
LMG0502

DOMACK

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All of the data has been archived with the Unix “tar” command and/or compressed using Unix “gzip” compression.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 Windows9X, 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.tar.gz*. This name does not follow the 8.3 naming convention of the ISO9660 format. So the file was renamed, dropping the .tar extension and making the file name *File.gz*. 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.gz* but it does not append the .tar extension. So you may not recognize the file as a tar archive, but the 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 unarchive 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
```

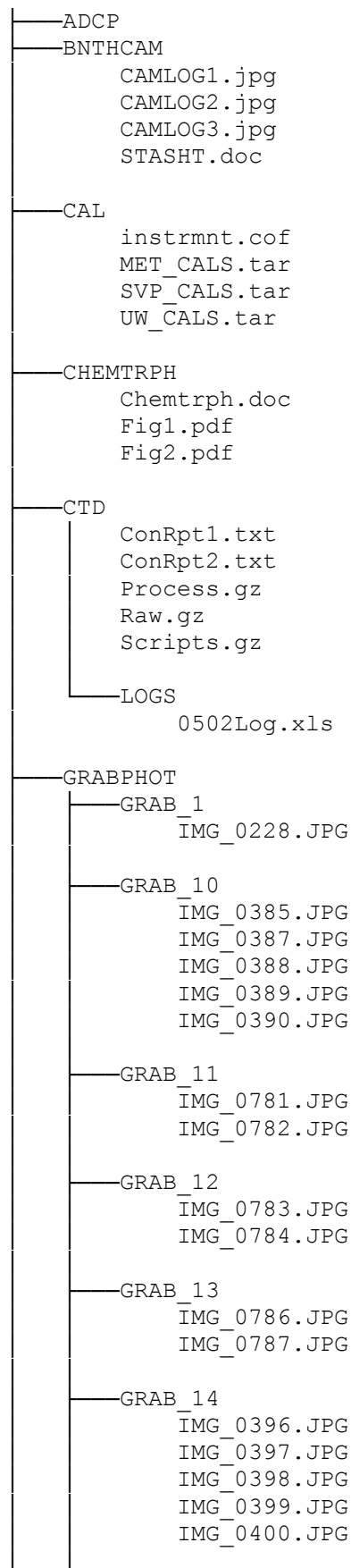
To extract the files from the archive:

```
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



GRAB_15	IMG_0401.JPG
	IMG_0402.JPG
	IMG_0403.JPG
	IMG_0404.JPG
	IMG_0405.JPG
GRAB_16	IMG_0406.JPG
	IMG_0407.JPG
	IMG_0408.JPG
	IMG_0409.JPG
GRAB_18	LMG05-02 Sta 18 Grab.jpg
GRAB_19	IMG_0790.JPG
	IMG_0791.JPG
	IMG_0792.JPG
GRAB_2	IMG_0765.JPG
	IMG_0766.JPG
GRAB_20	1SMG 20.JPG
	2SMG 20.JPG
	3SMG 20.JPG
	Station 20.JPG
GRAB_21	IMG_0578.JPG
	IMG_0580.JPG
	IMG_0581.JPG
	IMG_0582.JPG
GRAB_22	IMG_0639.JPG
	IMG_0643.JPG
	IMG_0645.JPG
	IMG_0646.JPG
	IMG_0647.JPG
	IMG_0648.JPG
GRAB_24	IMGP1137.JPG
	IMGP1138.JPG
GRAB_25	IMGP1153.JPG
	IMGP1154.JPG
	IMGP1155.JPG
	IMGP1156.JPG
GRAB_26	IMG_0691.JPG
	IMG_0692.JPG
	IMG_0693.JPG
	IMG_0694.JPG

- IMG_0695.JPG
- GRAB_3
 - IMG_0767.JPG
 - IMG_0768.JPG
- GRAB_4
 - IMG_0275.JPG
 - IMG_0276.JPG
 - IMG_0277.JPG
 - IMG_0278.JPG
 - IMG_0279.JPG
 - IMG_0280.JPG
 - IMG_0281.JPG
- GRAB_5
 - IMG_0772.JPG
 - IMG_0773.JPG
- GRAB_8
 - IMG_0776.JPG
 - IMG_0777.JPG
- GRAB_9
 - IMG_0353.JPG
 - IMG_0354.JPG
 - IMG_0355.JPG
 - IMG_0356.JPG
 - IMG_0357.JPG
 - IMG_0358.JPG
 - IMG_0362.JPG
 - IMG_0363.JPG
 - IMG_0364.JPG
 - IMG_0366.JPG
 - IMG_0367.JPG
- ICE
 - IceImg.tar
- ISOBARS
 - Isobars.tar
- JGOF
 - lmgjgof.tar
- MAG
 - Sus.gz
 - Xcel.gz
- MAPS
 - cruztrak.ai
 - cruztrak.jpg
 - cruztrak.pdf
- MISC
 - Misc.gz
- MOORING
 - Moorings.gz

