LAMONT DATA REDUCTION CRUISE SUMMARY

CRUISE: EW9309

START: 20 November 1993 [324] Capetown, South Africa

END: 27 December 1993 [361] Montevideo, Uraguay

PURPOSE: Rock dredging and geochemical study of the Mid-Atlantic
ridge from 41S to 51S

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DATA REDUCTION: William J. Robinson

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TIME:

Instrument: Kinemetrics GPS Synchronized clock, Model GPS-DC
Logging: 60 second intervals

SPEED AND HEADING:

Instrument: Furuno CI-30 2-axis doppler speed log
Logging: 3 second intervals
Checking: visual check of plot of data
Smoothing: mean value of all good values within the same minute
Notes:
(1) The Furuno, which has previously been an extremely reliable instrument, was showing erroneous speeds throughout much of cruise EW9309. Speeds would be low by 2-3 knots and also seemed to have some cyclic fluxuation. The heading seemed to be ok.

(2)

day	time	comment
336	0247-0315	gap: power failure and logging system reboot

TRANSIT SATELLITE FIXES:

Instrument: Magnavox MX-1107RS dual frequency Transit satellite receiver
Logging: all fixes from Transit #2 (bridge)
Notes:
(1) Transit #1 (lab) was down during the whole cruise

GPS SATELLITE FIXES:

Instrument: Magnavox MX-4200D Global Positioning System receiver
Logging: 10 second intervals
Checking:
minimun number of sats: 3

dilution of precision (DOPs) maximum: north = 4.0, east = 4.0
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

Smoothing: positions at 00 and 30 seconds of each minute were extracted from the logged data and then smoothed with a 41 point running average for straight sections and 9 point running average for turns.

Notes:

(1) The GPS data has a sinusoidal-like wave in it which is assumed to come from some degrading of the GPS quality for civilian users. This wave seems to vary in period and shape and is not a perfect sine curve. The periods are less than 20 minutes. The amplitudes and period will vary over 24 hours but always seem to be present in the data. This degrading produces a false ship's track for realtime navigation and introduces extreme errors, up to 6 mGals, in the Eotvos correction for the gravity. To handle this problem the following steps have been used to process the GPS:

1. the smoothing has been increased from a 9 point (4 minute) running average of the interpolated positions to a 41 point (20 minute) running average.
2. the GPS data with the 41 point smoothing is deleted at turns because the heavy smoothing greatly "widens" the turns.
3. GPS with the 9 point smoothing is inserted where the GPS with 41 point smoothing has been deleted.

This degraded GPS quality has been observed since January 1992.

(2) On previous cruises the method to deal with this degraded GPS had been to use the 41 point smoothing as in step 1 and to delete this data at turns as in step 2. After these two steps the GPS would be decimated to 20 minute intervals and the Furuno speed log data would be used to DR at the turns and between the decimated GPS. However, during EW9309,the Furuno was producing erroneous speeds and was used only occasionally when the speeds seemed in agreement with GPS speeds and also at some small gaps in GPS coverage.

(3)

day	time	comment
336	0247-0315	gap: power failure and logging system reboot

NAVIGATION:

A "1 minute navigation" is produced using GPS with 41 point smoothing during straight navigation sections and GPS with 9 point smoothing at turns. DR'ing with
the Furuno was used during some periods when the Furuno speeds were in agreement with GPS speeds and also at some small gaps in GPS coverage. (See Notes under "Speed and Heading" and "GPS" above.)

BATHYMETRY:

Instrument: Atlas Hydrosweep DS
Logging: every ping
Checking: visual check of plot of data. Bad data points removed with

an interactive graphics editor.
Sound Velocity: All days were computed using 1500 meters per second.
Final data: interpolated depth value (meters) at 00 seconds of each minute
Notes:

(1)

day	time	comment
336	0246-0320	gap: power failure and logging system reboot

(2) there are scattered small gaps throughout the cruise due to noisy data or instrument resets. Generally, Hydrosweep performed well.

MAGNETICS:

Instrument: Varian V75 magnetometer
Logging: 6 second intervals
Checking: visual check of plot of data. Bad data points removed with
an interactive graphics editor.
Reference field: International Geomagnetic Reference Field 1990 (IGRF 1990)
model of the main field at 1990.0 and a predictive model of the
secular variation for adjusting to dates between 1990.0 and 1995.0
Final data: median values at 00 seconds of each minute calculated from
the values +30 seconds of this time.
Notes:
(1)

