LMG08-08

Season II

Cruise Data Report

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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 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All of the data has been archived with the Unix "tar" command and/or compressed using Unix "gzip" compression.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:
lmg0808a.tgz
lmg0808b.tgz
lmg0808c.tgz
lmg0808d.tgz
lmg0808e.tgz
LMG0808.tgz

Cal:
CTD_Cals.tar
InstCoef.txt
MET_CALS.tar
UW_CALS.tar
xrvdaslg.txt

CTD:
LMG0804.tar
LMG0808.tar

Drifter:
DrifterN.pdf
DrifterS.pdf

Imagery:
Ice.tar
Waves.tar
WX.tar

Isobars:
isobars.tar

JGOF:
lmgJGOF.tar

PCO2:
lmgPCO2.tar
```

```
QCPlots:
lmgQC.tar

Report:
REPORT.DOC
REPORT.pdf
REPORT.mth

RVDAS:
lmgnav.tar
lmguw.tar

Salinity:
AutoSal
SaltLog.pdf
Salts.xls

Science:
G0804LOG.xls
G0808Log.xls

SITREPS:
Sitreps.tar

TCO2:
TCO2Log.pdf

TSG:
lmgTSG.tar

XBT:
XBTLog.pdf
xbt.tar

XCTD:
XCTDLog.pdf
xctd.tar
```

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 InstCoef.txt 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/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/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/Data/raw

The raw.tgz 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 g501CCC.ext, where g is for the LMG, 501 is the cruise 05-01, CCC is the cast 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/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 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.

Ice Images

/ICE_IMAGE/

This directory contains .jpg files of Terrascan ice imagery sent to the ship from Palmer station to aid in navigation of the ship and science.

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.

XBT

/XBT/

Expendable Bathythermographic (XBT) "Deep Blue" probes were used to obtain water column temperature profiles. The dataset includes the following files:

    dat.zip   The probe drop schedule and other configuration files.

efiles.zip	The edited data files.
log.zip	The log files for drop and GPS positioning.
nav.zip	The navigation files.
sfiles.zip	The raw data files.
*.pdf	Scanned images of the paper log sheets.

XCTD

/XCTD/

Expendable Conductivity, Temperature, and Depth (XCTD) digital probes were used to obtain water column temperature and Salinity profiles. The two files were created for each drop .RDF files contain the raw data, and the .EDF contain the exported ascii data.

TCO2

/TCO2/

This directory contains the log sheet for the TCO2 sample during the Drake Transect Sampling. For further information on this data, contact Tim Newberger at ***tnewberg@ldeo.columbia.edu***

Salts

/SALT/

This directory contains the log sheet for the Salt sample take during the Drake Transect Sampling, also a spreadsheet containing the Salt sample and TSG comparison. These samples were analyzed with the onboard AutoSal by the MST.

Drifters

/DRIFTERS/

This directory contains the log sheet for the drifter buoys released during the Drake Transect.

Science

/Science/

This directory contains data and photos collected by the individual scientists.

Maps

/Maps/

This directory contains a tar file, maps.tar, which contains various cruise maps generated with GMT. The tar file scripts.tar contains the csh scripts use to create these maps, along with data point files.

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	$^\circ$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	$^\circ$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

TSG Data files

/TSG/tsgfl

RVDAS processes the ltsg.d### file, using the Seabird calibration. It produces a daily tsgfl.d### file with the below fields.

```
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	$^\circ$C
3	External water temperature	$^\circ$C
4	Conductivity	S/cm
5	Salinity	PSU
6	Transmissometer signal	Volts

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
PAR, (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
PIR (LW radiation)	lmwx	continuous	1 sec	Eppley PIR
PSP (SW radiation)	lmwx	continuous	1 sec	Eppley PSP
Port Ultrasonic Wind Speed/Direction	lmwx	continuous	1 sec	Gill Wind Observer II

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
Garmin 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	lwn1	variable	varies	Markey DUSH 11
DUSH 5 Winch	lwn1	variable	varies	Markey DUSH 5
DUSH 4 Winch	lwn1	variable	varies	Markey DUSH 4

