

LAMONT DATA REDUCTION CRUISE SUMMARY

CRUISE: EW9502

START: 27 March 1995 [086] Balboa, Panama

END: 27 April 1995 [117] Manzanillo, Mexico

Project Title: "Investigation of upper plate response to subducting plate morphology and seamounts as subduction zone asperities: Cooperative German, Costa Rican and United States project"

SURVEY AREA: NP13 - Pacific margin of Costa Rica

CHIEF SCIENTIST(s): Kirk McIntosh - The University of Texas Institute
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DATA REDUCTION: William J. Robinson

TIME:

Instrument: TrueTime (Kinematics) GPS Synchronized clock, Model GPS-DC

Logging: 60 second intervals

Notes:

- (1) the True Time clock was used to synch the CPU clocks of the logging computer

Instrument: Datum

Logging: 60 second intervals

Notes:

- (1) The Datum clock exhibited problems throughout cruise EW9502. The times from the printer port ("tr2." data) had the wrong day of year until day 100 and the time was usually 1 second ahead of the CPU clock which is synched to the True Time.

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

GPS SATELLITE FIXES:

Instrument: Magnavox MX-4200D Global Positioning System receiver
(there are two MX-4200D receivers)

Logging: 10 second intervals

Checking:

minimum 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

checked that GPS was satisfactory for gravity eotvos correction

Interpolation: interpolated positions at 00, 30 seconds of each minute

Smoothing: smoothed interpolated positions with 5 point running average

Notes:

- (1) The GPS data designated "gp3" came from the Magnavox MX4200D

receiver that was receiving the differential corrections via a MARISAT link.

- (2) the GPS data designated "gp4" came from the other Magnavox MX4200D which was not receiving the differential corrects. This receiver was turned off on day 088 to avoid possible confusion.
- (3) The "gp3" data stream was without the differential corrections from between day 097 at 1629 to day 098 at 0240. This seems to have been caused by a switching of the serial lines between the two MX-4200s and without putting the other receiver in differential mode. The GPS data during this period was heavily smoothed with a 41 point (20 minute) running average and decimated to 20 minute intervals. In addition the GPS was deleted at turns.

Instrument: Trimble NT200D
Logging: 10 second intervals
Notes:

- (1) the data from the Trimble was not processed

NAVIGATION:

A "1 minute navigation" is produced from the GPS MX-4200D ("gp3") 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.

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 use a sound velocity of 1500 meters per second
Final data: interpolated depth value (meters) at 00 seconds of each minute

MAGNETICS:

Logging: not collected

GRAVITY:

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 6 second intervals.
Smoothing: mean gravity values at 00 seconds of each minute calculated from the milligal values +/-30 seconds of this time.
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: 15.0 mGal from pre-cruise tie at Balboa
Drift rate: 0.0000 mGal per day
Pre-cruise Tie date: 27 March 1995 (day 086) at 1323 Z
Balboa, Panama
Post-cruise Tie date: 00 April 1995 (day 000) at 0000 Z
Manzanillo, Mexico

Final data: Free Air Anomaly value at 00 seconds of each minute.
1980 theoretical gravity formula.

SEISMIC:

Instruments: 20-30 ocean bottom seismometers and hydrophones were deployed in three experiment areas. Shooting was from the R/V Ewing 20 gun array and selected land shots. There were also 30+ land instruments. Single channel seismics were also collected.

Notes:

- (1) the shot times put in the header records are from the TrueTime clock.
- (2) the problematic behavior of the Datum clock caused frequent stops/restarts of the Seismic handler program on the Sun logging computer resulting in missed shots and shots without times put in the headers.

085 - Mar 26
086 - Mar 27 Depart Balboa, Panama; Gravity tie Ht:10m at 1323Z
087 - Mar 28
088 - Mar 29
089 - Mar 30 start shooting
090 - Mar 31
091 - Apr 01
092 - Apr 02
093 - Apr 03
094 - Apr 04
095 - Apr 05
096 - Apr 06
097 - Apr 07
098 - Apr 08
099 - Apr 09
100 - Apr 10
101 - Apr 11
102 - Apr 12
103 - Apr 13
104 - Apr 14
105 - Apr 15
106 - Apr 16
107 - Apr 17
108 - Apr 18
109 - Apr 19
110 - Apr 20 end shooting
111 - Apr 21
112 - Apr 22
113 - Apr 23
114 - Apr 24
115 - Apr 25
116 - Apr 26
117 - Apr 27 Arrive Manzanillo
118 - Apr 28

Lamont Gravity Tie Report

R/V Ewing gravity meters:

Bell Aerospace BGM-3 marine gravity meter
bias = 852680.0;
scale = 5.0940744;

Port: Balboa, Panama

Date: 21,26,27 March 1995

Operator: Joe Stennett

Reference Station: The gravity tie used the Wollard and Rose reference in Cristobal. A reading with the Lacoste and Romberg was done there on March 21st. The pier value was established by a LaCoste and Romberg reading on March 26th. The height adjustment and BGM value was established on March 27th.

Pier/Ship's position:

Balboa Harbor, Pier #

Position with differential GPS
08 57.278 N 079 33.975 W

Portable gravity meter:

LaCoste & Romberg model G-237
Temperature of meter: 49 C

Readings and calculations:

| Date | Time | Location | L-R Reading |
|---------|-------|----------|-------------|
| 21Mar95 | 1130L | Ref | 1934.01 |
| 26Mar95 | xxxx | Pier | 1919.25 |

Lacoste difference in LR units:

$\text{delta_LR} = \text{pier_LR} - \text{ref_LR}$
 $\text{delta_LR} = 1919.25 - 1934.01$
 $\text{delta_LR} = -14.76$

Difference in mgal:

note: 1 LR unit = 1.06 mGals
 $\text{delta_mgal} = \text{delta_LR} * \text{constant}$
 $\text{delta_mgal} = -14.76 * 1.06$
 $\text{delta_mgal} = -15.65$
 $\text{delta_mgal} = -15.7$

Pier gravity value:

$\text{pier_grv_val} = \text{ref_val} + \text{delta_mgal}$
 $\text{pier_grv_val} = 978253.6 + (-15.7)$
 $\text{pier_grv_val} = 978237.9$

Height correction:

On March 27, 1995 (day 086) at 1323 Z
Difference between pier and gravity lab = 10.0 meters

note: free-air constant of +0.31 mgal per meter going towards
the center of earth; -0.31 mgal per meter going away.

$\text{hgt_corr} = \text{hgt} * \text{constant}$
 $\text{hgt_corr} = 10.0 \text{ m} * 0.31 \text{ mGal/m}$

hgt_corr = 3.10 mGal

Gravity at BGM level:

grv_at_BGM_level = pier_grv_val + hgt_corr
grv_at_BGM_level = 978237.9 + 3.1
grv_at_BGM_level = 978241.0

BGM-3 reading:

On March 27, 1995 (day 086) at 1323 Z
BGM_grv_val = 978256.0 mgal

BGM-3 Mistie:

BGM_mistie = BGM_grv_val - grv_at_BGM_level
BGM_mistie = 978256.0 - 978241.0
BGM_mistie = 15.0 mgal

BGM-3 DC shift:

BGM_dc_shift = 15.0 mgal

EW9502.README

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Files:

Daily files:

The logged and reduced data are organized as sets of daily files.

A filename is composed of 3 parts:

- (1) cruise id "ew9502" or NULL
- (2) data id "gp3.r"
- (3) dayofyear "103"

example:

gp3.r103

Note: The cruise id is NULL for the data files for ew9502.

".Z" files: files that end with a ".Z" have been compressed with the UNIX "compress" command. Use the "uncompress" command to make them readable

Directories:

LOGGER - contains the data files logged during the cruise with some minor editing or cleaning. These are referred to as the ".d" files.

SCCS - the directory holds the reduced files in the "sccs" format. The Source Code Control System (SCCS) that is used for program source files is also used for maintaining the data files. The SCCS facility serves as a backup and history mechanism for the data reduction process. Most files in SCCS are compressed, use the uncompress command and then issue the sccs command
sccs get filename
to get a copy of the file.

REPORT - cruise report files and PostScript plot files

XBT - data from xbt taken during the leg

shells - shell scripts that drive the data reduction

tmp - a temporary working directory

Time tagging:

During the logging process each record is tagged with the CPU's time. This tag usually appears at the beginning of the record as

yy+ddd:hh:mm:ss:mmm

where "yy" is the year, "ddd" is the day of year, "hh" is the hour, "mm" is the minute, "ss" is the second and "mmm" is the millisecond of the CPU time.

There are some variations in the positioning of these times as noted below in the Hydrosweep, gun depths and nav block (seismic) data.

One of the processes on the logging computer logs the GPS TrueTime clock once a minute and continuously sets the CPU clock to UTC time from the TrueTime clock.

The following data sets use this CPU time tag as their "official" time: Furuno, BGM-3 gravity, sea temperature, meteorological data.

The logged GPS data are also time tagged with this CPU stamp but all navigation derived from GPS uses the GPS position times.

Flag field:

The third column is used as a flag field to indicate a bad or rejected record.

"+" = initial field

"-" = rejected record

GPS MX-4200 (gp):

gp3 = GPS MX-4200D "3"

gp4 = GPS MX-4200D "4"

gp3.d - logged data (multiple records)

93+258:00:22:12.282 \$PMVXG,000,NAV,9,6,0000,0*02

yy day cpu_time status

93+258:00:22:20.834 \$PMVXG,001,002220,1832.421,S,03837.602,W,00026.1,2*4E

yy day cpu_time time lat lon

93+258:00:22:21.066 \$PMVXG,011,233.5,012.3,,,,,,,,*4F

yy day cpu_time course speed

93+258:00:22:21.467 \$PMVXG,022,260539.67,00.8,00.8,00.0,20,17,03,16,25,23*74

yy day cpu_time fix time EDOP NDOP VDOP PRN 1-6

gp3.r - gps 4200 after cleaning

same as gp3.d

gp3.i - interpolated positions at 00,30 sec of each minute

yy+ddd:hh:mm:ss.mmm N 12 12.1234 W 123 12.1234 gp3

yy day time lat lon id

gp3.s - smoothed postions at 00,30 sec of each minute

yy+ddd:hh:mm:ss.mmm N 12 12.1234 W 123 12.1234 gp3

yy day time lat lon id

GPS Trimble NT200D (gp1):

gp1.d - logged data (multiple records)

GPS Position:

95+102:00:00:47.018 \$GPGGA,000047,0929.387,N,08503.621,W,1,6,001,00030,M,-00002

,M,,

yy day cpu_time position rec

GPS Position:

\$GPGGA,XXXXXX,XXXX.XXX,N,XXXXX.XXX,W,X,X,XXX,uXX,M,uXX,M,XXXX,XXXX

| Data Field: | Description |
|-------------|---|
| 1 | UTC of Position Fix |
| 2 | Latitude in Degrees, Minutes, and Decimal Minutes |
| 3 | N=North, S=South Latitude |
| 4 | Longitude in Degrees, Minutes, and Decimal Minutes |
| 5 | E=East, W=West Longitude |
| 6 | GPS Quality: 0=GPS Unavailable, 1=GPS Fix, 2=DGPS Fix |
| 7 | Number of satellites used |
| 8 | Horizontal Dilution of Precision (HDOP) |
| 9,10 | Antenna height in meters (u=+/-) |
| 11,12 | Geoidal height in meters (u=+/-) |
| 13 | Age of differential GPS data |
| 14 | DGPS reference station ID |

NOTE: During Differential mode, it outputs the lat and lon with 4 decimal digits accuracy in the minutes. But, when it is running on a non-differential mode, it drops down to three decimal digits. Something to take into account when writing program for it.

Actual Track and Ground Speed:

95+102:00:00:47.053 \$GPVTG,229,T,226,M,005.3,N,009.9,K

yy day cpu_time actual track and ground speed rec

Actual Track and Ground Speed:

\$GPVTG,XXX,T,XXX,M,XXX.X,N,XXX.X,K

| Data Field: | Description |
|-------------|---------------------|
| 1,2 | COG; True |
| 3,4 | COG; Magnetic |
| 5,6 | SOG; Knots |
| 7,8 | SOG; Kilometer/hour |

Heading and water speed: (this is an input from Furuno)

95+102:00:00:47.035 \$GPVHW,249,T,246,M,05.30,N,09.82,K

yy day cpu_time heading and wayer speed rec

Heading and water speed:

\$GPVTG,XXX,T,XXX,M,XXX.X,N,XXX.X,K

| Data Field: | Description |
|-------------|-----------------------|
| 1,2 | Heading; True |
| 3,4 | heading; Magnetic |
| 5,6 | Speed; Knots |
| 7,8 | Speed; Kilometer/hour |

Trimble Sample:

```
,M,,
95+102:00:00:47.018 $GPGGA,000047,0929.387,N,08503.621,W,1,6,001,00030,M,-00002

95+102:00:00:47.035 $GPVHW,249,T,246,M,05.30,N,09.82,K
95+102:00:00:47.053 $GPVTG,229,T,226,M,005.3,N,009.9,K
95+102:00:00:56.969 $GPGGA,000056,0929.376,N,08503.626,W,1,6,001,00062,M,-00002

,M,,
95+102:00:00:56.988 $GPVHW,252,T,249,M,05.20,N,09.63,K
95+102:00:00:57.114 $GPVTG,230,T,227,M,005.3,N,009.9,K
95+102:00:01:06.981 $GPGGA,000106,0929.366,N,08503.630,W,1,6,001,00103,M,-00002

,M,,
95+102:00:01:06.999 $GPVHW,254,T,251,M,05.60,N,10.37,K
95+102:00:01:07.018 $GPVTG,231,T,228,M,005.3,N,009.8,K
```

gp1.r - Trimble GPS after cleaning

same as gp1.d

Furuno Speed and Heading (fu):

fu.d - speed & heading logged data (before cleaning stage)

```
yy+ddd:hh:mm:ss.mmm - 12.1 123.1 123.1
yr day   time         trk spd  hdg  gyro
```

trk: "-" = water track, "+" = bottom track

fu.r - speed & heading data after cleaning stage

same as fu.d

fu.s - smooth speed and heading data

```
yy+ddd:hh:mm:ss.mmm - 12.1 123.1 20
yr day   time         trk spd  hdg  number_pts
                                in minute
```