- PCO2
 - lmgpco2.tar
- PDF
 - PDF.gz
- QC_PLOTS
 - lmgqc.tar
- REPORT
 - REPORT.DOC
- RVDAS
 - lmgnav.tar
 - lmgtsqfl.tar
 - lmguw.tar
- SALINITY
 - lmg052-1.dat
 - lmg052-1.hdr
 - lmg052-1.raw
- SCUD
 - Scud.gz
- WAYPTS
 - Waypts.txt
- XBT
 - TD_00002.edf
 - TD_00002.RDF
 - TD_00003.edf
 - TD_00003.RDF
- XYZ
 - XYZ.gz

- PCO2
 - lmgpco2.tar
- PDF
 - PDF.tgz
- QC_PLOTS
 - lmgqc.tar
- REPORT
 - REPORT.DOC
- RVDAS
 - lmgnav.tar
 - lmgtsqfl.tar
 - lmguw.tar
- SALINITY
 - lmg052-1.dat
 - lmg052-1.hdr
 - lmg052-1.raw
- SCUD

```
    Scud.tgz
  └─WAYPTS
      Dwpts.txt
  └─XBT
      TD_00002.edf
      TD_00002.RDF
      TD_00003.edf
      TD_00003.RDF
  └─XYZ
      XYZ.tgz
```

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.

BNTHCAM

/BNTHCAM/

Contains scanned images of the Benthos camera log sheets. The Benthos uses 35mm film which is developed and printed separately

CAL

/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.TAR.

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.

CHEMTRPH

/CHEMTRPH/

Contains documents added to the science drive by the science party

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 were used and what freq or volt they were 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/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.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 collected 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 g502CCC.ext, where g is for the LMG, 502 is the cruise 05-02, CCC is the cast number. For example; the raw files associated with the Cast 1 on this cruise are: g502001.bl, g502001.con, g502001.dat, g502001 .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/Pscripts/*. 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.

GRABPHOT

/GRABPHOT/

Contains images of the Smith-Macintyre grab samples

Ice Images

/ICE_IMAGE/

This directory contains image files of Terrascan ice imagery sent to the ship from Palmer station before and during the cruise.

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.

MISC

/MISC/

Contains miscellaneous reports and logsheets stored in the root directory of the science drive.

MOORING

/MOORING/

Contains documents pertaining to the mooring deployments and recoveries

Data and Science Report

/Report/

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

XBT

/XBT/

Expendable Bathythermographic (XBT) probes were used to obtain water column temperature profiles. The data was collected using the MK21 Sippican Software. The .RDF files contain the raw data, and the .EDF contain the exported ascii data.

Maps

/Maps/

This directory contains a tar file, cruisetrack.tar, which contains various cruise maps.

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.

SALINITY

/SALINITY/

Contains data collected from CTD samples using the Autosal

SCUD

/SCUD/

Contains images collected by the scud system. The video is delivered separately on Hi-8mm magnetic tape.

WAYPTS

/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.

PDF

/PDF/

Contains PDF documents contributed by the science party

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	Gen1	variable	~1/3 sec	

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	Navigation Data	File ID
Meteorological	lmet	Gyro Compass	lgyr
Knudsen	lknu	P-CODE GPS	lpcd
Thermosalinograph	ltsg	Ashtech ADU2 GPS	lash
ADCP	ladc	Trimble NT2100 GPS	tgps
Sound Velocity Probe	lsvp		
GUV & PUV	lguv		
PCO2 System	lpcd		
Oxygen	loxy		

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

Gen1

99+099:00:18:19.775 V01 00199.8

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

Itsg

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

04+321:00:01:23.978 06D572EC1801D8182DE4

04+321:00:01:23.978 ttttccccrrrrrruuuvvv

Field	Data	Units
1	RVDAS Time Tag	
2	Internal water temperature – tttt	Hex Value
3	Conductivity - cccc	Hex Value
4	External water temperature - rrrrr	Hex Value
5	Fluorometer signal (analog) - uuu	Hex Value
6	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

Ipco

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

Iguv

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	$\mu\text{W}/\text{cm}^2\text{nm}$
6	Ed0340 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
7	Ed0313 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
8	Ed0305 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
9	Ed0380 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
10	Ed0PAR - GUV	$\mu\text{E}/\text{cm}^2\text{sec}$
11	Ed0395 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
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	$\mu\text{W}/\text{cm}^2\text{nm}$
6	EdZ313 -PUV	$\mu\text{W}/\text{cm}^2\text{nm}$
7	EdZ320 -PUV	$\mu\text{W}/\text{cm}^2\text{nm}$
8	EdZ395 -PUV	$\mu\text{W}/\text{cm}^2\text{nm}$
9	EdZ340 -PUV	$\mu\text{W}/\text{cm}^2\text{nm}$
10	EdZPAR -PUV	$\mu\text{E}/\text{cm}^2\text{sec}$
11	LuZChl -PUV	$\mu\text{E}/\text{srm}^2\text{sec}$
12	EdZ380 -PUV	$\mu\text{W}/\text{cm}^2\text{nm}$
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	$\mu\text{W}/\text{cm}^2\text{nm}$
21	Ed0340 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
22	Ed0313 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
23	Ed0305 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
24	Ed0380 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
25	Ed0PAR - GUV	$\mu\text{E}/\text{cm}^2\text{sec}$
26	Ed0395 - GUV	$\mu\text{W}/\text{cm}^2\text{nm}$
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

¹The 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.