Oceanographic Data

Measurement	File ID	Collect. Status	Rate	Instrument
Salinity	ltsg	continuous	6 sec	SeaBird 21
Sea Surface Temperature	ltsg	continuous	6 sec	SeaBird 3-01/S
Salinity	ls45	continuous	1 sec	SeaBird 21
Sea Surface Temperature	ls38	continuous	1 sec	SeaBird 3-01/S
Fluorometry (digital)	lflr	continuous	1 sec	Turner 10-AU-005
Fluorometry (digital)	ldflr	continuous	1 sec	Wetlab ECO
ADCP, Speed Log	ladc	continuous	1 sec	RD Instruments
Oxygen	loxy	continuous	1 sec	
PCO2	lpco2	continuous	2.5 min	

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 – RM Young	lmet
Meteorological - Cambell	lmwx
Knudsen	lknu
TSG - Thermosalinograph	ltsg
microTSG	ls45
Digital Remote Temperature	ls38
Fluorometer - Turner	lflr
Fluorometer – Wetlab ECO	ldfl
ADCP	ladc
Sound Velocity Probe	lsvp
GUV & PUV	lguv
PCO2 System	lpco
Oxygen	loxy
Wet Wall Flows	lsea
Winches: Dush4,5,&11	lwn1
Net Depth Sensor	lnds

Navigation Data	File ID
Gyro Compass	lgyr
P-CODE GPS	lpcd
Ashtech ADU2 GPS	lash
Garmin 17 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 – Knudsen Sonar

```
08+024:07:36:36.245 HF,00.00, 000,0,LF,448.9,-026,1
```

Field	Data	Units
1	RVDAS Time Tag	
2	HF – high frequency header (12 kHz)	
3	HF - depth to surface	meters
4	HF - Echo Strength	
5	HF – Depth Valid Flag	
6	LF – low frequency header (3.5 kHz)	
7	LF - depth to surface	meters
8	LF - Echo Strength	
9	LF – Depth Valid Flag	

Inds – Net Depth Sensor

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

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

lwn1 - Winches

`08+033:11:27:50.673 RD,DUSH-5,00111.63,00000000,-0000012,1938`

Field	Data	Units
1	RVDAS Time Tag	
2	Record Identifier, RD=Remote Data	
3	Winch Indentifier, DUSH-X where X is 4, 5, or 11	
4	Tension	lbs
5	Speed	Meters/minute
6	Payout	meters
7	Checksum	

Imet – RM Young Meteorological

`08+033:22:55:38.443  6.3 194  64  6.7 194  67  989.2   2.0  87   -2.9573  -12.1841  520.0833`

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	No longer Connected - PSP (long wave radiometer)	Volts
12	No Longer Connected - PIR (short wave radiometer)	Volts
13	PAR (photo-synthetically available radiation, 400 - 700 nm)	Volts

Imwx - Cambell Meterological DAS

`08+034:13:52:14.216 PUS,A,356,002.15,M,+332.28,+000.97,60,08`

Field	Data	Units
1	RVDAS Time Tag	
2	PUS tag – Port UltraSonic Anemometer	
3	Unit Identification, A-Z	
4	Port Wind Direction, degrees relative to Bow	deg
5	Port Wind Speed	m/s
6	Units, M=meters per second	
7	Sound Speed	m/s
8	Sonic Temperature	°C
9	Status, 0=ok, 60=Heating Enabled & ok, Other value mean a fault	
10	Check Sum	

```
08+034:13:52:14.454 MET,12.22322,44.25706,-75,-25,-363.6365,2.332982,-0.08215196,278.6845,
279.2192,854.6198
```

Field	Data	Units
1	RVDAS Time Tag	
2	MET tag	
3	Power Supply Voltage	Volts
4	Enclosure Relative Humidity	mBars
5	Not Used – future Air Temp	
6	Not Used – future Air Relative Humidity	
7	Not Used – future PAR	
8	PSP	mVolts
9	PIR	mVolts
10	PIR Thermopile	Volts
11	PIR Case Temperature	°C
12	PIR Dome Temperature	°C
13	Barometer	mBars

ls45 – microTSG, Thermosalinograph

For further information on this data, check on www.seabird.com on SBE 45 MicroTSG Thermosalinograph

```
08+037:13:45:57.596   2.6470,  3.03853,  33.8129, 1459.351
```