Fix File (x):

x. - fix file

```
yy+ddd:hh:mm:ss.mmm N 12 12.1234 W 123 12.1234 id
yr day   time         lat         lon         id_string
```

id strings: "gp3" = GPS

One Minute Navigation (n):

n. - 1 minute navigation from the "x." file and "fu.s" file

```
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
```

id strings: "gp3" = GPS #1

"dr" = Dead Reckoned position corrected
for set and drift error

Magnetics (mg):

mg.d - total intensity logged data

same as mg.r below

mg.r - total intensity magnetics after cleaning stage

yy+ddd:hh:mm:ss.mmm 41200.8
yr day time total_intensity

mg.m - median total intensity magnetics values at 00 seconds.
(median of values +-30 seconds)

yy+ddd:hh:mm:ss.mmm 41200.8
yr day time total_intensity

mg.n - median values merged with navigation; anomalies 1990 IGRF

yy+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

Hydrosweep center beam bathymetry (hb):

hb.d - center beam logged data

same as hb.r below

hb.r - center beam data after "cleaning" of hb.d file

yy+ddd:hh:mm:ss.mmm hh:mm:ss.mmm S 3445
yr day time 2nd_time mode depth_in_meters
^ ^
|_ Ping time |_ CPU time tag

mode: "S" for survey
note: 2nd time is CPU time tag

hb.i - interpolated center beam depth at 00 sec of each minute

yy+ddd:hh:mm:ss.mmm 3445
yr day ping_time depth_in_meters

hb.n - interpolated center beam merged with navigation

yy+ddd:hh:mm:ss.mmm N 12 12.1234 E 123.1234 2222.0
yr day ping_time lat lon depth_in_meters

BGM-3 Gravity (vt):

vc.d - BGM-3 "counts" logged data

same as vc.r below

vc.r - BGM-3 "counts" after "cleaning" of vc.d file

yy+ddd:hh:mm:ss.mmm 01:025069 00
yr day time int count status

int - count interval; 01 = 1 second

vt.r - mGal gravity values calculated from the counts

yy+ddd:hh:mm:ss.mmm 979171.448000
yr day time grav

vt.s - smooth BGM-3 values at 00 secs of each minute.
(mean of values +-30 secs)

yy+ddd:hh:mm:ss.mmm 979171.448000
yr day time grav

vt.n - "vt.s" merged with nav with EOTVOS correction and FAA
Note: "vt30.n" is merged data using 1930 theoretical formula

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 raw_vel smo_vel
shift N E N E

Gun depths (dg):

dg.d - gun depths logged data

same as dg.r below

dg.r - gun depths after cleaning stage

```
yy+ddd:hh:mm:ss.mmm 63 72 74 ... 76 74 61 68 59
yr day  shot_time  gun depths (in meters x 10)
      ^
      | time tag here is the shot time not CPU time tag
```

Shot times (ts1 and ts2):

ts1 = Datum clock
ts2 = TrueTime Clock

ts2.d - shot times logged data

same as ts.r below

ts2.r - shot times after cleaning stage

```
yy+ddd:hh:mm:ss.mmm 00:02:30.113 TrueTime
yr day cpu_time      shot_time      clock
```

samples:

```
==> ts1.r098 <==
95+098:00:01:28.643 00:01:28.2666477 Datum S65
yr day cpu_time      shot_time      clock status

==> ts2.r098 <==
95+098:00:01:28.645 00:01:28.266 TrueTime
yr day cpu_time      shot_time      clock
```


Partial Nav Block data (nb1 and nb2):

nb1 = uses Datum clock
nb2 = uses TrueTime Clock

nb2.d - nav block logged data

same as nb.r below

nb2.r - nav block after cleaning stage

yy+ddd:hh:mm:ss.mmm 15913 N 53 17.4460 W 166 59.4243 MCS1234c
yr day shot_time shot # latitude longitude line

Note: latitude and longitude are those values at shot time - a
calculated realtime position

Samples:

==> nb1.r098 <==
95+098:00:01:28.2666477 14222 N 09 27.7300 W 085 05.1187 ex2-1
yr day shot_time shot # latitude longitude line

==> nb2.r098 <==
95+098:00:01:28.266 14222 N 09 27.7300 W 085 05.1187 ex2-1
yr day shot_time shot # latitude longitude line

Shot time/Nav Block data remerged with final nav (ts1.n and ts2.n):

ts1.n uses Datum clock
ts2.n uses TrueTime Clock

ts2.n - shot time data merged with post processed navigation

94+195:00:02:50.371 15913 N 53 17.4459 W 166 59.4171 MCS1234c
yr day shot_time shot # latitude longitude line

latitude and longitude are from the post processed navigation

Sample:

==> ts2.n098 <==
95+098:00:01:28.266 14222 N 09 27.7288 W 085 05.0991 ex2-1
yr day shot_time shot # latitude longitude line

Sea temperature (ct):

ct.d - sea temperature logged data

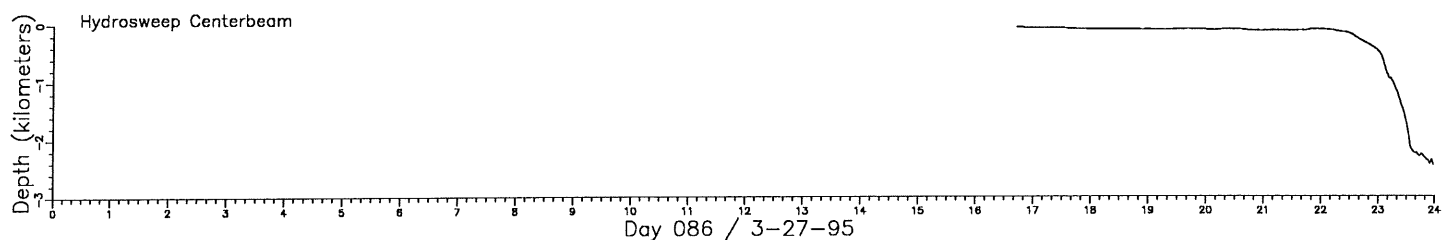
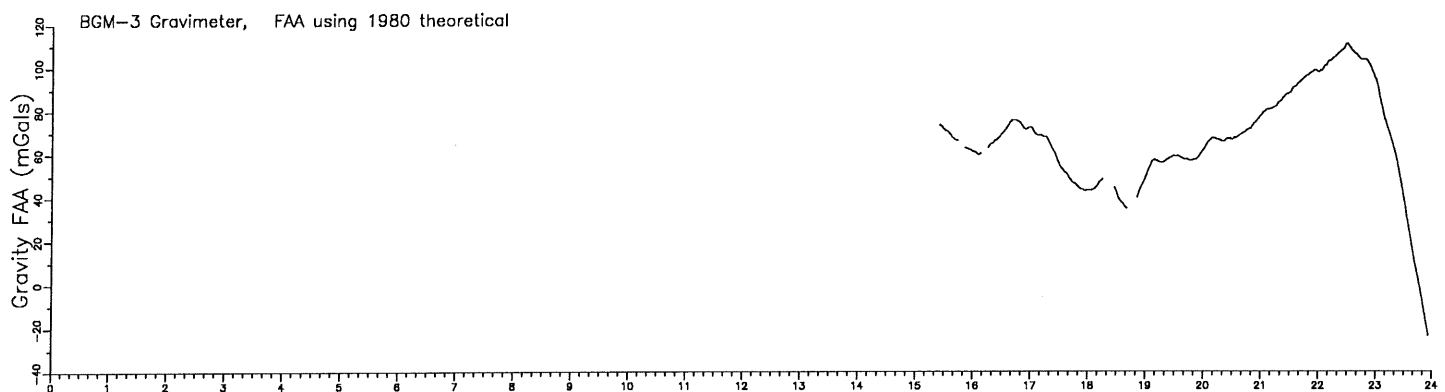
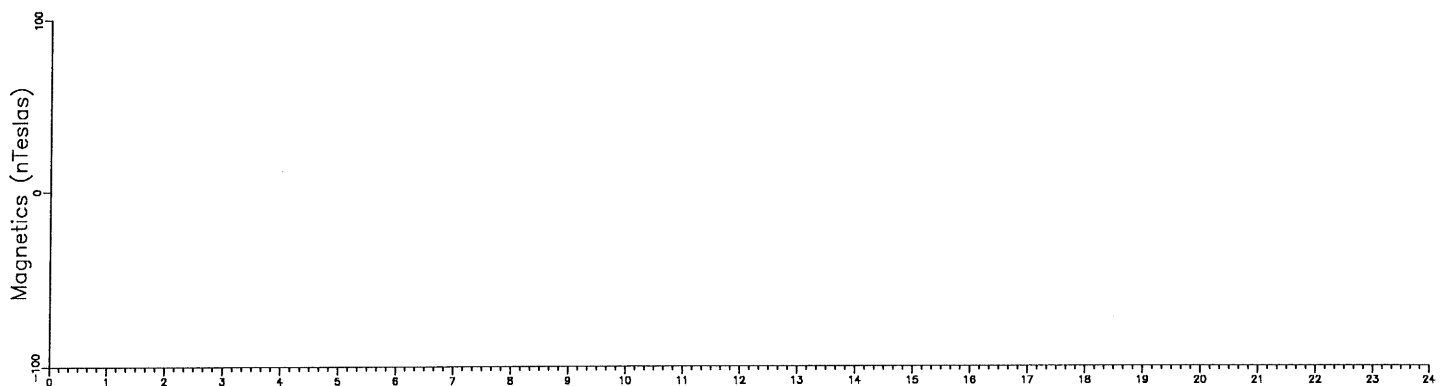
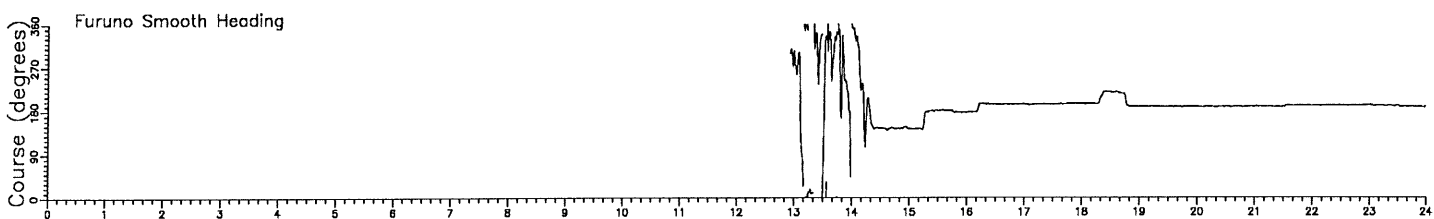
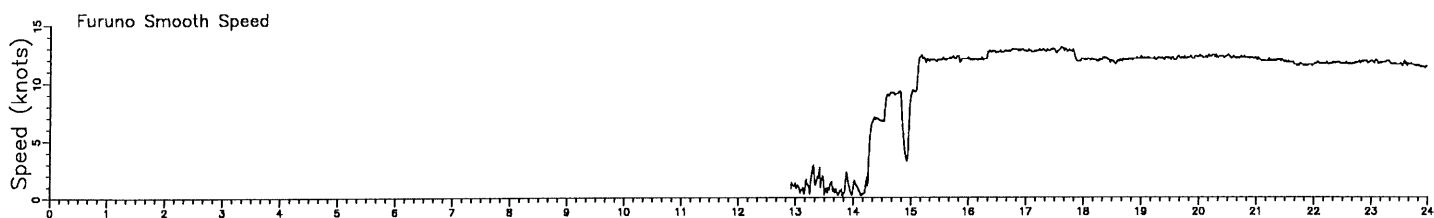
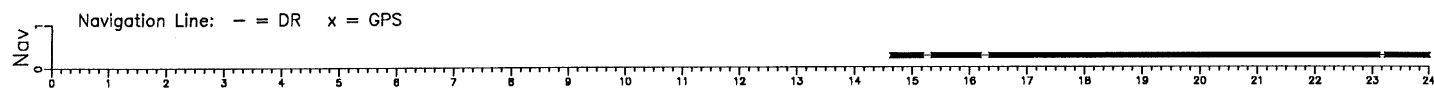
same as ct.r below

ct.r - sea temperature after cleaning stage

yy+ddd:hh:mm:ss.mmm 0007.6 00
yr day time temp (degrees C)

