LAMONT DATA REDUCTION CRUISE SUMMARY

CRUISE: EW9010

START: 1 December 90 (335) Newark, New Jersey

END: 12 December 90 (346) Recife, Brazil

PURPOSE: Transit, with stop in St. Georges, Bermuda on 4 December (338)

CHIEF SCIENTIST(S): None

DATA REDUCTION: William J. Robinson and Thomas D. Aitken

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TIME:

Instrument: Kinemetrics True Time clock model 468 DC
2 clocks designated "tr1" and "tr2"
Logging: 60 second intervals
Note:
Used tr1 clock for this leg.

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
Notes:

day	time	comment
335	2019	starts
343	1733-1904	gap
344	1342-1419	gap
345	0520-1731	gap
346	2231	ends

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:
None used in final navigation

GPS SATELLITE FIXES:

Instrument: Magnavox T-Set Global Positioning System 5 channel receiver
Logging: T-Set #1 at 2 second intervals, T-Set #2 at 20 second intervals.
Note:
T-Set #1 is logged at 2 second intervals to provide realtime postioning for the Hydrosweep; this GPS data is decimated to 20 second intervals before used in reduction.
Checking:
minimun number of sats: 3
dilution of precision maximum: north = 4.0, east = 4.0
carrier signal-noise ratio minimun: 35.0
compared GPS speed and course with Furuno smooth speed and heading
compared positions with Transit-Furuno 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:
Used T-Set #1 for navigation

NAVIGATION:

A "1 minute navigation" is produced from the above sources. Acceptable fixes are merged at 1 per minute with priority given to GPS, then to Transit. 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. Only GPS fixes used on this cruise.
Lamont data base: 1 minute navigation
Notes:

day	time	comment
335	2022	starts
346	2228	ends

Only GPS fixes used on this cruise.

BATHYMETRY:

Instrument: Krupp-Atlas Hydrosweep DS
Logging: each ping
Checking: visual check of plot of data; bad points removed with an interactive graphics editor.
Interpolation: interpolated depth value at 00 seconds of each minute
Lamont data base: interpolated depth value at 00 seconds of each minute.
Depth is in fathoms.
Notes:

day	time	comment
335	2216	starts
346	2125	hydrosweep ends

The Hydrosweep's performance was often very poor during this cruise and thus there are numerous gaps in the center beam data.

These readings are from the center beam of the swaths during the actual survey using whatever sound velocity was in effect at the time.

MAGNETICS:

Not collected

BGM-3 GRAVITY:

Instrument: Bell Aerospace BGM-3 marine gravity meter
Logging: 1 second counts
Filtering of counts and Mgals: Two stages- First a 60 second Gaussian filter of counts to mGals followed by a 480 second median filter of the mGal values.
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 of velocities from the navigation
Dc shift: 12.9 mGal
Drift rate: 0.3125 mGal/day

Notes:

day	time	comment
335	2019	start
346	2230	end

The BGM-3 during the period of July 1990 to October 1991 had an abnormally high drift. The BGM-3 data during this cruise still appears to be good and is corrected for this drift.

KSS-30 GRAVITY:

Instrument: Bodenseewerks KSS-30 Marine Gravity meter
Logging: mGal at 6 second intervals
Smoothing: mean values at 00 seconds of each minute calculated from the logged values +-30 seconds of this time. This stage also adjusts the times of the smoothed values for a 75 delay due to the filtering of the gravity by the KSS-30
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 of velocities from the navigation
Dc shift: -980149.89 mGal
Drift rate: -0.04125 mGal/day
Lamont database: Free Air Anomaly value at 00 seconds of each minute.
1930 theoretical gravity formula.

Notes:

day	time	comment
335	2045	starts
346	2226	ends

The KSS-30 gravity data was used for the Lamont database.

Pre-cruise Lamont Gravity Tie Report

R/V Ewing gravity meters:
Bell Aerospace BGM-3 marine gravity meter
scale factor = 4.952164
bias = 855758.1
Bodenseewerk KSS-30 marine gravimeter

Port: Newark, New Jersey
Date: 22 November 1990 (326)
Reference Station:
The reference station is in room 106 of the Oceanogaphy building on the Lamont-Doherty Geological Observatory campus.
Reference value: 980254.6

Pier/Ship's position:
The R/V Ewing is at berth 9 on the north side of Port Newark Channel. Position is about 330 meters east of the end of the end of the channel where a kilometer long conveyer belt ends. This position is the same position as during the 28 October 1990 Newark tie.

Readings and calculations:
Note: A full tie was not done on this date. The pier value established from the 28 October 1990 tie is used.

Pier gravity value in mgal:
pier_grv_val = 980242.7 mgal

Height correction:
Pier reading is 1.0 m above waist deck.
Waste deck is 5.5 m. above gravity lab.
Difference between pier and gravity lab: 6.5 m. hgt.