Field	Data	Units
1	RVDAS Time Tag	
2	Internal water temperature	°C
3	Conductivity	S/m
4	Salinity	psu
5	Sound Velocity	m/s

ls38 – digital Remote Temperature

For further information on this data, check on www.seabird.com on SBE38 Digital Thermometer

```
08+037:13:47:17.841  2.2527
```

Field	Data	Units
1	RVDAS Time Tag	
2	External water temperature	°C

ltsg - Thermosalinograph

For further information on this data, check on www.seabird.com on SBE 21 Thermosalinograph

```
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

Lflr – Fluorometer, Turner

`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)	

ldflr – Fluorometer, Wetlab ECO

`08+037:13:55:08.434 99/99/99      99:99:99       0.00    2585    73     543`

Field	Data	Units
1	RVDAS Time Tag	
2	Fluorometer Date	mm/dd/yy
3	Fluorometer Time	hh:mm:ss
4	Chlorophyll Signal	µg/l
5	Reference	λq
6	Counts – Chlorophyll Signal	Count
7	Thermistor	

loxy - Oxygen

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
```

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

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
24	RawTemp	Raw numeric

lpco – PCO2 system

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
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 – Biospherical GUV

```
08+037:14:17:59.211 020608 141758 –.000099 1.307E0 7.24E0 1.316E1 2.609E1 3.285E1 3.505E1 8.075E-
2 38.993 17.985
```

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	Ed0305 - GUV	$\mu W/cm^2 nm$		5	EdZ305 -PUV	$\mu W/cm^2 nm$
6	Ed0313 - GUV	$\mu W/cm^2 nm$		6	EdZ313 -PUV	$\mu W/cm^2 nm$
7	Ed0320 - GUV	$\mu W/cm^2 nm$		7	EdZ320 -PUV	$\mu W/cm^2 nm$
8	Ed0340 - 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	Ed0395 - GUV	$\mu W/cm^2 nm$		10	EdZPAR -PUV	$\mu E/cm^2 sec$

11	Ed0PAR - GUV	$\mu E/cm^2 sec$
12	Ed0Temp - GUV	$°C$
13	Ed0VIn	Volts

11	LuZChl -PUV	$\mu E/srm^2 sec$
12	EdZ380 -PUV	$\mu W/cm^2 nm$
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	Ed0305 - GUV	$\mu W/cm^2 nm$
21	Ed0313 - GUV	$\mu W/cm^2 nm$
22	Ed0320 - GUV	$\mu W/cm^2 nm$
23	Ed0340 - GUV	$\mu W/cm^2 nm$
24	Ed0380 - GUV	$\mu W/cm^2 nm$
25	Ed0395 - GUV	$\mu W/cm^2 nm$
26	Ed0PAR - GUV	$\mu E/cm^2 sec$
27	Ed0Temp - GUV	$°C$
28	Ed0VIn	Volts