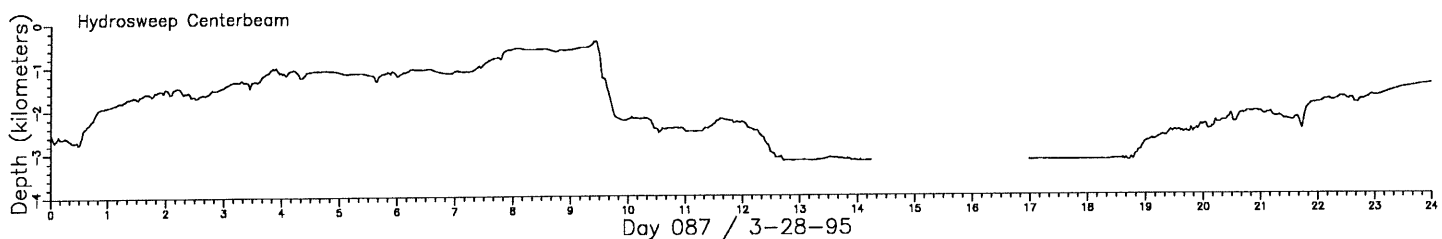
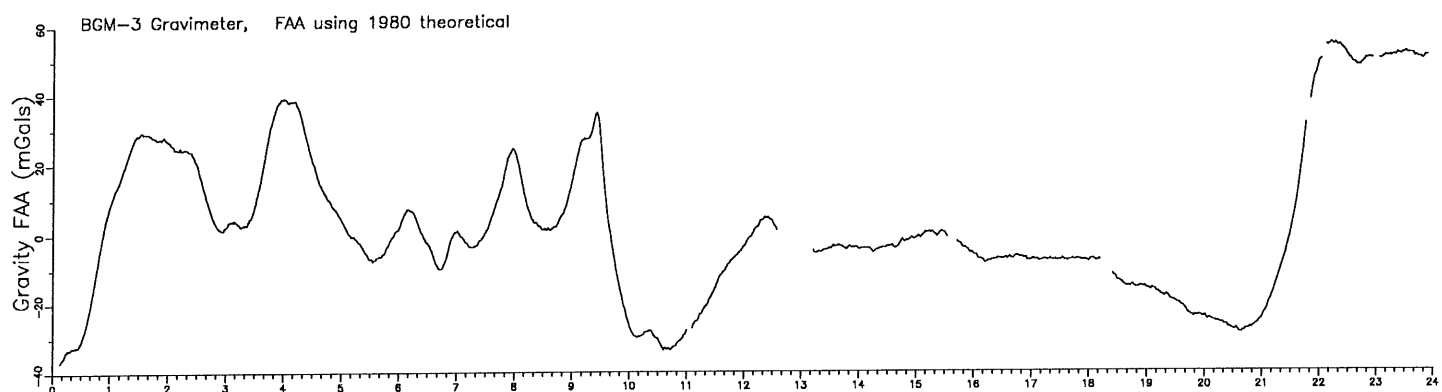
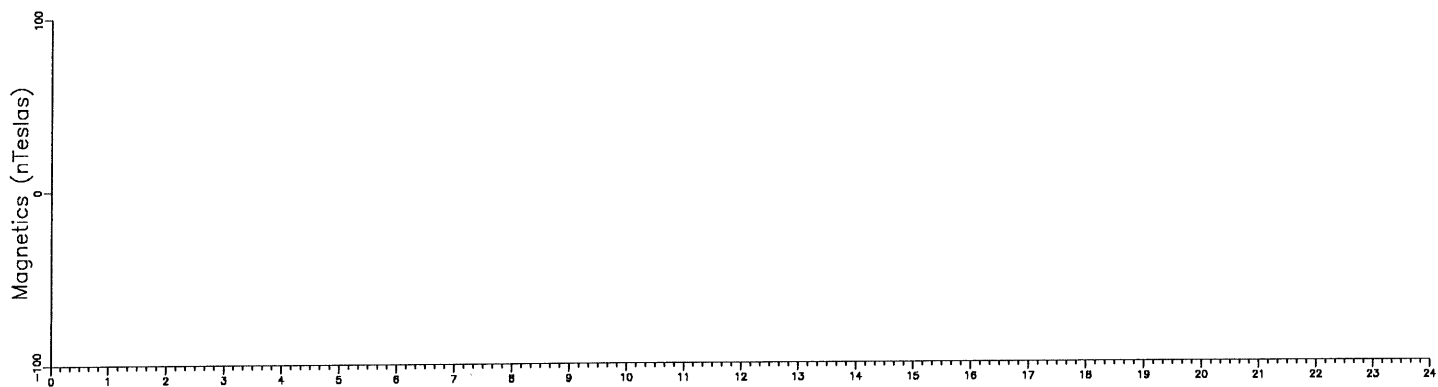
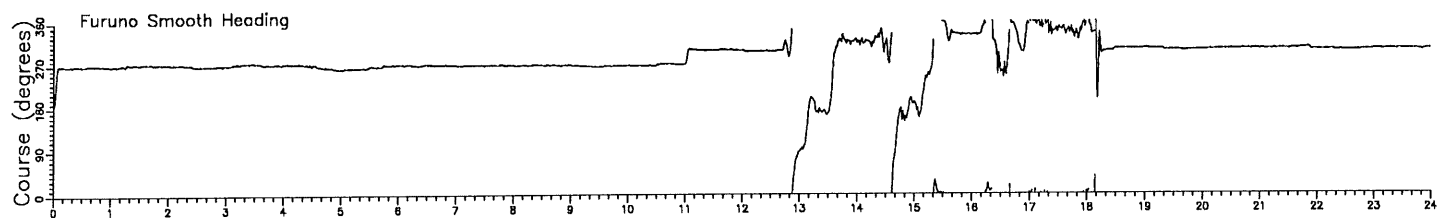
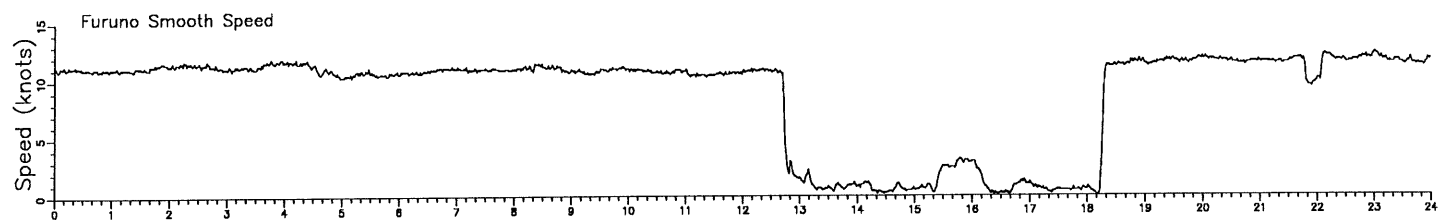
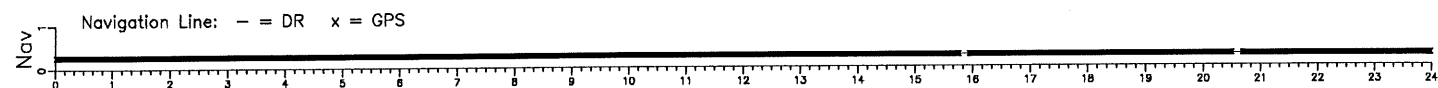
EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.086 Speed/Course file: fu.s086 Gravity file: vt.n086 Bathymetry file: hb.n086



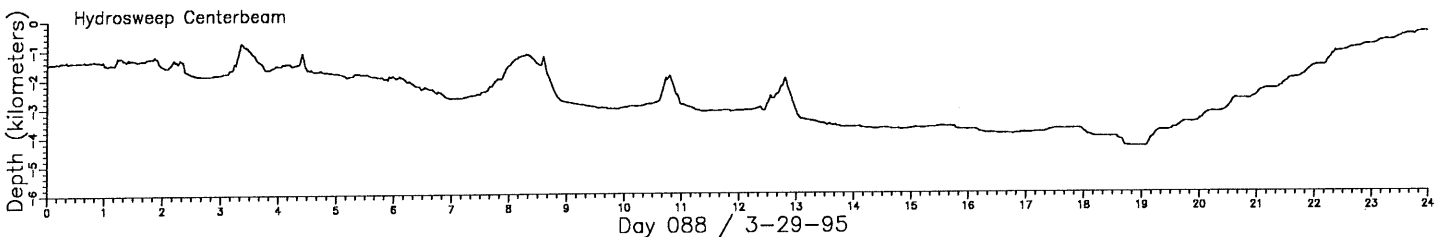
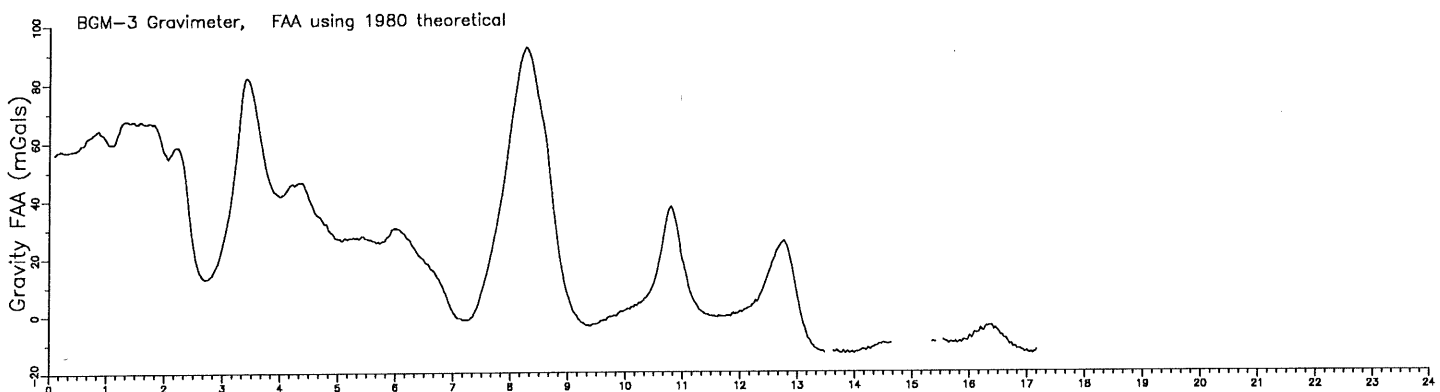
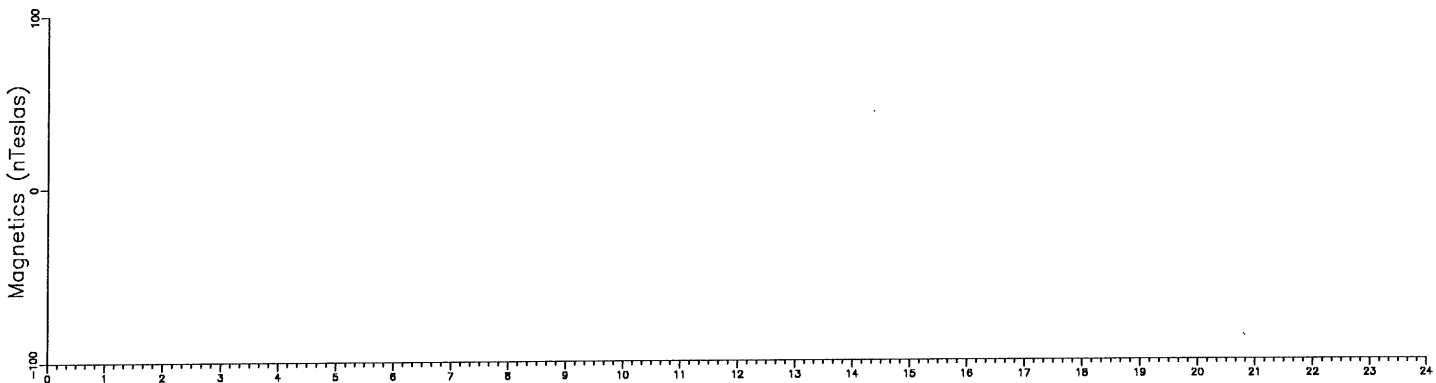
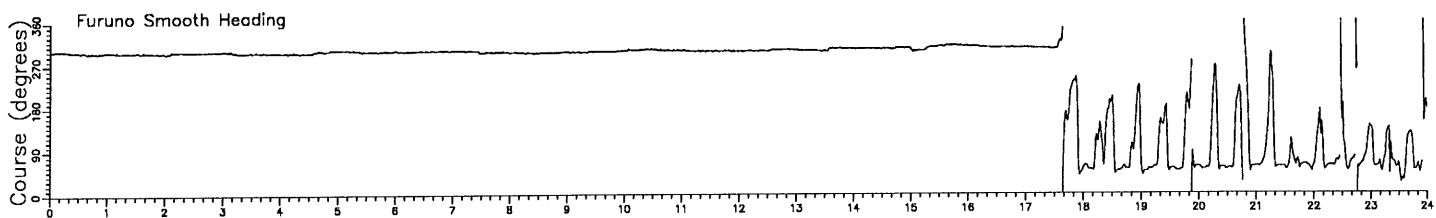
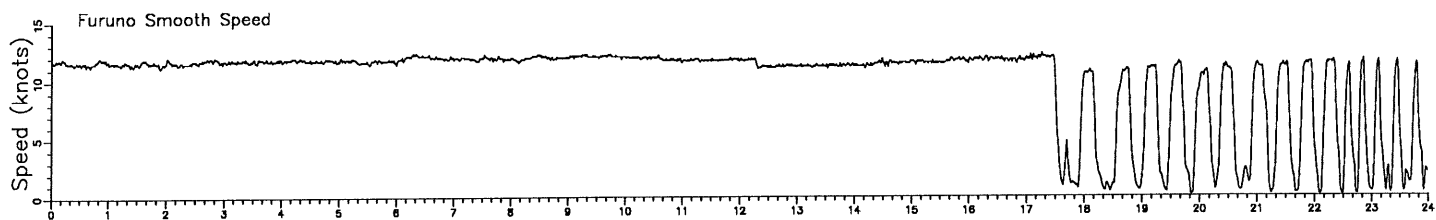
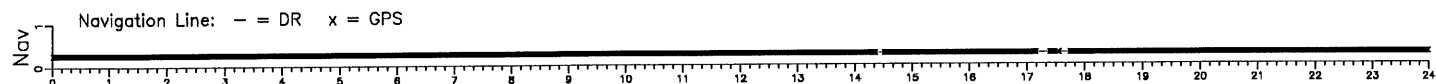
EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.087 Speed/Course file: fu.s087 Gravity file: vt.n087 Bathymetry file: hb.n087



EW9502 Balboa, Panama — Manzanillo, Mexico

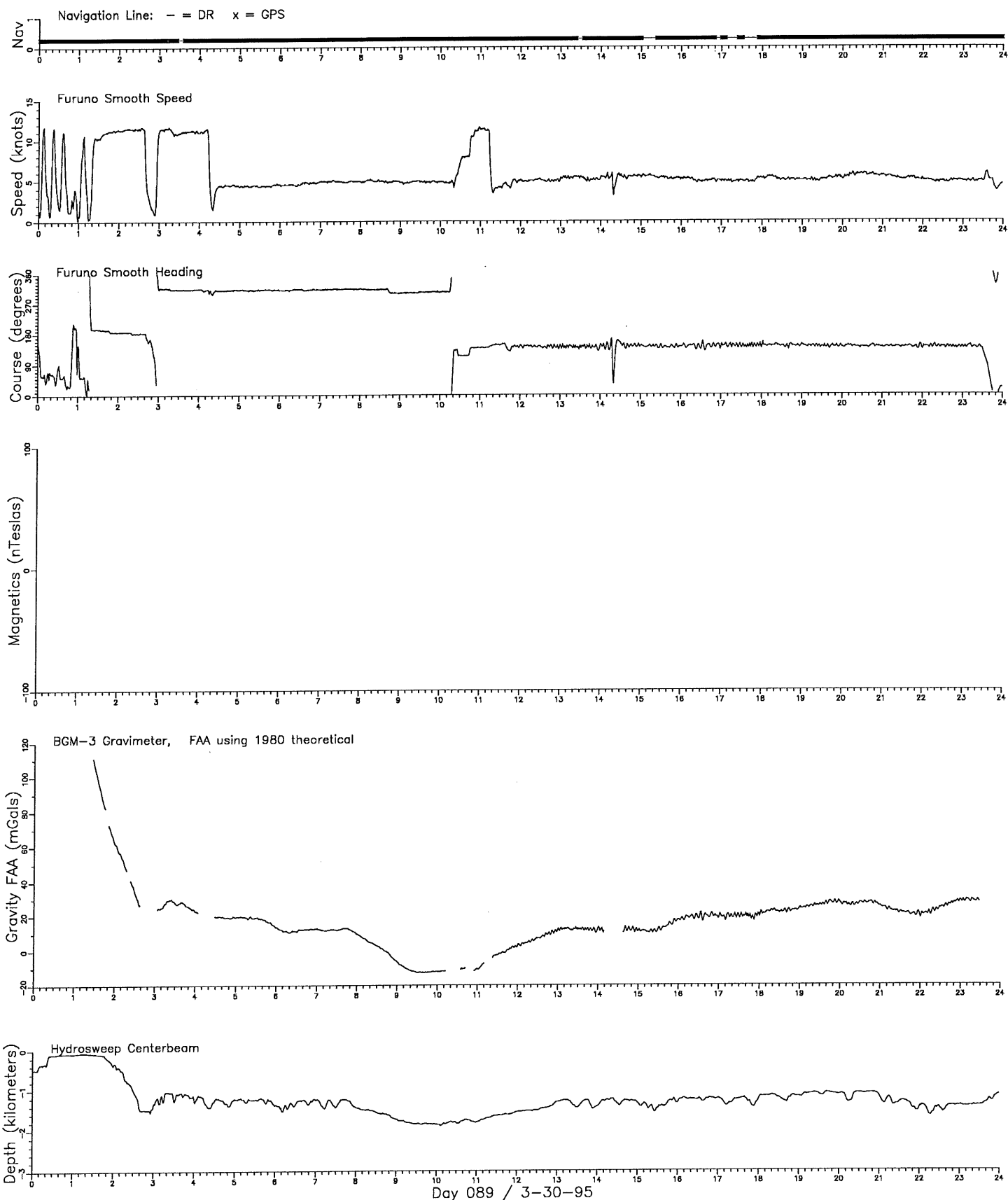
Navigation file: n.088 Speed/Course file: fu.s088 Gravity file: vt.n088 Bathymetry file: hb.n088