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
hgt_corr = 6.5 m * 0.31 mGal/m
hgt_corr = 2.0 mGal

Gravity at BGM/KSS level:
grv_at_BGM/KSS_level = pier_grv_val + hgt_corr
grv_at_BGM/KSS_level = 980242.7 + 2.0
grv_at_BGM/KSS_level = 980244.7 mgal

BGM-3 reading:
On 22 November 1990 (326) at 2140 Z
BGM_grv_val = 980257.6 mgal

BGM-3 Mistie:
BGM_mistie = BGM_grv_val - grv_at_BGM_level
BGM_mistie = 980257.6 - 980244.7
BGM_mistie = 12.9 mgal

BGM-3 DC shift:
BGM_dc_shift = 12.9 mgal

BGM-3 Drift:
prev_BGM_mistie: 8.4 mgal on 28 October 1990 (301)

BGM_drift = BGM_mistie - prev_BGM_mistie
BGM_drift = 12.9 - 8.4
BGM_drift = 4.5 mgal

KSS-30 reading:
On November 22, 1990 (day 326) at 2140 Z
KSS_grv_val = 81.21 mgal

KSS-30 DC shift:
KSS_dc_shift = KSS_grv_val - grv_at KSS_level
KSS_dc_shift = (81.21) - (980231.1)
KSS_dc_shift = -980149.89 mgal

KSS-30 Mistie:
BIAS = 980170.29
KSS_mistie = BIAS + KSS_grv_val - grv_at_KSS_level
KSS_mistie = (980170.29 + (81.21)) - 980244.7
KSS_mistie = 6.8

KSS-30 drift:
prev_KSS_mistie: 5.39 mgal on 28 October 1990 (301)

KSS_drift = KSS_mistie - prev_KSS_mistie
KSS_drift = 6.8 - 5.39
KSS_drift = 1.41 mgal

Post-cruise Lamont Gravity Tie Report

R/V Ewing gravity meters:
Bell Aerospace BGM-3 marine gravity meter
scale factor = 4.952164
bias = 855758.1
Bodenseewerk KSS-30 marine gravimeter

Port: Recife, Brazil
Date: 16 December 1990 (350)
Operator: Joe Greer
Reference Station: Lighthouse
DOD02242-3
JGB 32884M WH 1059
Reference value = 978162.52

It seems that this reference value is "corrected"
for Potsdam error. A value of 13.6 mgal will be added
to this reference value to make the value uncorrected.

reference value = 978162.52
+ Potsdam error = 13.6
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reference value = 978176.12

Pier/Ship's position:
Fuel Dock slot #2

Portable gravity meter:
LaCoste & Romberg model G #237
Temperature of meter: 49 deg C.

Readings and calculations:

Time	Location	L-R Reading
1845Z	Pier	1867.60 +- .05
1915Z	Ref	1868.71 +- .05
1933Z	Pier	1867.59 +- .05

Lacoste difference in LR units:
delta_LR = pier_LR - ref_LR
delta_LR = 1867.69 - 1868.71
delta_LR = -1.11

Difference in mgal:
note: 1 LR unit = 1.06 mGals
delta_mgal = delta_LR * constant
delta_mgal = (-1.11) * 1.06
delta_mgal = -1.18 mgal

Pier gravity value:
pier_grv_val = ref_val + delta_mgal
pier_grv_val = 978176.12 + (-1.18)
pier_grv_val = 978174.94 mgal

Height correction:
Pier reading is 0.3 m below waist deck.
Waste deck is 5.5 m above gravity lab.
Difference between pier and gravity lab = 5.2 meters

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
hgt_corr = 5.2 m * 0.31 mGal/m
hgt_corr = 1.61 mGal

Gravity at BGM/KSS level:
grv_at_BGM/KSS_level = pier_grv_val + hgt_corr
grv_at_BGM/KSS_level = 978174.94 + (1.61)
grv_at_BGM/KSS_level = 978176.55 mgal

BGM-3 reading:
On 16 December 1990 (350) at 1845 Z
BGM_grv_val = 978196.9 mgal

BGM-3 Mistie:
BGM_mistie = BGM_grv_val - grv_at_BGM_level
BGM_mistie = 978196.9 - 978176.5
BGM_mistie = 20.4 mgal

BGM-3 DC shift:
BGM_dc_shift = 20.4 mgal

BGM-3 Drift:
prev_BGM_mistie: 12.9 mgal on 22 November 1990 (326)

BGM_drift = BGM_mistie - prev_BGM_mistie
BGM_drift = 20.4 - 12.9
BGM_drift = 7.5 mgal

KSS-30 reading:
On 16 December 1991 (350) at 1845 Z
KSS_grv_val = -1987.93 mgal

KSS-30 DC shift:
KSS_dc_shift = KSS_grv_val - grv_at KSS_level
KSS_dc_shift = (-1987.93) - (978176.55)
KSS_dc_shift = -980164.48 mgal

KSS-30 Mistie:
BIAS = 980170.29
KSS_mistie = BIAS + KSS_grv_val - grv_at_KSS_level
KSS_mistie = (980170.29 + (-1987.93)) - 978176.55
KSS_mistie = 5.81 mgal

KSS-30 drift:
prev_KSS_mistie: 6.8 mgal on 22 November 1990 (326)

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KSS_drift = KSS_mistie - prev_KSS_mistie
KSS_drift = 5.81 - 6.8
KSS_drift = -0.99 mgal
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