lsvp - Sound Velocity Probe in ADCP Transducer Well

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

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

ladc – ADCP Speed Log

`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 – Ashtech GPS

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

Field	Data	Units
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

Igyr - Gyro

```
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 - Garmin GPS

GGA: Global Positioning Fix Data

08+034:12:26:06.131 $GPGGA,122607,6446.4733,S,06403.4455,W,1,11,0.9,-193.4,M,9.7,M,,*5A

Field	Data	Units
1	RVDAS Time Tag	
2	$GPGGA Tag	
3	UTC of position	hhmmss.ss
4	Latitude in degrees with decimal minutes	ddmm.mmm
5	North (N) or South (S)	
6	Longitude in degrees with decimal minutes	ddmm.mmm
7	East (E) or West (W)	
8	GPS quality (1=GPS 2=DGPS)	
9	Number of GPS satellites used	
10	Horizontal dilution of precision (HDOP)	
11	Antenna height above/below mean-sea-level (geoid)	meters
12	Units for antenna height (M = Meters)	
13	Geoidal Separation[1]	
14	Units for Geoidal Separation (M = Meters)	meters
15	Age of differential GPS data, number of seconds since last SC104 Type 1 or 9	
16	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

08+034:12:26:06.211 $GPGLL,6446.4733,S,06403.4455,W,122607,A

Field	Data	Units
1	RVDAS Time Tag	
2	$GPGLL Tag	
3	Latitude	ddmm.mmm
4	North (N) or South (S)	
5	Logitude	ddmm.mmm
6	East (E) or West (W)	
7	UTC of position	hhmmss.ss
8	Status: A = Data Valid, V =Data Not Valid	

VTG: Track Made Good and Speed over Ground

08+034:12:26:06.211 $GPVTG,167,T,151,M,000.0,N,0000.0,K

Field	Data	Units
1	RVDAS Time Tag	
2	$GPVTG Tag	
3	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	

lpcd – Trimble Pcode GPS

GGA: Global Positioning Fix Data

08+034:12:26:06.131 $GPGGA,122607,6446.4733,S,06403.4455,W,1,11,0.9,-193.4,M,9.7,M,,*5A

Field	Data	Units
1	RVDAS Time Tag	
2	$GPGGA Tag	
3	UTC of position	hhmmss.ss
4	Latitude in degrees with decimal minutes	ddmm.mmm
5	North (N) or South (S)	
6	Longitude in degrees with decimal minutes	ddmm.mmm
7	East (E) or West (W)	
8	GPS quality (1=GPS 2=DGPS)	
9	Number of GPS satellites used	
10	Horizontal dilution of precision (HDOP)	
11	Antenna height above/below mean-sea-level (geoid)	meters
12	Units for antenna height (M = Meters)	
13	Geoidal Separation[1]	
14	Units for Geoidal Separation (M = Meters)	meters
15	Age of differential GPS data, number of seconds since last SC104 Type 1 or 9	
16	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

08+034:12:26:06.211 $GPGLL,6446.4733,S,06403.4455,W,122607,A

Field	Data	Units
1	RVDAS Time Tag	
2	$GPGLL Tag	
3	Latitude	ddmm.mmm
4	North (N) or South (S)	
5	Logitude	ddmm.mmm
6	East (E) or West (W)	
7	UTC of position	hhmmss.ss
8	Status: A = Data Valid, V =Data Not Valid	

VTG: Track Made Good and Speed over Ground

08+034:12:26:06.211 $GPVTG,167,T,151,M,000.0,N,0000.0,K

Field	Data	Units
1	RVDAS Time Tag	
2	$GPVTG Tag	
3	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	

RMC: Recommended Minimum Specific GNSS Data

08+034:13:17:26.627 $GPRMC,131726.605,A,6446.4820,S,06403.3075,W,000.0,094.4,030208,16.3,E

Field	Data	Units
1	RVDAS Time Tag	
2	$GPRMC Tag	
3	UTC of position	hhmmss.ss
4	Status A = Data Valid, V = Navigation Receiver Warning	
5	Latitude in degrees with decimal minutes	ddmm.mmm
6	North (N) or South (S)	
7	Longitude in degrees with decimal minutes	ddmm.mmm
8	East (E) or West (W)	
9	Speed Over Ground, knots	knots
10	Course Over Ground, degrees True	degrees
11	Date	ddmmyy
12	Magnetic Variation, degrees E/W	degrees
13	Mode Indicator E= Estimated Mode	

LMG Sensors

Shipboard Sensors

Sensor	Description	Serial #	Cal. Date	Status
Port Anemometer	R.M. Young 105106	WM57508	1-Aug-2007	Collected
Stbd Anemometer	R.M. Young 105106	WM28394	1-Aug-2007	Collected
Ultra Sonic Anemometer	*Gill*		*15-May-2007*	*Evaluation*
Barometer	R.M. Young 61201	BP01150	19-Feb-2007	Collected
Humidity/Wet Temp	RM Young 41372LC	6133	17-Aug-2007	Collected
PAR for Mast	Biosph. Inst. QSR-240P	6394	29-Aug-2006	Collected
PIR	Eppley PIR	28903F3	31-Aug-2007	Collected
PSP	Eppley PSP	28933F3	22-Aug-2007	Collected
GUV (Mast)	Biosph. Inst. GUV-2511	25110805126	13-Nov-2007	Collected
Transmissometer	WET Labs C-Star 25 cm deep	CST-891DR	20-Nov-2006	Collected
Fluorometer	Turner 10AU-005-CE	6592 RTX		Collected
TSG	Sea-Bird 21	2131422-3208	30-Jun-2005	Collected
Remote Temp	Sea-Bird 3S	34015	11-May-2007	Collected
MicroTSG	*Sea-Bird 45*	*200*	*21-Mar-2007*	*Evaluation*
Digital Remote Temp	*Sea-Bird 38*	*0352*	*06-Jun-2007*	*Evaluation*
Fluorometer	*WET Labs ECO-FL*	*FLRTD-398*	*30-Oct-2007*	*Evaluation*