day	time	comment
324	0000 2359	no magnetics collected - 200 mile limit
325	0000 1317	no magnetics collected - 200 mile limit
328	0951 1231	gap: very noisey data
330	0502 1119	no magnetics collected - dredging
330	1120 1201	gap: very noisey data
330	1202 1439	noisey data
330	1440 1901	gap: very noisey data
330	1902 2359	noisey data
331	0000 0109	noisey data
331	1723 2359	no magnetics collected - dredging
332	0000 2359	no magnetics collected - dredging
333	0000 2359	no magnetics collected - dredging
334	0000 2359	no magnetics collected - dredging
335	0000 0623	no magnetics collected - dredging
335	0624 0837	noisey data
335	0838 1852	no magnetics collected - dredging
335	2105 2359	no magnetics collected - dredging
336	0000 0104	no magnetics collected - dredging
336	0105 1156	noisey data - some gaps
336	1157 1232	no magnetics
336	1813 2254	no magnetics collected - dredging
337	0345 0800	noisey data - some gaps
337	2224 2359	no magnetics collected - dredging
338	0000 1219	no magnetics collected - dredging
339	1347 1742	no magnetics collected - dredging
340	1454 1824	no magnetics collected - dredging
341	1201 1706	no magnetics collected - dredging
341	2056 2359	no magnetics collected - dredging
342	0000 0017	no magnetics collected - dredging
342	1259 1713	no magnetics collected - dredging
342	1900 2359	noisey data - some gaps
343	0000 0945	noisey data
343	2254 2359	no magnetics collected - dredging
344	0000 0719	no magnetics collected - dredging
344	1746 2359	no magnetics collected - dredging
345	0000 2359	no magnetics collected - dredging
346	0000 2359	no magnetics collected - dredging
347	0000 2359	no magnetics collected - dredging
348	0000 2359	no magnetics collected - dredging
349	0000 2359	no magnetics collected - dredging
350	0000 2359	no magnetics collected - dredging
351	0000 2359	no magnetics collected - dredging

352 0000 1412 no magnetics collected - dredging

GRAVITY:

Instrument: Bodenseewerks KSS-30 Marine Gravity meter
Logging: mGal values 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 second delay due to the
    filtering of the gravity by the KSS-30.
Merge with navigation: calculate Eotvos correction and Free Air Anomaly.
    The velocities, from the navigation, used in the Eotvos
    correction are smoothed with a 5 point running average for all days
Checking: visual check of plot of data to determine satisfactory Eotvos
    corrections, delete spikes of data at turns
Tie date:
    Pier gravity value established on 12 Nov 93 (day 316) at 0930Z (Capetown)
    Ship gravity values taken on 14 Nov 93 (day 318) at 0630Z (Capetown)
Dc shift: -980160.72 mGal (14 November 93, 0630Z)
Drift rate: -0.0169 mGal per day (between Capetown and Montevideo)
Final Data: Free Air Anomaly value at 00 seconds of each minute.
Lamont Database: KSS-30 gravity; 1930 theoretical.
Notes:
    (1) The problems discussed under sections "Speed and Heading", "GPS"
      and "Navigation" above directly affected the quality of the gravity.

    (2) the gravity data is generally quite noisy due to the heavy seas.

    (3) There is a difference between the KSS-30 and the BGM-3 FAA of about
      3-4 mGals since the beginning of the cruise. THe BGM-3 being higher
      than the KSS-30. A plot of the FAA data from both meters shows that
      this divergence occurs just as the ship leaves the dock in Capetown.
      Towards the end of the cruise the FAA values seem to approach each
      other.

    (4) day   time   comment
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      336 0243-0330 gap: power failure and logging system reboot

Instrument: Bell Aerospace BGM-3 marine gravity meter
Logging: 1 second counts
Filtering: an observed gravity value in mGal is calculated by filtering
    the 1 second counts with a 360 second Gaussian filter, scaling the result
    and adding a bias. A value in mGal is calculated at 00 seconds of
    each minute.
Merge with navigation: calculate Eotvos correction and Free Air Anomaly.
    The velocities, from the navigation, used in the Eotvos
    correction are smoothed with a 5 point running average for all days
Checking: visual check of plot of data to determine satisfactory Eotvos
    corrections, delete spikes of data at turns
Tie date:
    Pier gravity value established on 12 Nov 93 (day 316) at 0930Z (Capetown)
    Ship gravity values taken on 14 Nov 93 (day 318) at 0630Z (Capetown)
Dc shift: 7.27 mGal
Drift rate: 0.0089 mGal per day
Final data: Free Air Anomaly value at 00 seconds of each minute. 1980
    theoretical gravity formula.

Notes:

(1) The problems discussed under sections "Speed and Heading", "GPS" and "Navigation" above directly affected the quality of the gravity.

(2) the gravity data is generally quite noisy due to the heavy seas.

(3) There is a difference between the KSS-30 and the BGM-3 FAA of about 3-4 mGals since the beginning of the cruise. THe BGM-3 being higher than the KSS-30. A plot of the FAA data from both meters shows that this divergence occurs just as the ship leaves the dock in Capetown. Towards the end of the cruise the FAA values seem to approach each other.

(4)

day	time	comment
336	0244-0318	gap: power failure and logging system reboot