Day 088 / 3-29-95

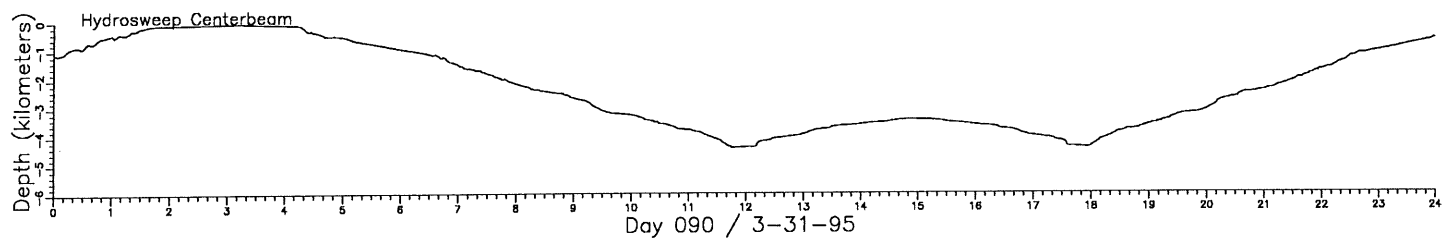
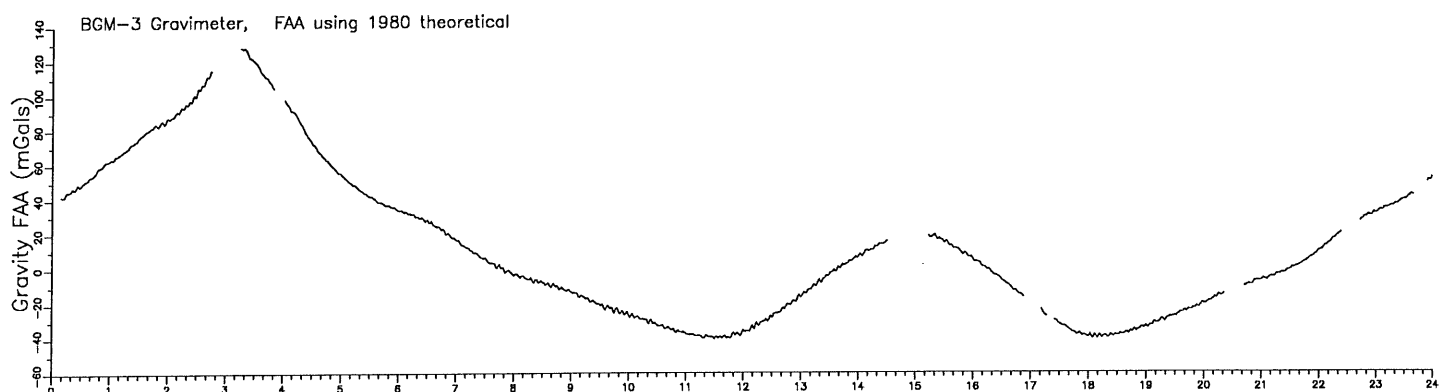
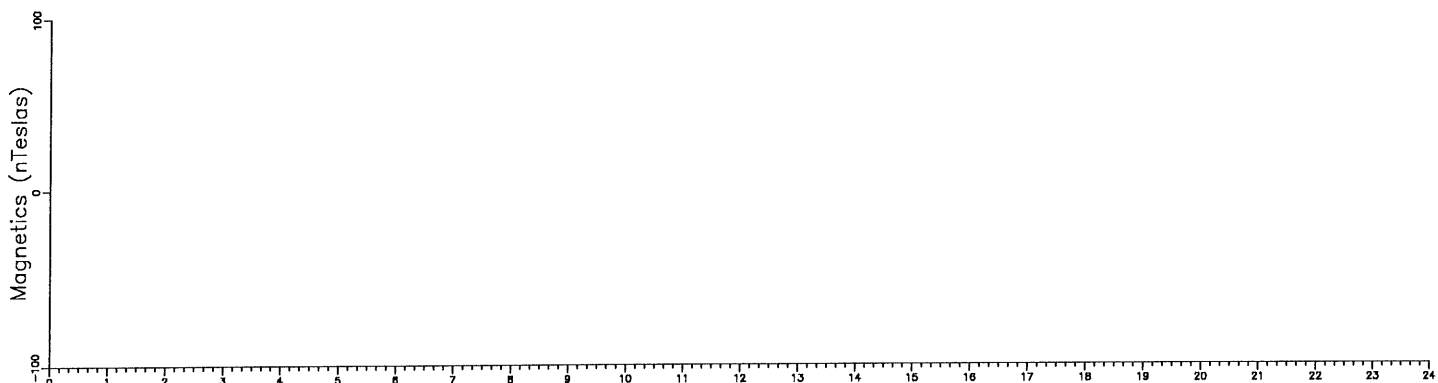
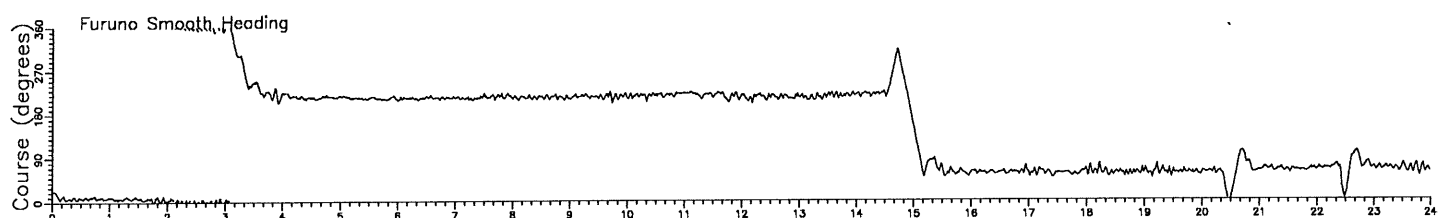
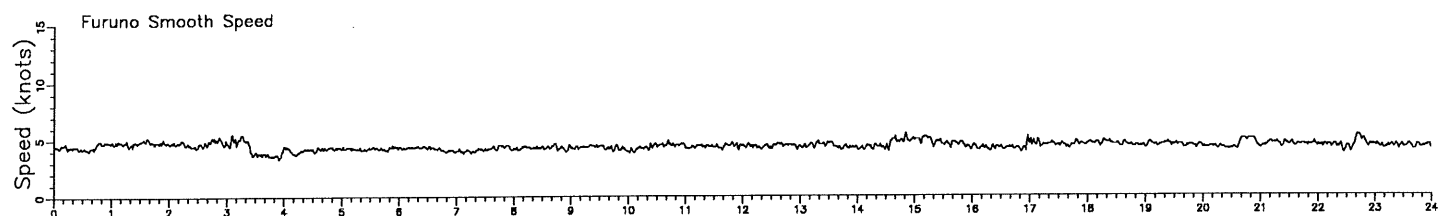
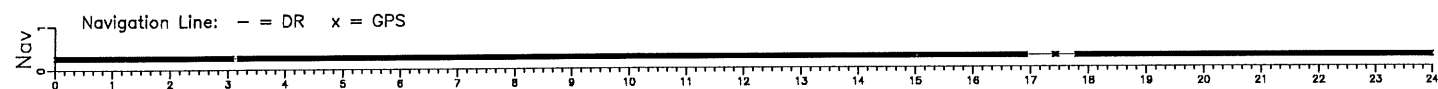
EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.089 Speed/Course file: fu.s089 Gravity file: vt.n089 Bathymetry file: hb.n089



EW9502 Balboa, Panama — Manzanillo, Mexico

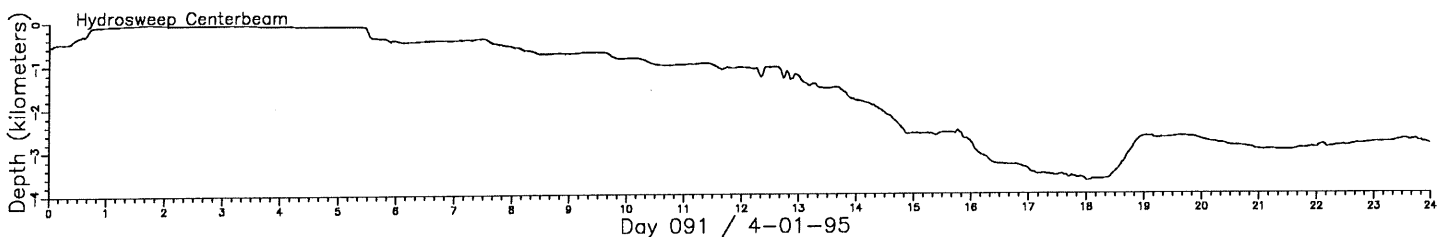
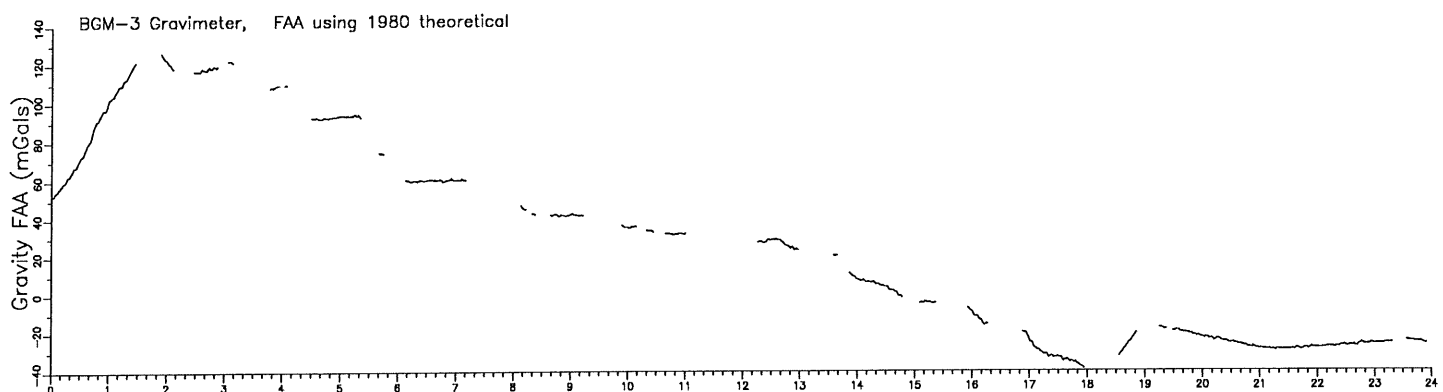
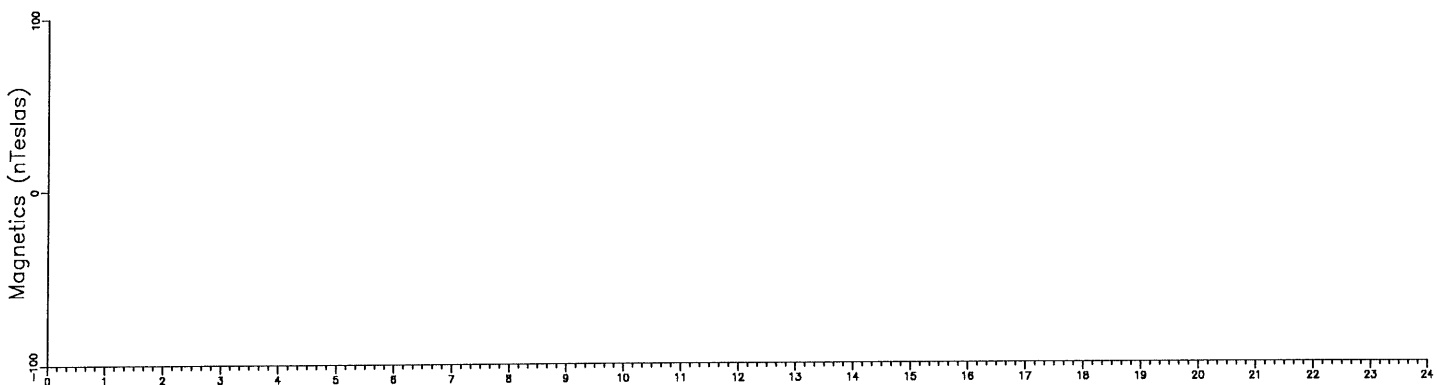
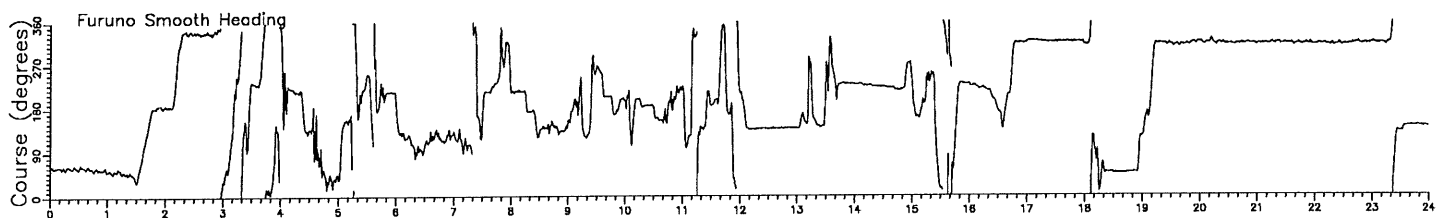
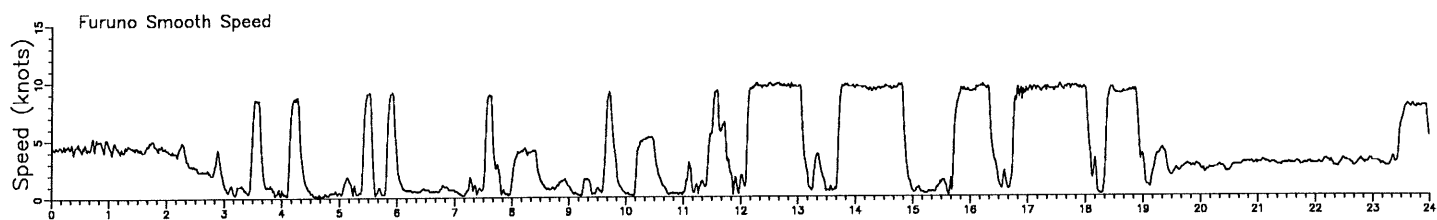
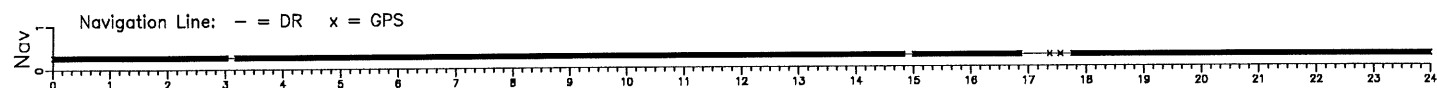
Navigation file: n.090 Speed/Course file: fu.s090 Gravity file: vt.n090 Bathymetry file: hb.n090



