*** looks better with enscript -f"Helvetica12" -B ***

LAMONT DATA REDUCTION CRUISE SUMMARY

CRUISE: EW-9102

START: 03/21/91 080 Punta Arenas, Chile

END: 05/07/91 127 Papeete, Tahiti

PURPOSE: Two ships Multi-Channel experiments of the Crustal Structure of the East Pacific Rise and the Seismic Variability of the Axial Magma Chamber Reflector.

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DATA REDUCTION: Stefanus Budhypramono

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TRUE TIME CLOCK:

Instrument: Kinemetric/TrueTime Division Model 468-DC
Kinemetric/TrueTime Division Model GPS-DC GPS Synchronized Clock
Logging: 1 minute intervals
Checking: visual check of plot of data
Note:
Both true time are connected to a 5065A Rubidium Vapor Frequency Standard and 468-DC true time is being used throughout the cruise to calibrate the data except for day 99 and 100

SPEED AND HEADING:

Instrument: Furuno CI-30 2-axis Doppler speed log, Sperry MK-27 gyro
Logging: 3 second intervals
Checking: visual check of plot of data
Smoothing: mean value of all good values within the same minute

TRANSIT SATELLITE FIXES:

Instrument: Magnavox MX-1107RS dual frequency Transit satellite receiver
Logging: all fixes
Checking: reject receiver flagged fixes, fixes with high drifts in navigation and fixes producing Eotvos correction errors in gravity
Note: Transit Sat #1 (lab) was used from day 80 to 112, while Transit Sat #2 (bridge) was used from day 113 to 127 to reduce navigation

GPS SATELLITE FIXES:

Instrument: Magnavox T-Set Global Positioning System receiver
Logging: 2 second intervals on GPS set #1 and
20 second intervals on GPS set #2
Checking:
minimum number of sats: 2
dilution of precision maximum: north = 6.0, east = 6.0
carrier signal-noise ratio minimum: 35.0
standard deviation maximum: north = 10.0, east = 10.0
time step maximum: 3
speed maximum: 15.0
compared GPS speed and course with Furuno smooth speed and heading
compared positions with Transit-Furuno navigation
reject fixes with high drifts in navigation
reject fixes producing Eotvos correction errors in gravity
Interpolation: interpolated positions at 00, 30 seconds of each minute
Smoothing: smoothed interpolated positions with 9 point running average
Note: Throughout the cruise, both GPS #1 and GPS #2 are used together to reduce navigation. The 2 second data was being reduced to 20 second prior to processing.

DAY	TIME	COMMENTS
081	0000-1930	GPS #2 had problem ; no data
083	0300-1700	GPS #2 had problem ; no data
086	0500-2250	GPS #2 had problem ; no data
087	1500-2359	GPS #2 had problem ; no data
088	0000-0450	GPS #2 had problem ; no data
088	0000-0450	GPS #2 had problem ; no data
092	0630-0930	GPS #2 had problem ; no data
102	1130-1630	GPS #2 had problem ; no data
106	2130-2359	GPS #2 had problem ; no data
106	2130-2359	GPS #2 had problem ; no data
107	0000-0610	GPS #2 had problem ; no data

NAVIGATION:

A "1 minute navigation" is produced from the above sources. Acceptable fixes are merged at 1 per minute with priority given to GPS.
The smooth speed and heading data is used to fill any gaps of 2 minutes or longer between fixes by computing 1 minute DR'ed positions corrected for set and drift between fixes. The DR'ed positions are produced at 00 seconds of each minute.
Chief scientist's final data: final calibrated and cleaned data

FORMAT: 9102n.ddd
yy+ddd:hh:mm:ss.mmm N 12 12.1234 E 123 12.1234 id 123.1 12.1
yr day time lat lon id set drift
Lamont database: 1 minute navigation.

BATHYMETRY:

Instrument: Krupp Atlas Hydrosweep Center Beam
Logging: At each ping of Hydrosweep, data is being broadcasted real time to the network, which in turn is being received by data logger. The logger computer then extracted the center beam depth. Intervals vary, dependent on depth: about every 12 sec. at 4000 m., more often at less depth.
Checking: minimal visual check of plot of the interpolated data
Chief scientist's final data: final calibrated and cleaned data
Depth is in meters.

FORMAT: 9102hb.nddd
yy+ddd:hh:mm:ss:mmm N 12 12.1234 E 123 12.1234 2222.0
yr day time lat lon depth_in_meters

Lamont database: Same as above. Depth is in fathoms.

