LMG0701

Palmer LTER

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All of the data has been archived with the Unix "tar" command and/or compressed using Unix "gzip" compression.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:                       ./Oxygen:                     ./XCTD:
  lmg0501a.tar                  Oxy.tar                       *.edf
  lmg0501b1.tar                                               *.RDF
  lmg0501b.tar                ./PCO2:                         XCTD_Log.pdf
  lmg0501.tar                   lmgpco2.tar
                                                            ./XCTD/Drake:
./CAL:                        ./QC_PLOTS:                     *.edf
  CTD_CALS.pdf                  lmgqc.tar                     *.RDF
  instrmnt.cof                                                XCTDLog.pdf
  MET_CALS.tar                ./REPORT:
  SVP_CALS.tar                  REPORT.DOC
  UW_CALS.tar                   REPORT.htm
                                REPORT.txt
./CTD:
  CONFIG.XLS                  ./RVDAS:
  Graphs.tgz                    lmgnav.tar
  Process.tgz                   lmgtsgfl.tar
  Raw.tgz                       lmguw.tar
  scripts.tar                   xrvdas.log
  setup.tar
                              ./SALINITY:
./CTD/LOGS:                     SAL.tar
  *.pdf
                              ./SALINITY/Drake:
./DRIFTERS:                     SaltLog.pdf
  DriftLog.pdf                  XBTsalts.xls

./EVENTLOG:                   ./TCO2:
  EVENTLOG.XLS                  TCO2Log.pdf

./ICE:                        ./WAYPTS:
  Ice.tar                       0301wpt.txt
                                0501wpt.txt
./ISOBARS:
  Isobars.tar                 ./XBT:
                                DAT.ZIP
./JGOF:                         EFILES.ZIP
  lmgjgof.tar                   LOG.ZIP
                                NAV.ZIP
./MAPS:                         SFILES.ZIP
  Map24.ps                      XBTLog.pdf
  Map8.ps

./MOORING:
  Mooring.tar

./NUT:
  Nutr.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 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/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.

MOCNESS

1-meter and 10-meter

Mocness/

The MOCNESS data resides in the MOC1.gz and MOC10.gz archive for the 1-meter and 10-meter respectively. The data set from each cast is made up of three files. The filenames consist of the station number and an extension: .pro .raw or .tab. The type of data in each file is listed below.

> .pro   processed data in space delimited tabular format
>
> .raw   raw cast data in ASCII text format
>
> .tab   statistical summary in space-delimited tabular format

Processed filename *.pro

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

Rows 1-5   header information about sensors and the tow

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

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

time   Julian day, hours and minutes expressed as decimal

pres   depth (m)

temp   temperature degrees C

theta   potential temperature, formulae from Fofonoff and Millard 1983

sal   salinity ppt

sigma	potential density, formulae from Fofonoff and Millard 1983
angle	angle 0-90
flow	flow counts 0000-9999
hzvel	horizontal velocity (knots)
vtvel	vertical velocity (m/min)
vol	seawater volume filtered (m3)
net	net number
fluor	fluorescence (0-5 volts)
ptran	extinction coefficient (0-5 volts)
oxycurrent	0-5 volts
oxytemp	0-5 volts internal to the probe
oxygen	dissolved oxygen (ml/l)
lat	latitude decimal degrees
lon	longitude decimal degrees

Raw filename *.raw

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

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

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

The fields are as follows and are discussed individually below.

N1	net count, counts of left response switch, 00-99
N2	net count, counts of right response switch, 00-99
AA	net angle in degrees, 00-99
FFFF	flow counts, 0000-9999. Reset to 0000 with every net response or increment net # button command
PPPPP	pressure value, converted to decibars by the deck computer
PTPT	a decimal number derived from the temperature sensor in the pressure sensor which is used to improve the pressure calibration
TTTTTT	averaged SeaBird temperature period. The frequency from the SeaBird temperature sensor is measured and processed in the NCU to generate the value TTTTTT, a 6-digit decimal number. This number is scaled as follows: (frequency of the temp.

sensor)=K/(TTTTTT) where K=1,258,291,200. Software in the deck computer uses this frequency value along with the individual sensor's calibration file to calculate temperature.

CCCCCC   averaged SeaBird conductivity period, handled exactly like the temperature frequency and the same scaling factor should be used

BBB   battery voltage (divide value by 10)

$GPGLL   latitude and longitude in decimal degrees

Tab filename *.tab

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

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

Captured screens, filenames *.bmp

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

Optical Plankton Counter

/OPC/

The OPC was towed along with the 1-meter MOCNESS. The data collected from these tows are in the OPC.gz archive.