Day 090 / 3-31-95

EW9502 Balboa, Panama — Manzanillo, Mexico

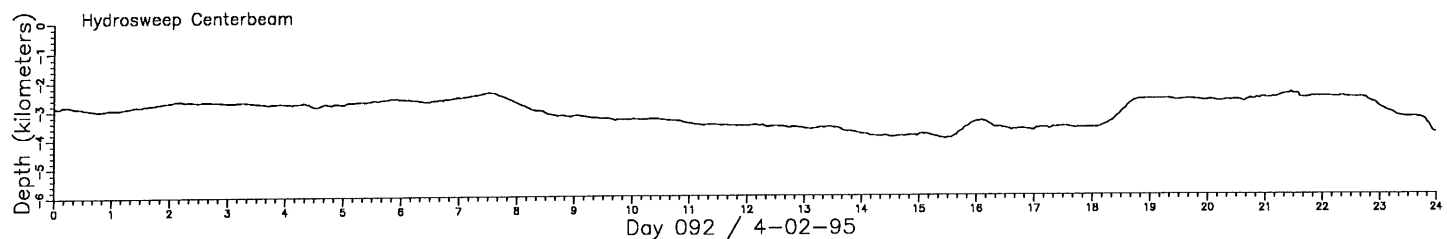
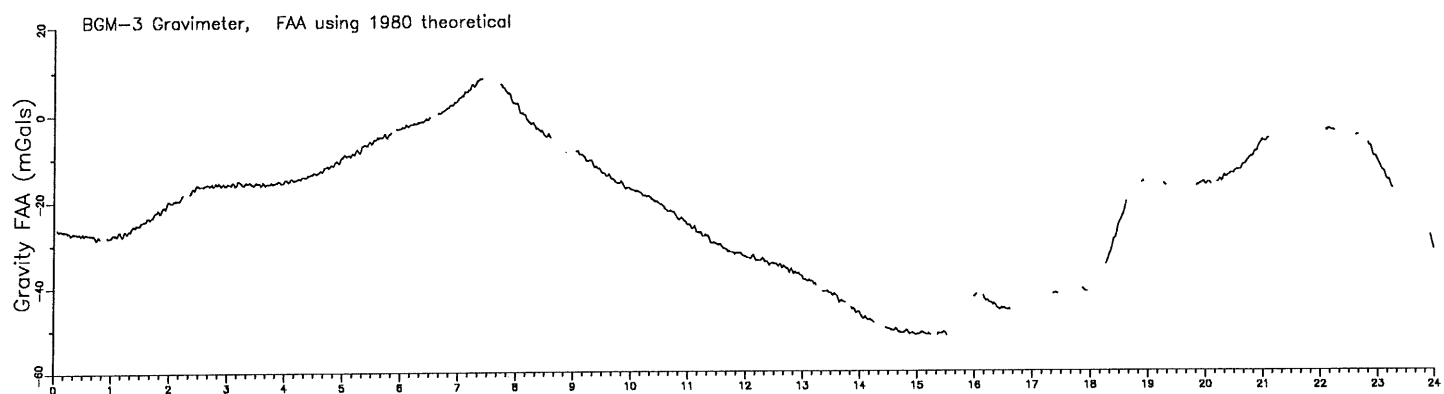
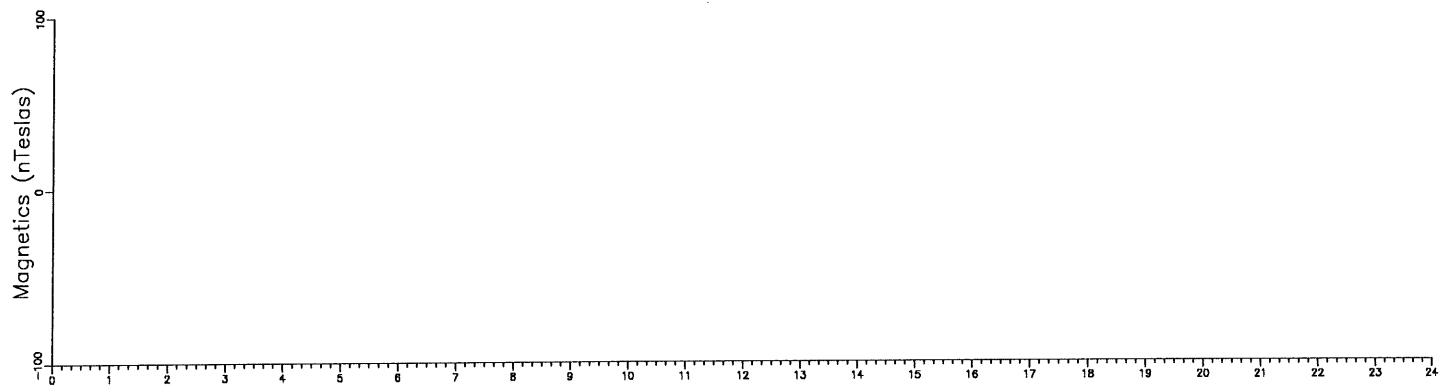
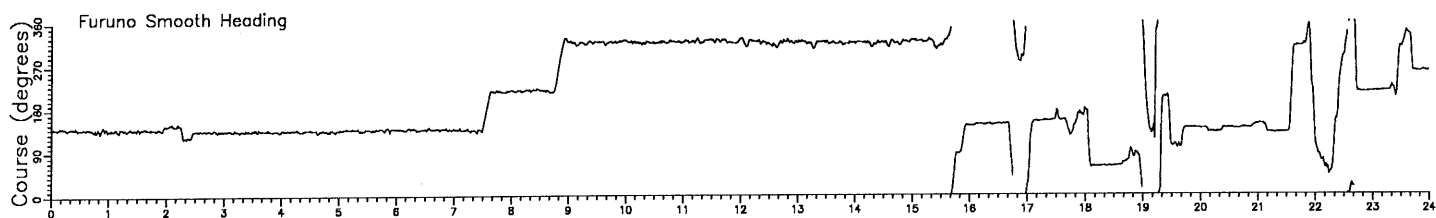
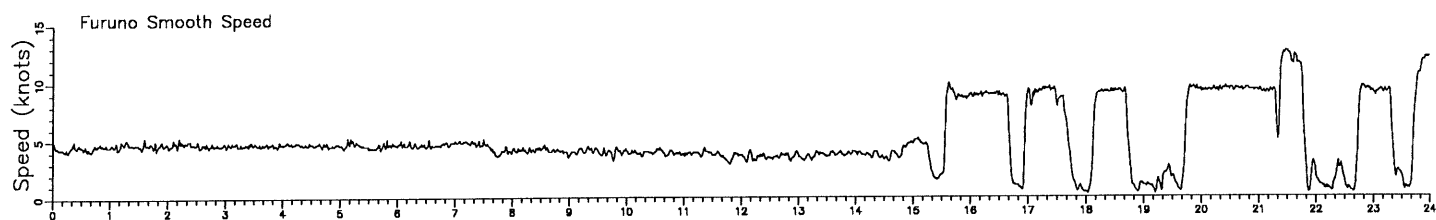
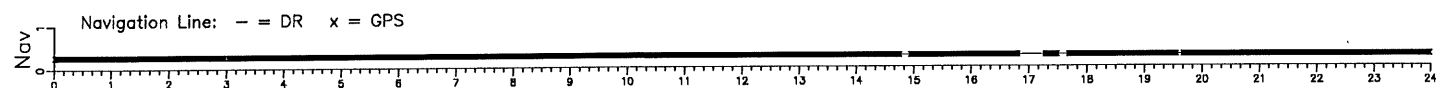
Navigation file: n.091 Speed/Course file: fu.s091 Gravity file: vt.n091 Bathymetry file: hb.n091



Day 091 / 4-01-95

EW9502 Balboa, Panama — Manzanillo, Mexico

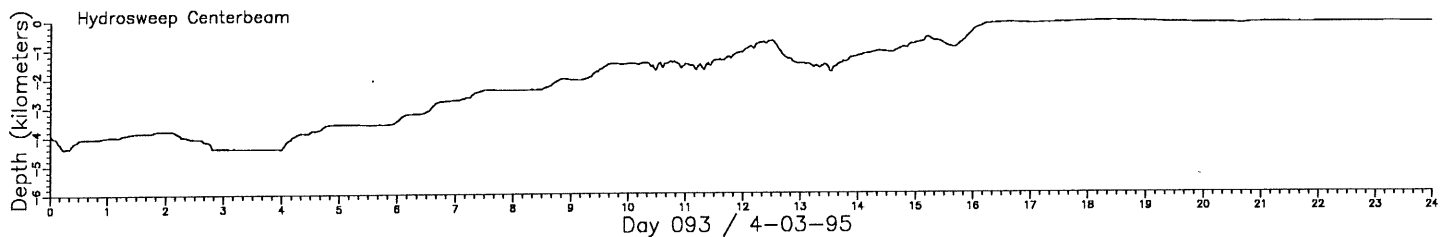
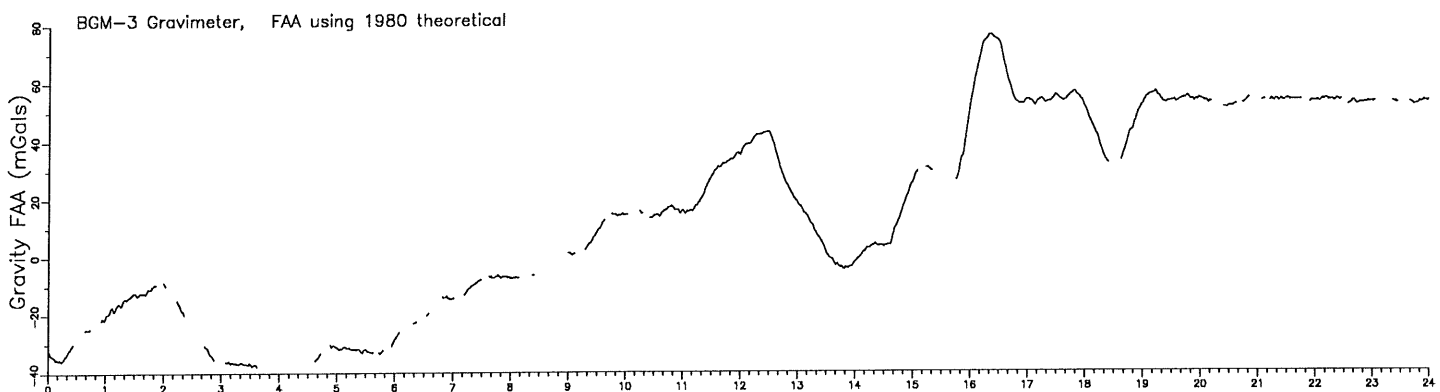
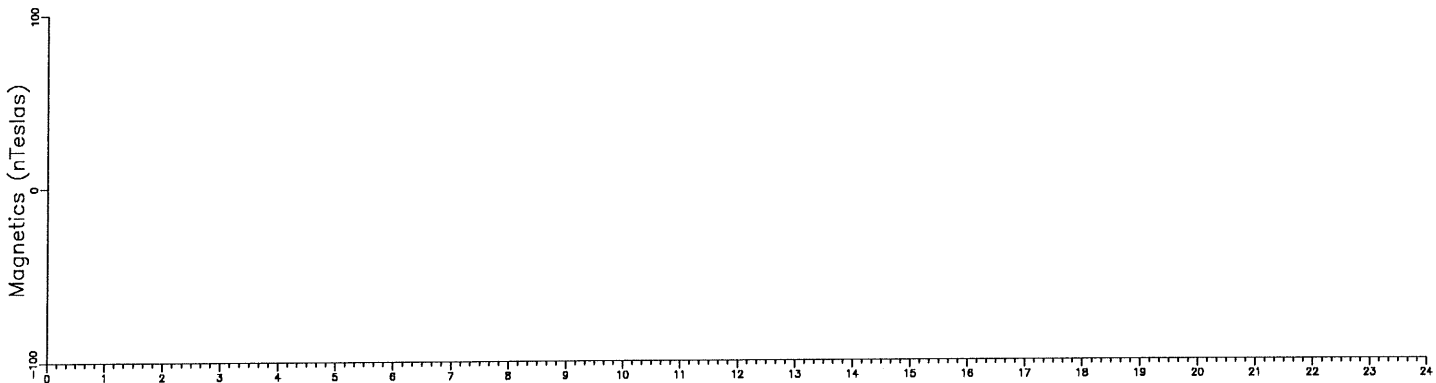
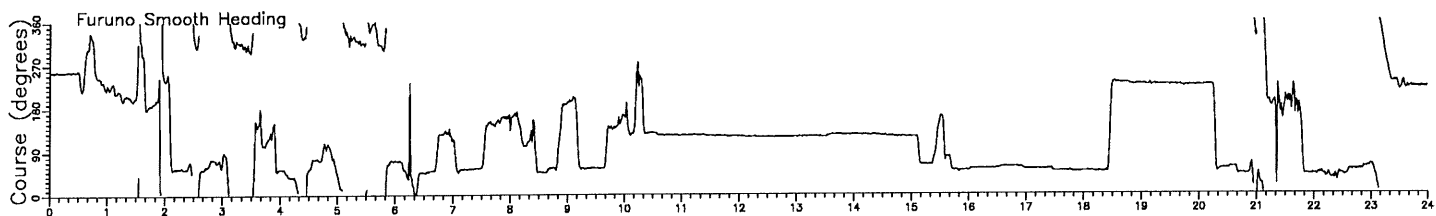
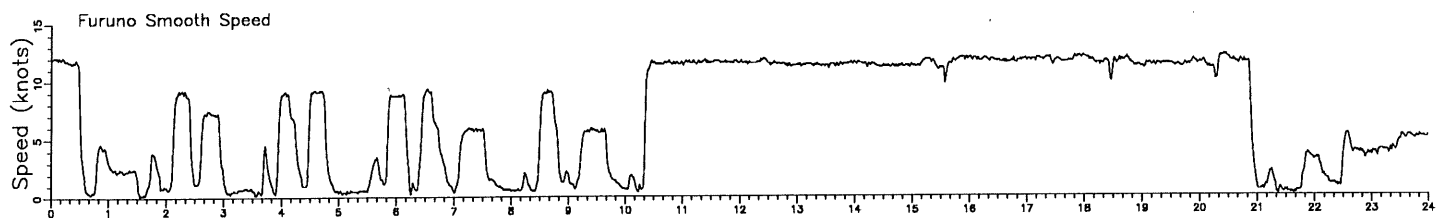
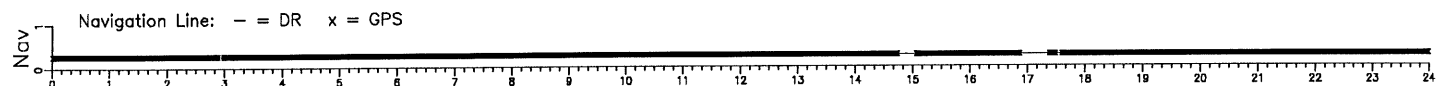
Navigation file: n.092 Speed/Course file: fu.s092 Gravity file: vt.n092 Bathymetry file: hb.n092