Note: The Hydrosweep intruments hasn't been performing very well. It apparent in the number of spikes and the general noise we are seeing in the data. The data has been considerably cleaned while trying to preserve the actual countour. As a result there might be spikes that was not removed because of the uncertainty.

DAY	TIME	COMMENTS
081	1530	started logging
084	1830-1945	hydrosweep shutdown ; PDR record was not available
085	1510-1620	hydrosweep shutdown ; gaps filled with 5 min PDR
090	0420-0940	hydrosweep shutdown ; gaps filled with 5 min PDR
090	1455-1550	hydrosweep shutdown ; gaps filled with 5 min PDR
091	0000-0450	hydrosweep shutdown ; gaps filled with 5 min PDR
091	1800-2240	hydrosweep shutdown ; gaps filled with 5 min PDR
092	0140-0215	hydrosweep shutdown ; gaps filled with 5 min PDR
092	2030-2051	hydrosweep shutdown ; gaps filled with 5 min PDR
094	0140-0230	hydrosweep shutdown ; gaps filled with 5 min PDR
120	1920-2359	hydrosweep shutdown ; gaps filled with 5 min PDR
121	0000-0130	hydrosweep shutdown ; gaps filled with 5 min PDR
121	1915-2220	hydrosweep shutdown ; gaps filled with 5 min PDR

MAGNETICS:

Instrument: Varian V75 magnetometer
Logging: 6 second intervals
Checking: visual check of plot of data
Reference field: International Geomagnetic Reference Field 1985 (IGRF 1985)
model of the main field at 1985.0 and a predictive model of the secular variation for adjusting to dates between 1985.0 and 1990.0
Residual field: Applied by bilinear interpolation across a 1 degree square.
Chief Scientist's final data: final calibrated and cleaned data

FORMAT: 9102mg.nddd
yr+ddd:hh:mm:ss.mmm N 12 12.1234 E 123 12.1234 41200.8 -367.1
yr day time lat lon total_ anomaly intensity

Lamont Database: interpolated total intensity value at 00 seconds of each minute
Note: Due to the excessive amount of spikes in the magnetic data, we employed a technique of comparing the raw 6 seconds interval magnetics with a filtered 6 seconds magnetics using 'Median Filter 240 sec'. A difference of greater than 9 (nine) Gammas is considered a spike which is then flagged as bad.
A 9 Gammas cut-off are employed throughout the cruise for uniformity. It doesn't always produce the 'smoothest curve' but it is believed that this is preferable because it reserved some of the small fluctuation. A 1 Gammas cut-off will produce a much smoother curve.

DAY	TIME	COMMENTS
085	0100	started logging
093	1040-2359	maggie turned off, deploying streamer
094	0000-2359	maggie turned off, deploying streamer
095	0000-1130	maggie turned off, deploying streamer
118	0350-1300	maggie turned off, reeling in streamer
120	1600-2359	maggie turned off
121	0000-0520	maggie turned off
123	1730	stopped logging, maggie off the water

BGM-3 GRAVITY:

Instrument: Bell Aerospace BGM-3 marine gravity meter
Logging: 1 second intervals
Merge with navigation: calculate Eotvos correction and Free Air Anomaly.
Checking: visual check of plot of data to determine satisfactory Eotvos
corrections, reject spikes of data at turns.
Velocity smoothing: 5 point running average throughout the cruise
Free air smoothing: 15 min. cubic-spline filter
Chief scientist's final data: Observed, Eotvos, Free Air Anomaly value
at 00 seconds of each minute. 1980 theoretical gravity formula:
Yo = 978.0327 * (1 + a - b) where
a = .0053024 * sin(theta) * sin(theta) and
b = .0000058 * sin(2 * theta) * sin(2 * theta).
and final calibrated and cleaned data

FORMAT: 9102vt.nddd
yy+ddd:hh:mm:ss.mmm N 10 20.1234 W 120 23.1234 1980 77.1
yr day time lat lon theog FAA

979317.5 64.1 1.5 10.2 -1.7 9.7 -1.6 9.8
raw_grav eotvos drift dc_shift raw_vel smo_vel

Lamont database: Free Air Anomaly value at 00 seconds of each minute.
1930 International gravity formula.
Note: The BGM data are not reliable. It is only used when there is a gap
in KSS-30 data.