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.

Nutrients

/NUT/

Oxygen

/OXY/

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	°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

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

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	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
6	VCO2	mL
7	Equilibrator temperature	°C

Field	Data	Units
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	$\mu W/cm^2nm$
6	Ed0340 - GUV	$\mu W/cm^2nm$
7	Ed0313 - GUV	$\mu W/cm^2nm$
8	Ed0305 - GUV	$\mu W/cm^2nm$
9	Ed0380 - GUV	$\mu W/cm^2nm$
10	Ed0PAR - GUV	$\mu E/cm^2sec$
11	Ed0395 - GUV	$\mu W/cm^2nm$
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	$\mu W/cm^2nm$
6	EdZ313 -PUV	$\mu W/cm^2nm$
7	EdZ320 -PUV	$\mu W/cm^2nm$
8	EdZ395 -PUV	$\mu W/cm^2nm$
9	EdZ340 -PUV	$\mu W/cm^2nm$
10	EdZPAR -PUV	$\mu E/cm^2sec$
11	LuZChl -PUV	$\mu E/srm^2sec$
12	EdZ380 -PUV	$\mu W/cm^2nm$
13	WTemp -PUV	°C
14	Depth -PUV	m
15	EdZTemp -PUV	°C
16	LuZTemp -PUV	°C
17	Tilt -PUV	Degrees
18	Roll -PUV	Degrees
19	Ed0Gnd - GUV	Volts
20	Ed0320 - GUV	$\mu W/cm^2nm$
21	Ed0340 - GUV	$\mu W/cm^2nm$
22	Ed0313 - GUV	$\mu W/cm^2nm$
23	Ed0305 - GUV	$\mu W/cm^2nm$
24	Ed0380 - GUV	$\mu W/cm^2nm$
25	Ed0PAR - GUV	$\mu E/cm^2sec$
26	Ed0395 - GUV	$\mu W/cm^2nm$
27	Ed0Temp - GUV	°C

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	Differential reference station ID	

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

GLL: Geographic Position – Latitiude/Logitude

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

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

VTG: Track Made Good and Speed over Ground

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

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

VHW: Speed Through Water and Heading

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

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

ZDA: Time and Date

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

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

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

BWC: Bearing and Distance to Waypoint

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

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

lpcd

GGA: GPS Position Fix – Geoid/Ellipsoid

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

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

GLL: GPS Latitude/Longitude

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

Field	Data	Units
1	RVDAS Time Tag $GPGLL	
2	Latitude	degrees
3	North or South	
4	Longitude	degrees

