	text
20	Bpot	Raw numeric
21	Ramp heading	text
22	Ramp	Raw numeric
23	RawTem heading	text
24	RawTemp	Raw numeric

LMG Sensors

Shipboard Sensors

Sensor	Description	Serial #	Cal. Date	Status
Port Anemometer	R.M. Young 105106	WM28392	12Sep05	collected
Stbd Anemometer	R.M. Young 105106	WM28393	12Sep05	collected
Barometer	R.M. Young 61201	BP01150	8Apr05	collected
Humidity/Wet Temp	R.M. Young 41372LC	06719	15Apr04	collected
Mast PAR	BSI QSR-240P	6394	24Aug04	collected
Pyranometer	Eppley PSP	28933F3	21Jun05	Collected
Pyrgeometer	Eppley PIR	28903F3	21Jun05	collected
Biosperical GUV	GUV-2511	25110203113	05Oct05	Collected
TSG	SeaBird SBE21 SeaBird SBE21	1577 3208	18Mar05 30Jun05	Collected collected
TSG Remote Temp	SeaBird 3-01/S	2686	14Jun05	collected
Fluorometer	Turner 10-AU-005 Lamp: daylight 10-045, reference filter: 10-052, emission filter: 10-051, excitation filter: 10-050.	6592RTX	n/a	collected
Transmissometer	WET Labs C-Star 25cm	CST-891DR	24Aug05	collected
Bathymetry	Knudsen 320B/R	10489	n/a	collected
Net Depth	Omega PX605	41200937	n/a	**Not collected**

CTD Sensors

Sensor	Description	Serial #	Cal. Date
Pressure Sensor	In Fish s/n 0232	43528	14Nov05
Temperature	Primary	0717	19Jul05
Temperature	Secondary	1027 2426	06Aug05 23Jan06
Conductivity	Primary	1223	07Feb06
Conductivity	Secondary	2048	25Aug05
Oxygen	Primary	0182	19Aug05
Oxygen	Secondary	0190	19Aug05
Transmissometer		CST-406	03Nov05
Fluorometer		88211	10Aug05

Acquisition and Processing Information

Processing Specifics

Refer to the instrmnt.cof file along with the specific instrument calibration sheets, both 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
081	03:21	Started DAS Loggers	@68W
081	03:40	ADCP and Sound Speed turn on	@68W
081	03:53	Adjusted Fluorometer's system time	@68W
087	21:48	SeaWater Off DAS Logger (TSG, FL, PCO2, OXY) Off	@ Palmer Station
087	21:49	ADCP OFF	@ Palmer Station
090	14:18	ADCP ON	Departed Palmer Station
090	14:24	SeaWater ON	Departed Palmer Station
090	14:28	DAS Loggers ON	Departed Palmer Station
090	15:52	TSG Logging Properly, Transmissometer values were wrong.	Departed Palmer Station
092	~15:00	TSG quit logging. In troubleshooting SeaWater shutdown.	
092	18:04	TSG and SeaWater back on. TSG was change out to s/n3208	
092	20:23	All DAS Logger Stopped	@ 68 West