Day 092 / 4-02-95

EW9502 Balboa, Panama — Manzanillo, Mexico

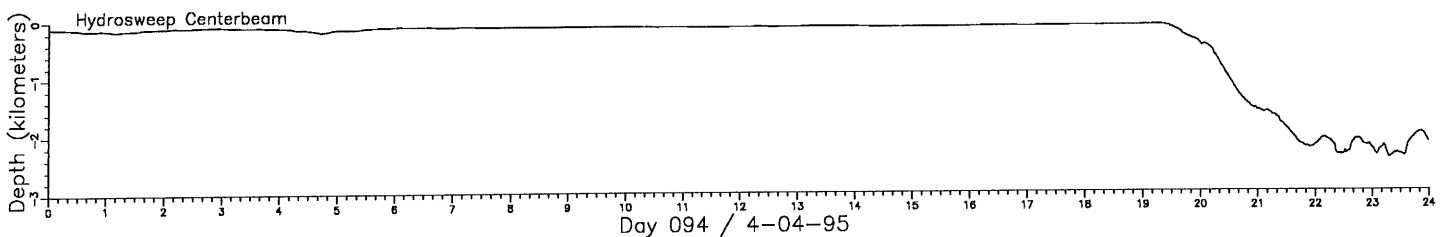
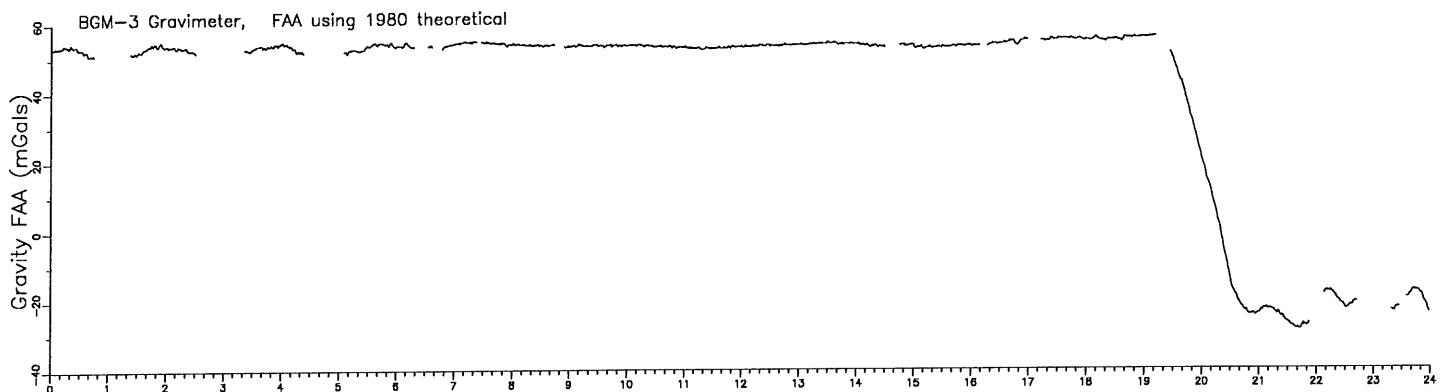
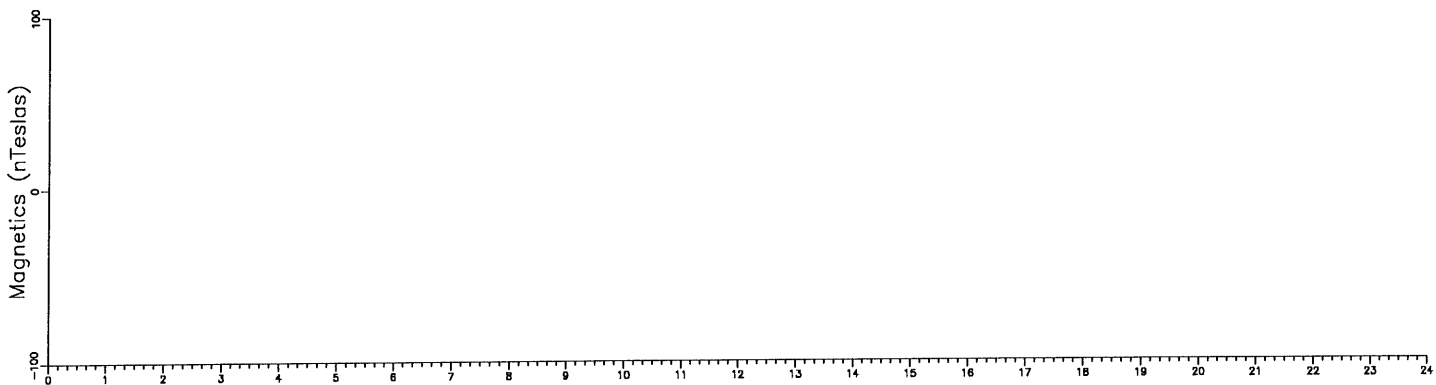
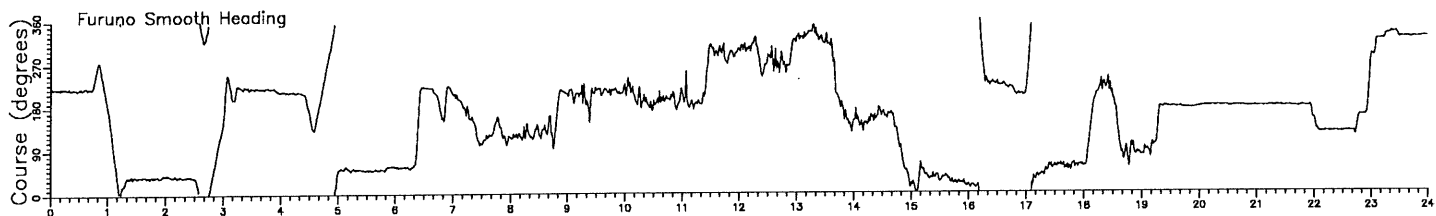
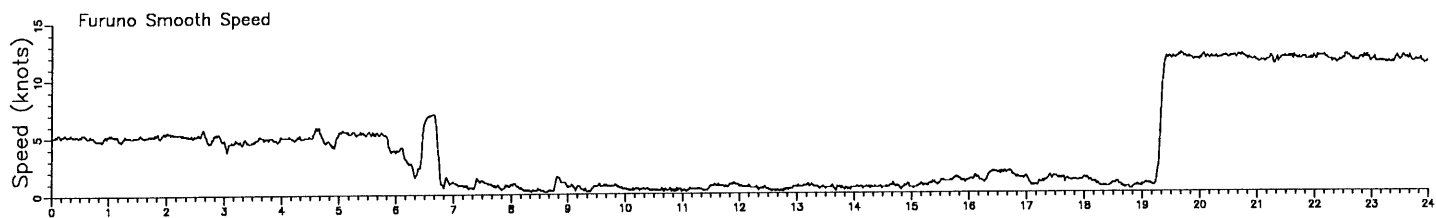
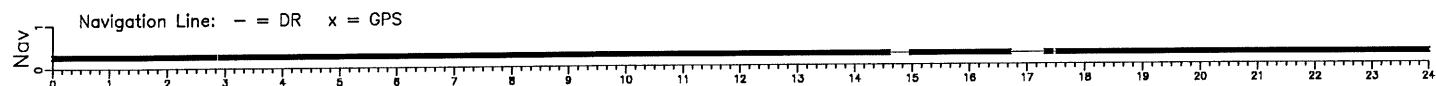
Navigation file: n.093 Speed/Course file: fu.s093 Gravity file: vt.n093 Bathymetry file: hb.n093



Day 093 / 4-03-95

EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.094 Speed/Course file: fu.s094 Gravity file: vt.n094 Bathymetry file: hb.n094



Day 094 / 4-04-95

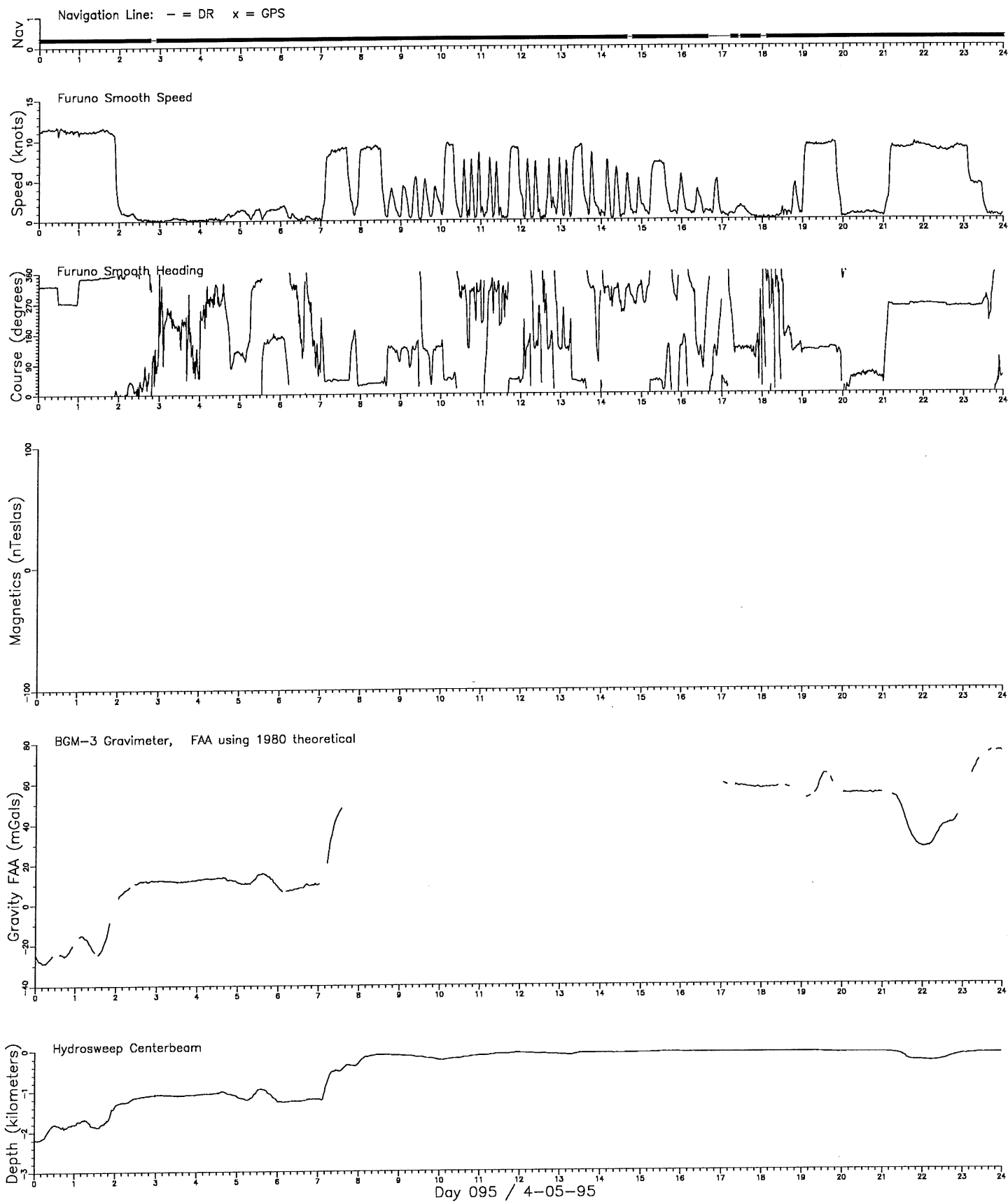
EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.095