```
Note:  Items in green and italics above are running as part of a new
    equipment evaluation and no claims are made as to the veracity of the
    data collected from them.
```

CTD Sensors

Sensor	Description	Serial #	Cal. Date
Pressure Sensor	In Fish s/n 0312	1480	26Sep06
Temperature	Primary	2470	8Feb08
Temperature	Secondary	2205	8Feb08
Conductivity	Primary	2247	20Mar08
Conductivity	Secondary	1223	24Jul07
Oxygen	Primary – Voltage 0	0202	14Aug07
Oxygen	Secondary – Voltage 1	0196	12Apr08
Altimeter	Voltage 2	43915	
Transmissometer	Voltage 4	CST-407DR	7Dec08
Fluorometer	Voltage 6	FLRTD-399	27Mar08

Acquisition and Processing Information

Processing Specifics

Refer to the InstCoef.txt 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
177	6:30	RVDAS Loggers Started	@68W
177	6:35	PCO2 System Started	@68W
177	6:38	ADCP Started	@68W
177	6:40	TSG Started	@68W
177	6:43	Digital Fluorometer, Transmissometer Turned On	@68W
177	6:54	Transmissometer seemed to read low, re-clean and check tube. No problem found.	@68W
178	~8:00	Seawater to Fluorometer and Transmissometer not flowing	
178	12:42	Seawater to Fluorometer and Transmissometer not flowing	
178	12:45	Ashtech was locked up since 5:31, Reset	
178	12:55	Started new cruise on ADCP, plots not working – LMG0808a	
181	16:52	Changed Sound Speed Setting on Knudsen from 1500 to 1450. Avg Sound Speed from CTD Cast. Depth now agrees with CTD Cast.	
183	12:02	Found Knudsen left in Pinger mode after last Megacore cast ~6:03	
184	15:33	SeaWater Off	Arriving @ Palmer Station
184	15:36	UnderWay Loggers Off	Arriving @ Palmer Station
184	17:14	Tied Up	@ Palmer Station
185	19:15	Restart GUV Computer – Windows Updates	
186	14:20	Sonar On	Departed Palmer Station
186	14:26	Seawater On	Departed Palmer Station
186	14:28	RVDAS UW Loggers On	Departed Palmer Station
186	14:49	PCO2 System Running	Departed Palmer Station
187	12:35	Adjusted PCO2 Standard Flows	
188	11:05	Ashtech Locked Up @ 4:42, reset	
188	16:30	Started New Cruise on ADCP, LMG0808b	
188	20:12	ADCP - Nb150 Contour plots not working - Started ADCP New Cruise LMG0808c	
188	21:02	ADCP - Nb150 Contour Plots still not working - Shutdown UHDAS and Started new Cruise	

		LMG0808d	
189	05:16	ADCP - Shutdown UHDAS and started with new cruise lmg0808e	
190	03:01	RVDAS Loggers Shutdown	@ 68 West
190	03:03	ADCP Shutdown	@ 68 West
190	03:05	Seawater off	@ 68 West
190	03:29	PCO2 Finished Standard Run	@ 68 West