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	

lflr

```
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	°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
Stbd Anemometer	R.M. Young 105106	WM28394	04Oct06	collected
Port Anemometer	R.M. Young 105106	WM57508	04Oct06	collected
Barometer	R.M. Young 61201	BP01150	8Apr05	collected
Humidity/Wet Temp	R.M. Young 41372LC	06720	15Apr04	collected
Mast PAR	BSI QSR-240P	6393	16Jan06	Collected
Pyranometer	Eppley PSP	28933F3	21Jun05	Collected
Pyrgeometer	Eppley PIR	28903F3	17Aug06	Collected
Biosperical GUV	GUV-2511	25110203113	5Sep06	Collected
TSG	SeaBird SBE21	1789	25Jan06	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-248DR	30Mar06	collected
Bathymetry	Knudsen 320B/R	10489	n/a	collected
Net Depth	Omega PX605	41200937	n/a	collected

CTD Sensors

Sensor	Description	Serial #	Cal. Date
Pressure Sensor	In Fish s/n 0312	53580	28Feb06
Pressure Sensor	In Fish s/n 1480, used after cast 18	53952	26Sep06
Temperature	Primary	2637	24Mar06
Temperature	Secondary	2658	26May06
Conductivity	Primary	350	24Mar06
Conductivity	Secondary	2047	24Mar06
Oxygen	Primary, Voltage 6, after cast 5 Voltage 4	196	08Apr06
Oxygen	Secondary, Voltage 7, after cast 5 Voltage 6	181	22Feb06
PAR	Voltage 3	4470	5Apr06
PAR	Voltage 3, used for cast 16	4561	1Jun06
Transmissometer	Voltage 0	CST-830DR	27Jan06
Fluorometer	Voltage 4, after cast 5 Voltage 2	FLRTD-380	29July05

CTD Operations Notes

Cast 1: Water sampler configuration was set to 12 bottles vice 24, so bottles 13-24 are numbered 12 in the data.

Cast 2 - Primary Tempature, Primary Conductivity, and Primary Oxygen stopped working at about 790meters, resumed on the upcast at approx 250m. Found water in connectors, cleaned connectors.

Cast 5 - Primary Tempature, Primary Oxygen, and Secondary Oxygen stopped working at about 520meters. Changed out handmade Oxygen Y-cable. Had to change configuration on Voltage sensor, since we did not have another Oxygen Y-cable.

Cast1-8 - Corrected PAR Calibration Constant in CON File. Changed from 37037037037.0 to 3703703704. This did not seem to help the processed PAR value. Data does not look corrected

Cast 16 - Decide to try a different PAR s/n 4561. This did not help the processed PAR value either. The PAR Voltage look correct. Switched back to the original PAR for Cast 17. After reviewing the PAR Calculations and comparing them to the PRR, it was decided that the calculation Seasave is using is not the one they say they are using in the documentation. Using Biosherical equation and the PAR Voltage results in the correct values.

Cast 18 - Fish flooded at about 210meters. Switched to the spare fish s/n 1480

Cast 54 - Seasave Software failed at bottom, when the bottle #1 was fired. Restarted software and deckbox,continued with cast as filename G701054b. Bottle file is G701054b.btl for this cast.

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
002	~00:00	Started DAS and all underway systems	@68W
002	14:01	Cleaned Mast Sensors	
005	01:22	Reset Ashtech	63 24.°S, 61 33.6°W
005	02:11	Reset Ashtech	63 31.8°S, 61 28.8°W
005	13:47	SeaWater Shutdown, TSG and FL Off, PCO2 running Stds	@ Palmer Station
005	19:12	Measured and enter new dark value for Mast PAR in the DAS	@ Palmer Station
007		UW Systems Turned On	Left Palmer Station
008	00:00	Restart PCO2 System to run standards, Std Tanks not turn on when we left palmer	65 28.8°S, 66 9.°W
008	19:30	Restart PC02 System to run standards, Found IR Box off. On 007 @ 1:30 local we had a scheduled power outage. Questioning if PCO2 system in on UPS???	64 50.4°S, 64 45.°W
010	0458	Trimble NT200 GPS locked up	64 28.32°S, 65 42.27°W
010	0522	Trimble NT200 GPS restored	64 28.4°S, 65 42.8°W
010	16:40	Seawater not flowing through UW Fluorometer, since power outage on 007.	
011	2:47	Started a new ADCP Cruise, due to plots not being generated	
011	23:58:06	Trimble NT200 GPS locked up	63 58.090°S, 66 51.00°W
012	01:26	Trimble still not working, maybe an antenna issue. Routed PCode GPS to all of the instruments and DAS via serial mux as a temporary fix. **Please note** that for this time period, data in the tgps file is simply a duplicate of the lpcd information.	63 57.6°S, 66 49.8°W
012	06:07	Trimble NT200 restored	63 51.6°S, 67 7.2°W
015	1:55	TSG shutdown for cleaning	65 54.°S, 66 7.8°W
015	3:02	TSG back on. Soaked with a 0.1% Triton Solution.	65 54.°S, 66 7.8°W
015	06:46	During rounds discovered that the	66 .°S, 66 24.6°W

		grounding wire had not been placed back on TSG. Data from 03:02 to 06:46 should be viewed with skepticism.	
016	09:58	Fluorometer had stopped flowing. Restarted flow.	64 49.2ºS, 64 4.2ºW
017	14:29	Reset Ashtech GPS	65 10.8ºS, 67 26.4ºW
018	00:55	Reset Ashtech GPS	65 13.8ºS, 69 48.6ºW
024	14:46	Reset Ashtech GPS	66 42.0ºS, 72 25.8ºW
025	15:04	Restarted GUV	67 10.8ºS, 71 23.4ºW
027	18:28	Sonar shut down	Rothera pier
028	10:15	Restarted sonar	67 35.4ºS, 68 9.ºW
028	13:43	Reset Ashtech GPS	67 54.ºS, 69 13.8ºW
028	14:33	Ashtech cold restart.	67 55.2ºS, 69 33.ºW
037	11:32	Shutdown Seawater, TSG, Fluorometer, PC02, and ADCP	@Palmer Station
038	13:21	Restarted sonar & ADCP	Departing Palmer Station
038	13:28	Seawater wall on	Departing Palmer Station
041	16:00	Shutdown all logging	@68W