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                 LAMONT DATA REDUCTION CRUISE SUMMARY
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CRUISE: EW9301

START: 16 May 1993 [136] Jacksonville, Florida

        20 May 1993 [140] Newark arrival

        22 May 1993 [142] Newark departure

END: 23 May 1993 [143] Woods Hole, Mass.

PURPOSE: transit & shake down after shipyard period

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TIME:

Instrument: Kinemetrics GPS Synchronized clock, Model GPS-DC
Logging: 60 second intervals
Notes:
    (1) During the cruise EW9301 a program was developed to continuously
        adjust the CPU time of the logging computer to the UTC time
        from the GPS clock. This development involved some experimenting
        and debugging of the software and this work induced some errors
        in the CPU time tags for days 136 - 139. These errors were corrected
        by examining the GPS position times for both the Magnavox T-Set
        receivers and the Magnavox MX-4200D receivers. The corrections
        to the CPU time tags are listed in the table below.

        day   time   required adjustment
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        136   2300-2359   -10 seconds
        137   0000-2359   -10 seconds
        138   0000-0906   -10 seconds
        138   0907-2359   seconds
        139   0000-0250   seconds
        139   0252-0257   seconds
        139   0258-2359   0 seconds

    No adjustment was needed for days 140-143.

    (2) The logged files of CPU time vs GPS clock time, the "tr1.d" files
        were discarded as they were erroneous and would just add confusion
        to this problem.

    (3) The data files for Furuno, Transit fix, GPS T-Set ("gp1.d" and "gp2.d"),
        GPS 4200 ("gp3.d" and "gp4.d"), PCO2, and sea temperature were corrected
        for the time errors.

(4) The Hydrosweep swath ("hs.d") and center beam ("hb.d") files were not
    corrected as their time tags are from another logging computer and
    there seems to be an additional problem reconciling the times on the
    Hydrosweep computer (SGI: "olive") and the general logging computer
    (SUN: "moray").

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SPEED AND HEADING:
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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) see notes under "TIME" above


TRANSIT SATELLITE FIXES:
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Instrument: Magnavox MX-1107RS dual frequency Transit satellite receiver
Logging: all fixes from Transit #2 (bridge)
Notes:
    (1) see notes under "TIME" above


GPS SATELLITE FIXES:
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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
Notes:
    (1) see notes under "TIME" above

    (2) 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. this smooth GPS data is deleted at turns because the heavy smoothing
           greatly "widens" the turns.
        3. the remaining smooth GPS data is decimated to 20 minute intervals

        These GPS processing steps, together with using the smooth speed and
        heading data from the Furuno for DR'ing between the decimated GPS
       positions produces good navigation and gravity data.

        This degraded GPS quality has been observed since January 1992.

     (3) used MX-4200 "gp3" for all days except day 140 when "gp4" was used.
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NAVIGATION:

A "1 minute navigation" is produced from the GPS and Furuno sources. The
smooth speed and heading data is used to fill the gaps between the processed
GPS positions by computing 1 minute DR'ed positions corrected for set and
drift. The DR'ed positions are produced at 00 seconds of each minute.

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BATHYMETRY:
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Instrument: Atlas Hydrosweep DS
Logging: every ping
Notes:
    (1) see notes under "TIME" above; especially note (4)


GRAVITY:
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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
Dc shift: -980167.40 mGal (from Jacksonville tie of 13 May 93)
Drift rate:  0.205 mGal per day (between Jacksonville and Newark)
Tie date: 13 May 1993 (day 133) at 1845 Z
Dc shift: -980165.76 mGal (from Newark tie of 21 May 93)
Drift rate: -0.018 mGal per day (between Newark and Woods Hole)
Tie date: 21 May 1993 (day 141) at 1744 Z
Lamont Database: Free Air Anomaly value at 00 seconds of each minute.
    1930 theoretical gravity formula.
Notes:
    (1) see notes under "TIME" above


Instrument: Bodenseewerks KSS-30 Marine Gravity meter
Logging: BGM-3 counts at 1 second intervals
Notes:
    (1) see notes under "TIME" above
    (2) BGM-3 data was not processed
    (3) BGM-3 was removed in Newark
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