KSS-30 GRAVITY:

Instrument: KSS-30 marine gravity meter
Logging: 6 second intervals
Merge with navigation: calculate Eotvos correction and Free Air Anomaly.
Checking: visual check of plot of data to determine satisfactory Eotvos
corrections, reject spikes of data at turns.
Velocity smoothing: 5 point running average throughout the cruise
Free air smoothing: 15 min. cubic-spline filter
Chief scientist's final data: Observed, Eotvos, Free Air Anomaly value
at 00 seconds of each minute. 1980 theoretical gravity formula:
Yo = 978.0327 * (1 + a - b) where
a = .0053024 * sin(theta) * sin(theta) and
b = .0000058 * sin(2 * theta) * sin(2 * theta).
and final calibrated and cleaned data

FORMAT: 9102vk.nddd
yy+ddd:hh:mm:ss.mmm N 10 20.1234 W 120 23.1234 1980 77.1
yr day time lat lon theog FAA

979317.5 64.1 1.5 10.2 -1.7 9.7 -1.6 9.8
raw_grav eotvos drift dc_shift raw_vel smo_vel

Lamont database: Free Air Anomaly value at 00 seconds of each minute.
1930 International gravity formula.

Note: KSS-30 is used as the primary gravity data. On the occasion that KSS-30 was not working, BGM-3 data is patched in.

DAY	TIME	COMMENTS
080	1840	started logging
083	0140-2257	KSS-30 gyro was locked (hung) gap was filled with BGM-3 data
085	0155-0215	KSS-30 data was bad BGM-3 data was equally bad ; not filled
086	0230-0305	KSS-30 data was bad BGM-3 data was equally bad ; not filled
087	0250-0330	KSS-30 data was bad BGM-3 data was equally bad ; not filled
088	0320-0400	KSS-30 data was bad BGM-3 data was equally bad ; not filled
090	0450-0505	KSS-30 data was bad BGM-3 data was equally bad ; not filled
090	0530-0550	KSS-30 data was bad BGM-3 data was equally bad ; not filled
091	0610-2359	KSS-30 gyro was locked (hung) gap was filled with BGM-3 data
092	0000-0819	KSS-30 gyro was locked (hung) gap was filled with BGM-3 data
093	0550-0640	KSS-30 data was bad BGM-3 data was equally bad ; not filled
110	0500-1800	KSS-30 data was bad gap was filled with BGM-3 data
120	0645-0705	KSS-30 data was bad BGM-3 data was equally bad ; not filled
124	0705-0715	KSS-30 data was bad BGM-3 data was equally bad ; not filled

NOTE:

A tare was discovered on JD 079 at 02:30Z. The value of this was determined by taking the average of KSS-30 value before and after the tare happened.

Difference of raw KSS-30 gravity value on JD 078 and JD 079:

Ave. value of KSS-30 on JD 078 from 1200-1700 = 1175.76 mGals
Ave. value of KSS-30 on JD 079 from 1200-1700 = 1177.15 mGals
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DIFFERENCE (= tare value) = -1.39 mGals

This tare value is then added to the KSS-30 gravity reading value. A new drift and dc-shift was then recalculated.

PRE-CRUISE GRAVITY TIE-IN:

Port: Punta Arenas, Chile
Date: Mar 19, 1991 (JD 078)
Operator: Joe Stennett
Reference Station: TIED TO PIER, USING PREVIOUS GRAVITY VALUE
Filtration Plant (see C2901 cruise summary for original tie.)
Pier/Ship's position: Taken from c2901 tie on 12-13 Feb. 1988.
This tie, the Ewing is in same place, as the previous tie, but turned around. hdg 340, gps w/ 4 sats: S 53 10.1770 W70 54.3954
Gravity meter: L & R Model G, serial number 237.
Temperature of meter: 49 C.
Readings and Calculations:

TIME	LOCATION	L&R READING	G	Potsdam Cor?
	Pier	.05		
	Ref	.05	981315.9	NO
	Pier	.05		

	G READING
0045Z BGM	981377.8
0045Z KSS-30	1175.89

Pier reading 0.0 m above waist deck. Waste deck is 7.0 m above gravity lab.
Difference beetwen pier and gravity lab : 7.0 + 0.0 = 7.0 m.