²The speed output 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	Differential reference station ID	

¹Geoidal 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 – Latitude/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	Longitude	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	

¹Zone 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	status 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	

Ifir

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

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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

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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	°C
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	WM28394	16-Oct-04	collected
Stbd Anemometer	R.M. Young 105106	WM5708	16-Oct-04	collected
Barometer	R.M. Young 61201	BP01150	26-Feb-03	collected
Humidity/Wet Temp	R.M. Young 41372LC	06133	23-Dec-03	collected
Mast PAR	BSI QSR-240P	6393	12-Dec-03	collected
Pyranometer	Eppler PSP	28933F3	30-Mar-04	collected
Pyrgeometer	Eppler PIR	28903F3	30-Mar-04	collected
TSG	SeaBird SBE21	3208	15-Apr-04	collected
TSG Remote Temp	SeaBird 3-01/S	1620	5-May-04	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-830DR	31-Jul-04	collected
P-Code GPS	Trimble 20636-00 (SM)	220035265	n/a	collected
Bathymetry	Knudsen 320B/R		n/a	collected

CTD Sensors

Sensor	Description	Serial #	Cal. Date
Pressure Sensor	In Fish s/n 0312	53580	08-Jul-04
Temperature	Primary	1529	5-May-04
Temperature	Secondary	2470	29-Jun-04
Conductivity	Primary	2047	29-Jun-04
Conductivity	Secondary	2065	8-Jul-05
Oxygen	Primary – Voltage 2	430179	24-Jun-04
Oxygen	Secondary – Voltage 3	430202	14-Jul-04
Transmissometer	Voltage 4	407DR	17-May-04
Fluorometer	Voltage 0	88211	12-May-2004

Note the Oxygen sensors were installed on the rosette approximately midway through the cruise.

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
042	1905	Departed dock	Punta Arenas
042	1925	RVDAS new cruise start	
043	1101	PCO2 Logging	68 W data limit
043	1112	ADCP Logging	68 W data limit
043	1130	TSG Logging	68 W data limit
043	1828	Toggled ADCP Bottom Track	
044	0734	ADCP Bottom Track off	
044	1133	TSG logging problems noted	
044	1144	TSG/FLR logger reset	
044	1201-1215	Adjusted PCO2 gas flows; stopped PCO2 system for adjustment	
044	1330	Run PCO2 program	
045	1300	PCO2 system lost power and was restarted	
045	1802	RVDAS stopped	
046	1800	ADCP bottom track turned on	
047	1200-1215	Stopped PCO2 after STDs run. Restarted and adjust STD flows	
048	2012	Power failure – seawater pump off	
048	2027	Seawater pump on – time approx.	
048	2309	Cleaned Fluorometer cell with instrument on. Signal spiked. Seawater flow through instrument was blocked from approx 2012 to 2309	
050	2155	Knudsen died	
051	0050	Knudsen power cycled	
051	0150	Knudsen back up	
051	0150	Knudsen time sync with GPS time corrected. (previously was off by approx. 3 min)	
051	0521	Knudsen GPS feed was found to be inactive; it had defaulted to incorrect baud rate after power cycle	
052	1430	noted PCO2 problem	
057	1430	changed PCO2 N2 cylinder. Time approx	
058	1805	ADCP log malfunction noted on DAS	

058	1855	Unplugged Ashtech feed into MUX for <1 min for ADCP test	
058	1859	Toggled Disable/Enable SVP on DAS for ADCP testing	
058	1900	SVP down now too... sweet	
058	1912	Entire DAS restart	
059	0038	Stopped ADCP logging/UHDAS and power-cycled ADCP per Eric Firing	
059	0040	Brought ADCP up – no go	
059	0044	Took UHDAS and both ADCP's offline	
059	0101	ADCP back up	
061	1300	Noted PUV/GUV deck box was powered down. Restored power	
063	2333	Secured Knudsen for acoustic release operation	
064	2219	Secured Knudsen and ADCP for acoustic release operation	
065	0800-1200	Intermittently secured Knudsen and ADCP for acoustic release operation	
065	1800	Shut down servers for UPS service	
065	1914	Restored servers	
065	2110	Secured ADCP and Knudsen for acoustic release operations	
069	2218	Took down DAS inadvertently	
069	2222	Restored DAS	
070	1610	Stopped underway systems	68 W data limit
070	1632	DAS loggers stopped	