Speed/Course file: fu.s095

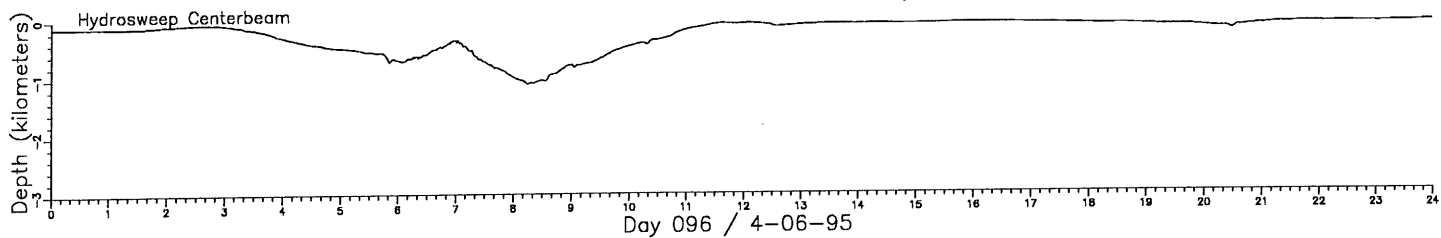
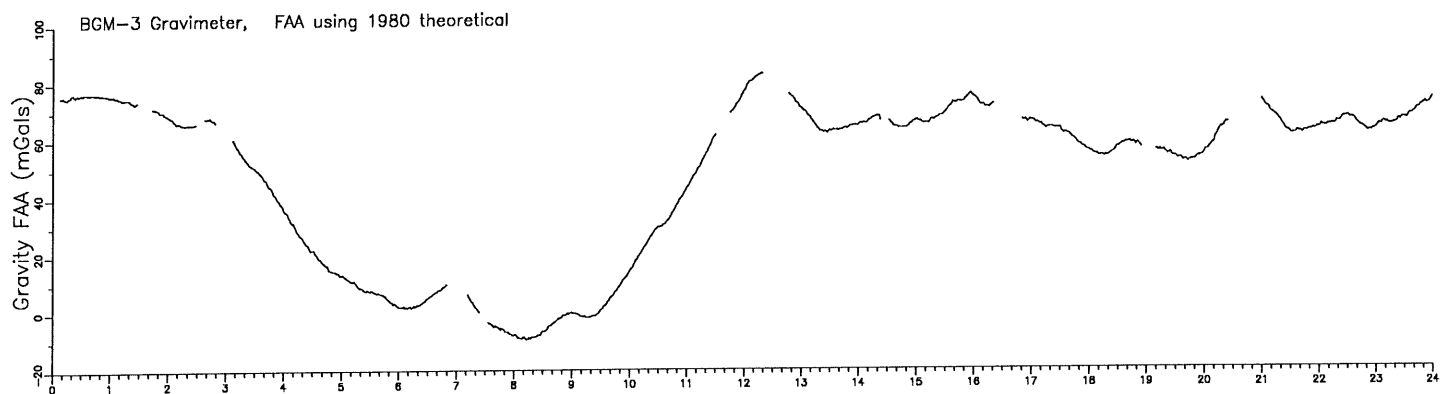
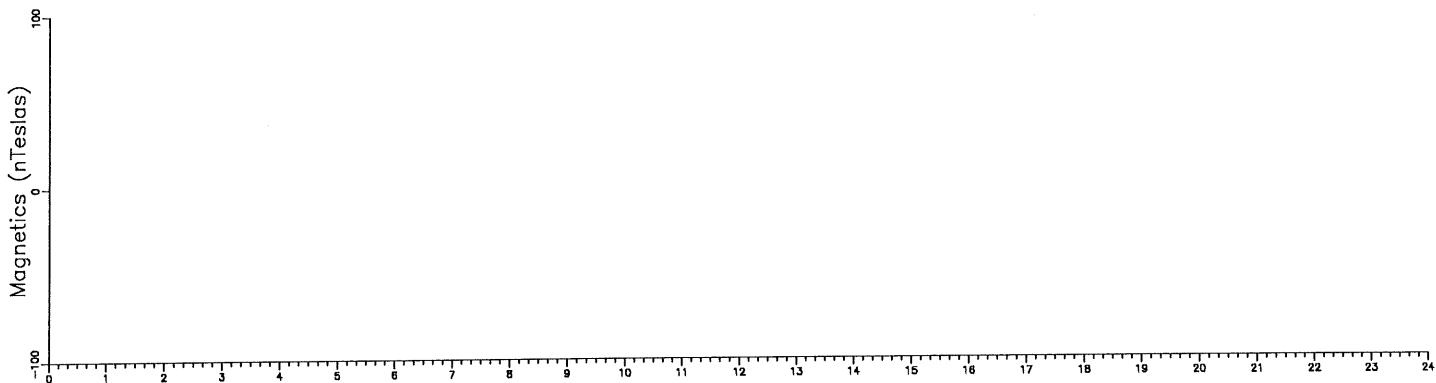
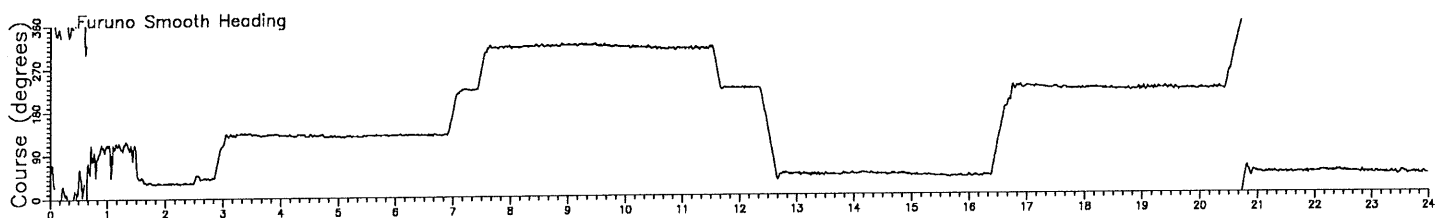
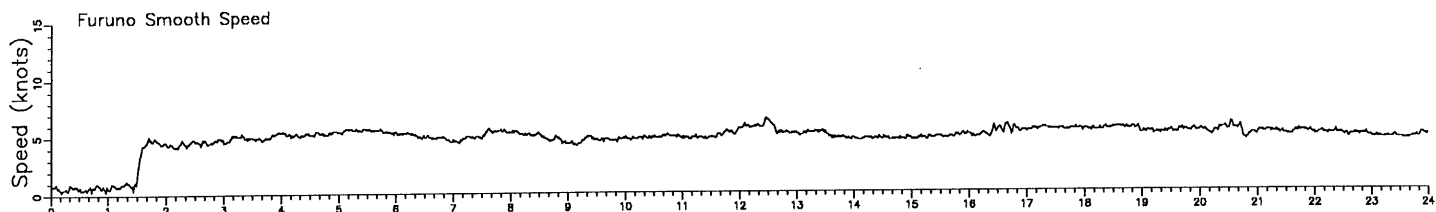
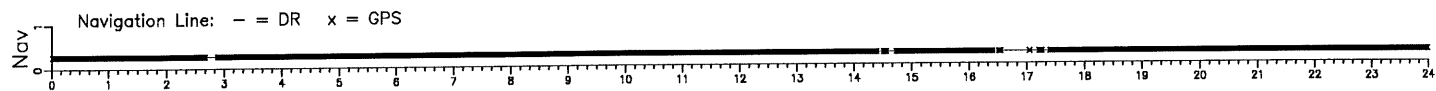
Gravity file: vt.n095

Bathymetry file: hb.n095



EW9502 Balboa, Panama — Manzanillo, Mexico

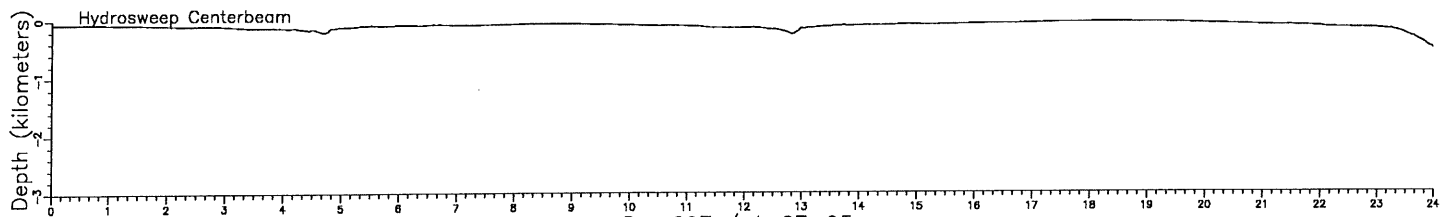
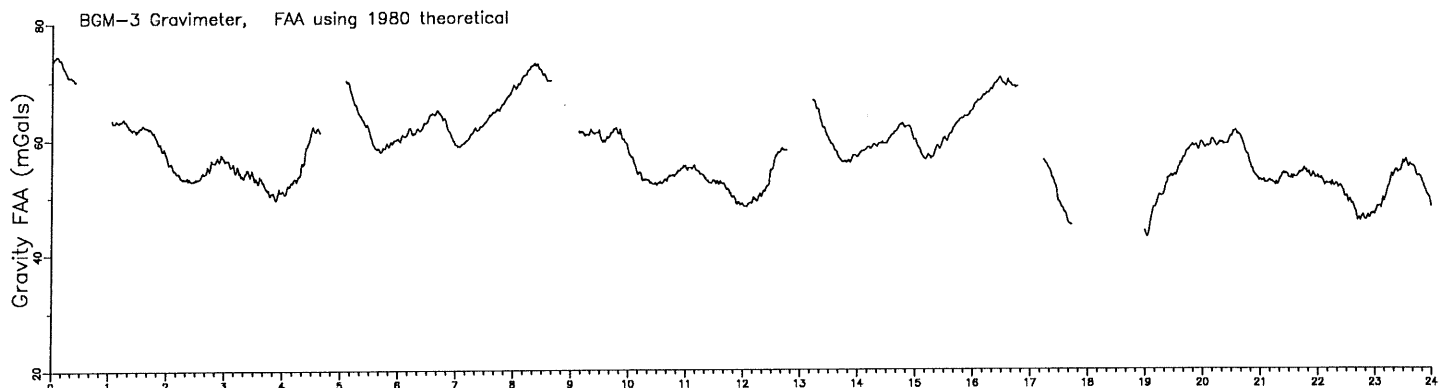
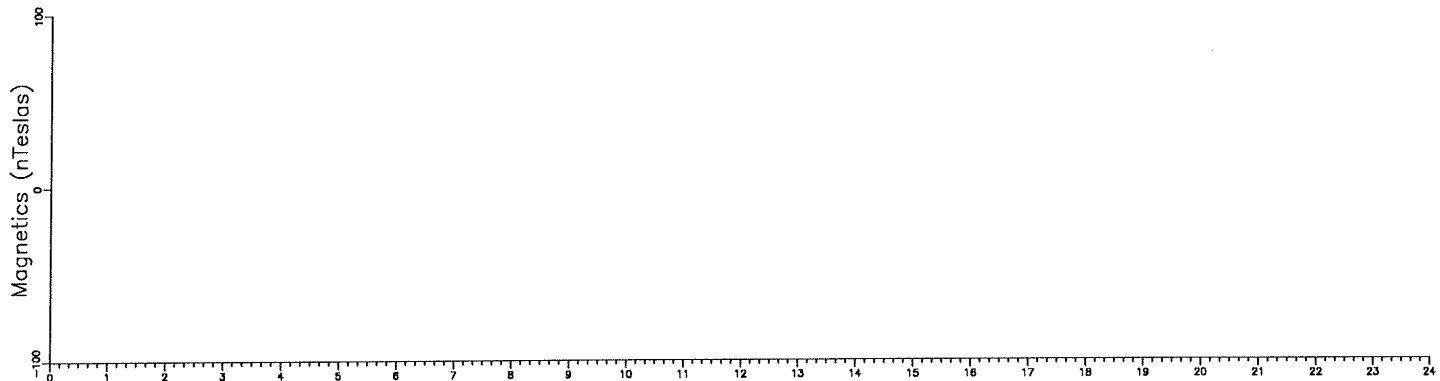
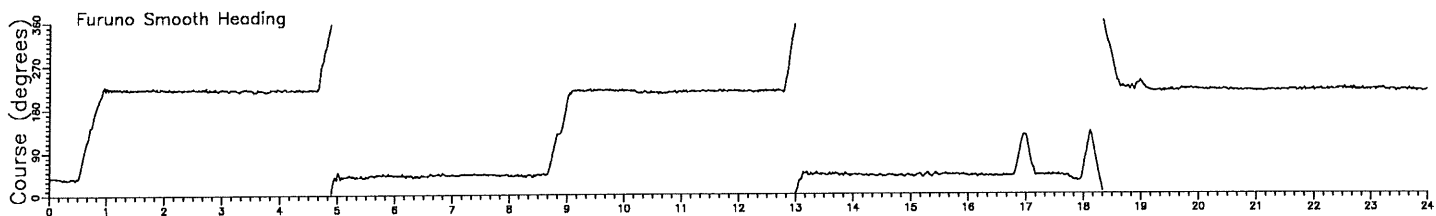
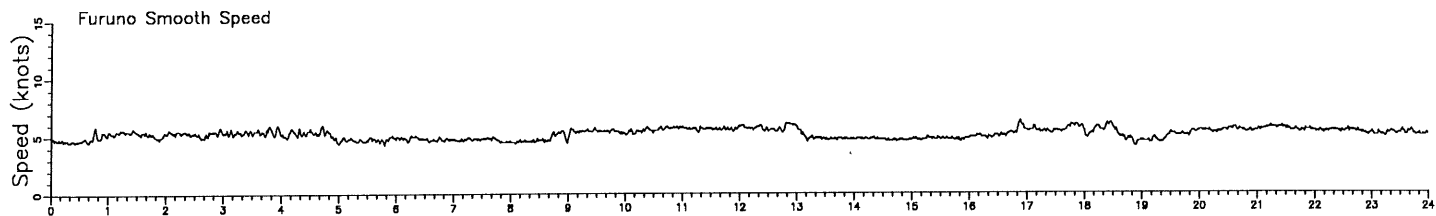
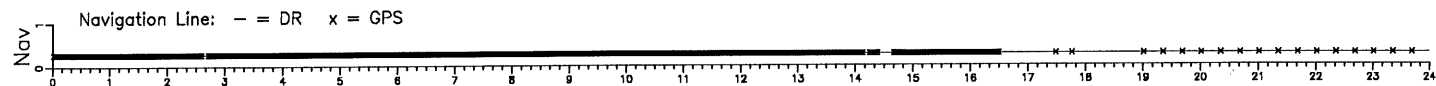
Navigation file: n.096 Speed/Course file: fu.s096 Gravity file: vt.n096 Bathymetry file: hb.n096