Lacoste difference in LR units:
delta_LR = pier_LR - ref_LR
=

Difference in mgal: (1 LR unit = 1.06 mGals)
delta_mgal = delta_LR * constant

Pier gravity value in mgal: ref_val = G - 13.6 = 981315.9 - 13.6 = 981302.3
pier_grv_val = ref_val + delta_mgal
981321.7 = 981302.3 + 19.4 <--from P.A. tie 2/13/88

Height correction:

Height correction in mgal:
note: free-air constant of +0.31 mgal per meter going towards the center of earth; -0.31 mgal per meter going away.
hgt_corr = hgt * constant
2.17 mGal = 7.0 * 0.31 mGal/m

Gravity at gravity lab level in mgal:
grv_at_lab_level = pier_grv_val + hgt_corr
981323.87 = 981321.7 + 2.17

BELL GRAVIMETER

BGM_filt_grv = (scale factor * counts) + bias = 981365.8
using s.f. 4.952164 and bias 855758.1, filter width 480. (8 minutes)

Mistie in mgal:
mistie = BGM_grv_val - grv_at_lab_level
53.93 = 981377.8 - 981323.87

Drift in mgal since last tie:
prev_mistie: 42.2 mgal on date Jan 28, 1991
drift = mistie - prev_mistie
11.73 = 53.93 - 42.2

KSS-30

KSS_grav_val = kss_unbiased_output + bias - TARE VALUE
981347.57 = 1175.89 + 980170.29 - (-1.39)

Mistie in mgal:
mistie = KSS_grv_val - grv_at_lab_level
24.17 = 981347.57 - 981323.4

Drift in mgal since last tie:
prev_mistie: 22.76 mgal on date Jan 28, 1991

drift = mistie - prev_mistie
1.41 = 24.17 - 22.76

POST-CRUISE GRAVITY TIE-IN:

Port: Papeete, Tahiti
Date: May 10, 1991 (JD 130)
Operator: Joe Stennett
Reference Station: Code THT-N Papeete - Quai d'Honnenur
Pier/Ship's position: from the Gravity Tie Report:
Ship is docked at the the pier near the custom house, Area of Quai d'Honnenur
Gravity meter: L & R Model G, serial number 237.
Temperature of meter: 49 C.
Readings and Calculations:

TIME	LOCATION	L&R READING	G	Potsdam Corr?
	Pier			
	Ref		978699.3	YES
	Pier			
		G READING		
0300Z	BGM	978768.1		
0300Z	KSS-30	-1448.69		

Pier reading -1.0 m above waist deck. Waste deck is 5.5 m above gravity lab. 5.5 + -1.0 = 4.5 m.

Lacoste difference in LR units:
delta_LR = pier_LR - ref_LR
=

Difference in mgal: (1 LR unit = 1.06 mGals)
delta_mgal = delta_LR * constant
=

Pier gravity value in mgal: ref_val = G - 13.6 if NOT Ptsdam Corrected
pier_grv_val = ref_val + delta_mgal
978699.3 = 978699.3 + 0.0

Height correction:

Height correction in mgal:
note: free-air constant of +0.31 mgal per meter going towards the center of earth; -0.31 mgal per meter going away.
hgt_cor = hgt * constant
1.4 mGal = 4.5 * 0.31 mGal/m

Gravity at gravity lab level in mgal:
grv_at_lab_level = pier_grv_val + hgt_corr
978700.7 = 978699.3 + 1.4

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BELL GRAVIMETER
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Mistie in mgal:
      mistie      = BGM_grv_val     - grv_at_lab_level
      67.4  = 978768.1  -  978700.7

Drift in mgal since last tie:
      prev_mistie: 53.93 on date March 19, 1991
      drift = mistie - prev_mistie
      13.47 = 67.4      - 53.93

==>   DC Shift    = prev_mistie
                  = 53.93
      Drift/Day   = drift/(tot. # of day)
                  = 53.93/(130 - 78)
                  = 13.47/52  = 0.259

KSS-30
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KSS_grav_val      = kss_unbiased_output   + bias
978721.6    =     -1448.9           + 980170.29

Mistie in mgal:
      mistie            = KSS_grv_val     -  grv_at_lab_level
      20.9        = 978721.6  -  978700.7

Drift in mgal since last tie:
      prev_mistie: 24.17 on date March 19, 1991

      drift = mistie - prev_mistie
      -3.27 = 20.9       - 24.17

==>   DC Shift    = prev_mistie - bias
                  = 24.17     - 980170.29
                  = -980146.12
      Drift/Day   = drift/(tot. # of day)
                  = -3.27/(130 - 78)
                  = -3.27/52  = -0.06288
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