Day 096 / 4-06-95

EW9502 Balboa, Panama — Manzanillo, Mexico

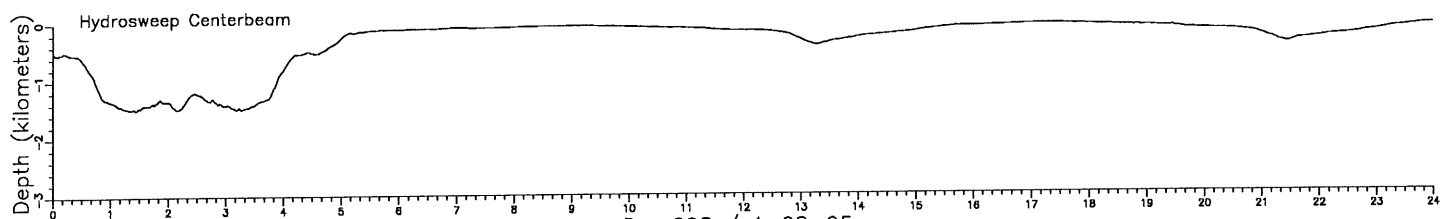
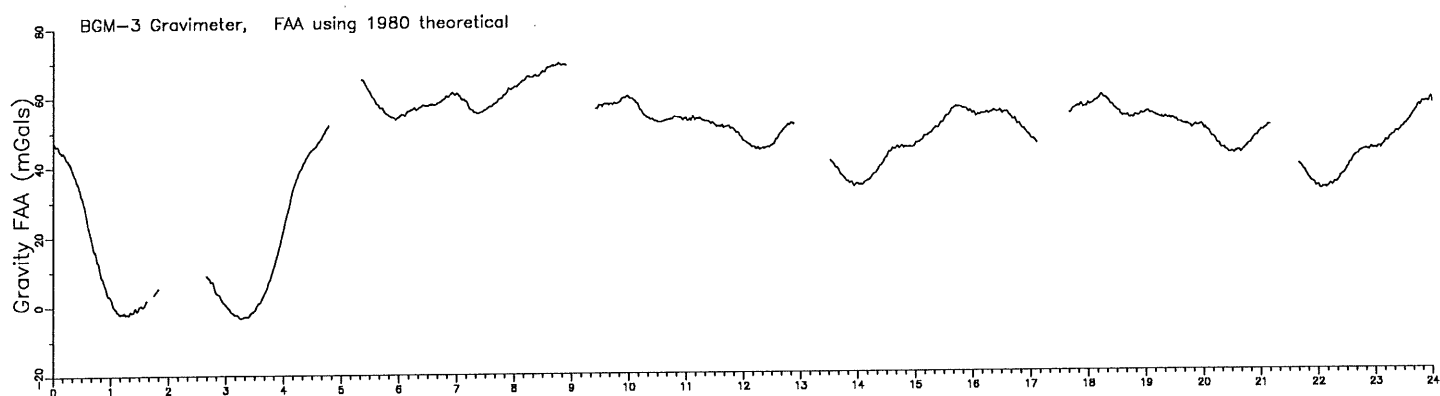
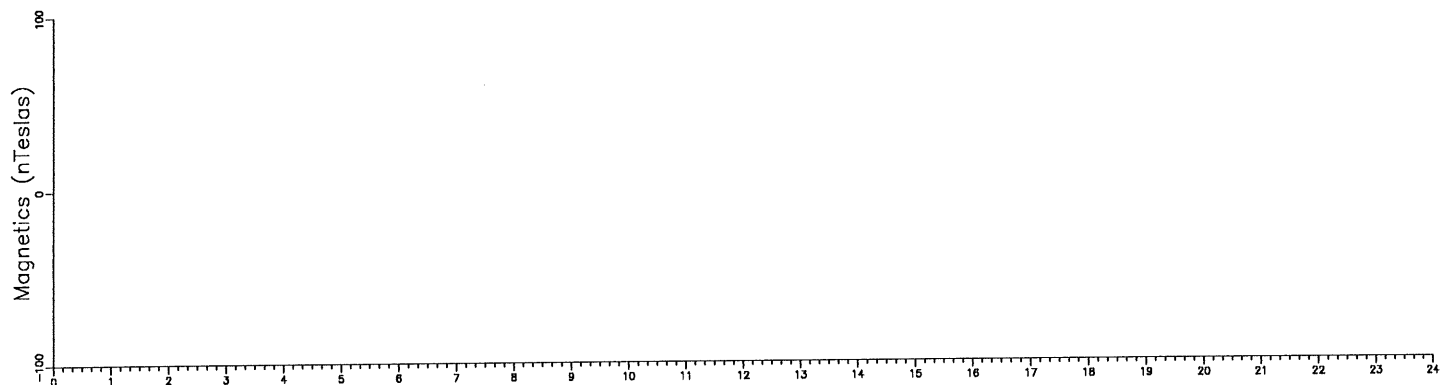
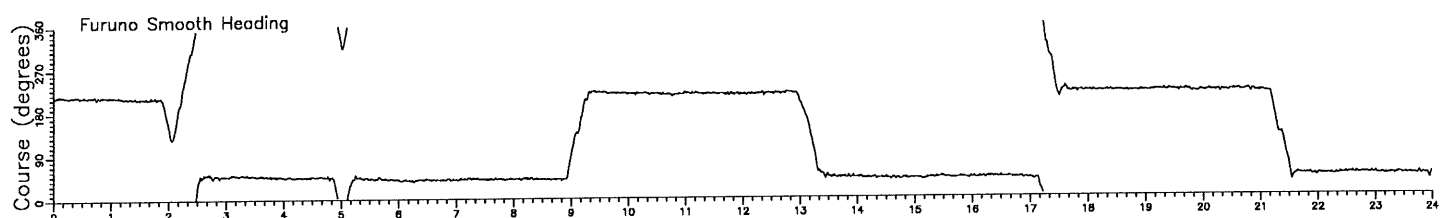
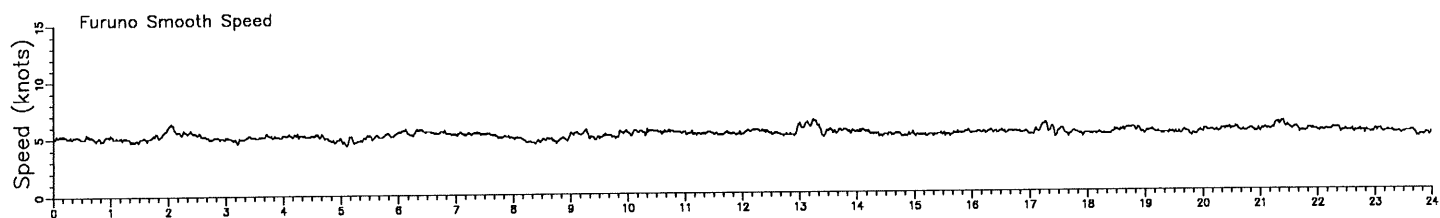
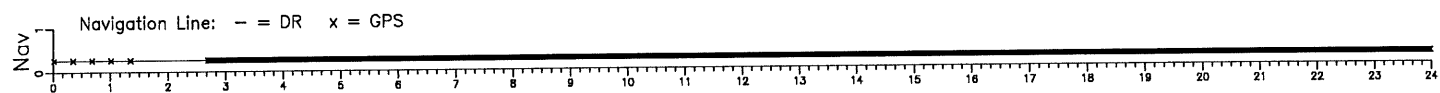
Navigation file: n.097 Speed/Course file: fu.s097 Gravity file: vt.n097 Bathymetry file: hb.n097



Day 097 / 4-07-95

EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.098 Speed/Course file: fu.s098 Gravity file: vt.n098 Bathymetry file: hb.n098



Day 098 / 4-08-95

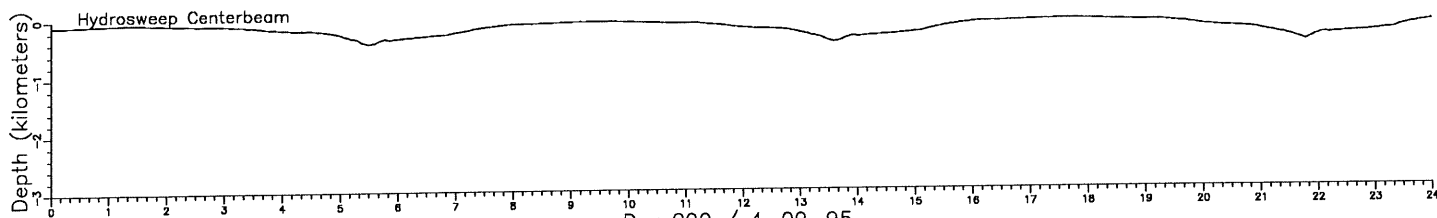
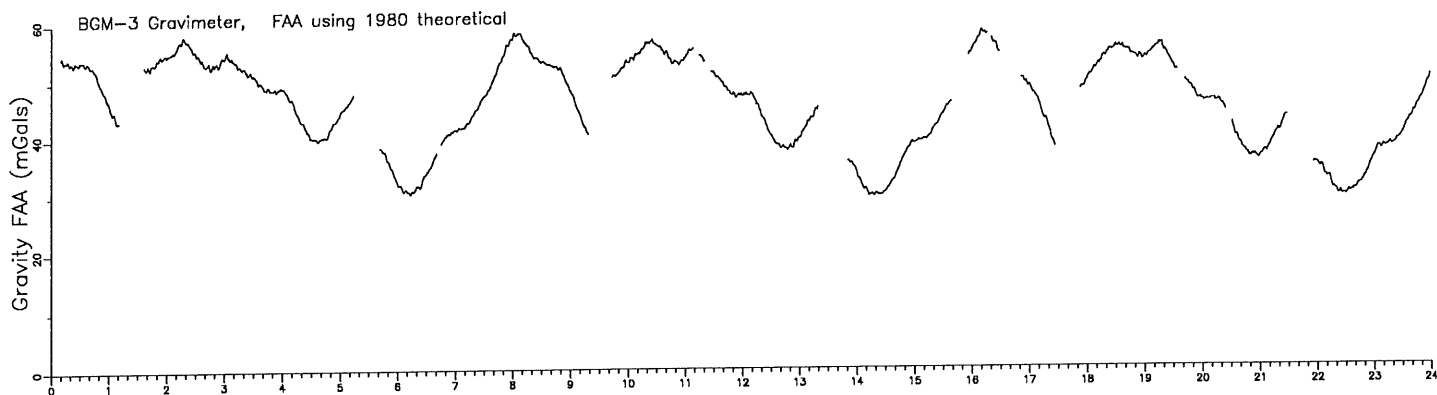
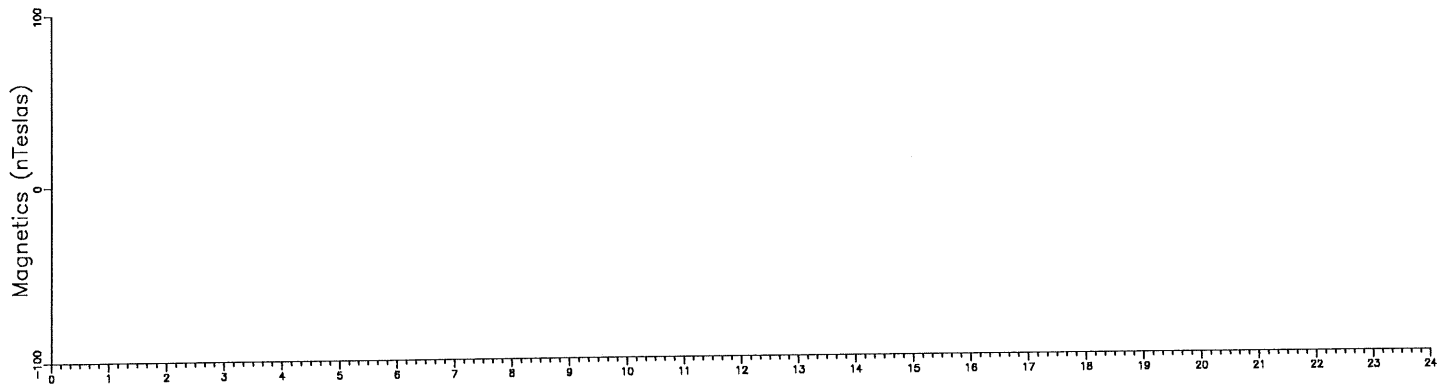
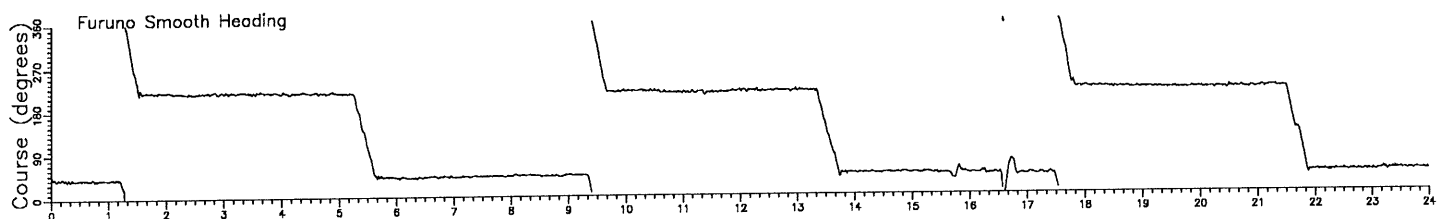
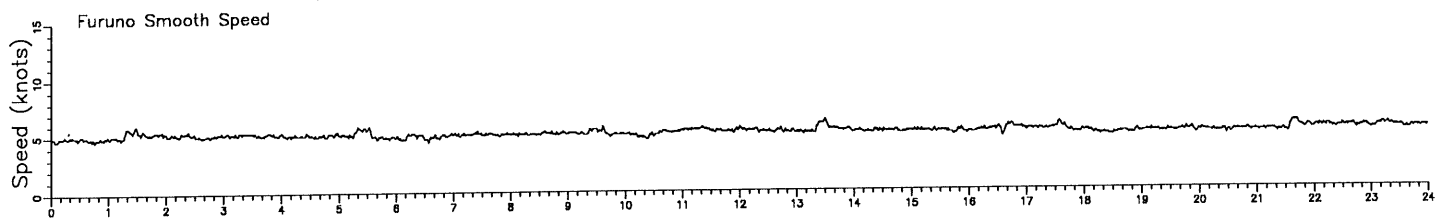
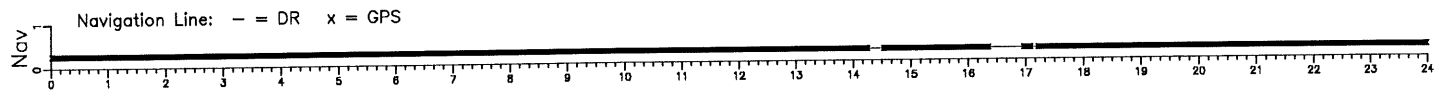
EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.099

Speed/Course file: fu.s099

Gravity file: vt.n099

Bathymetry file: hb.n099



Day 099 / 4-09-95

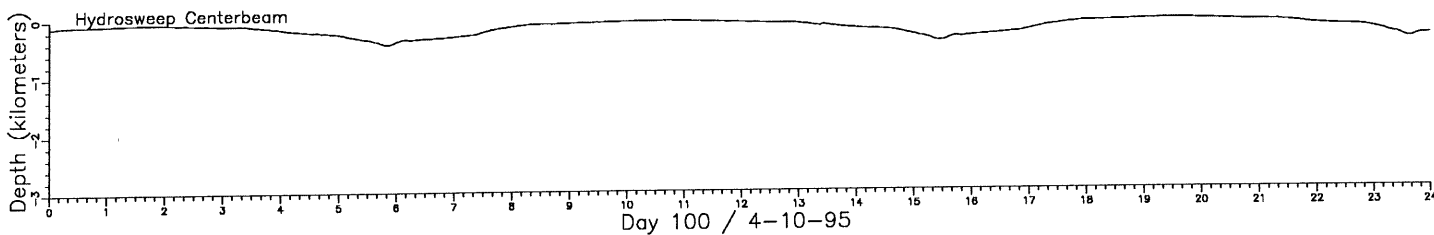
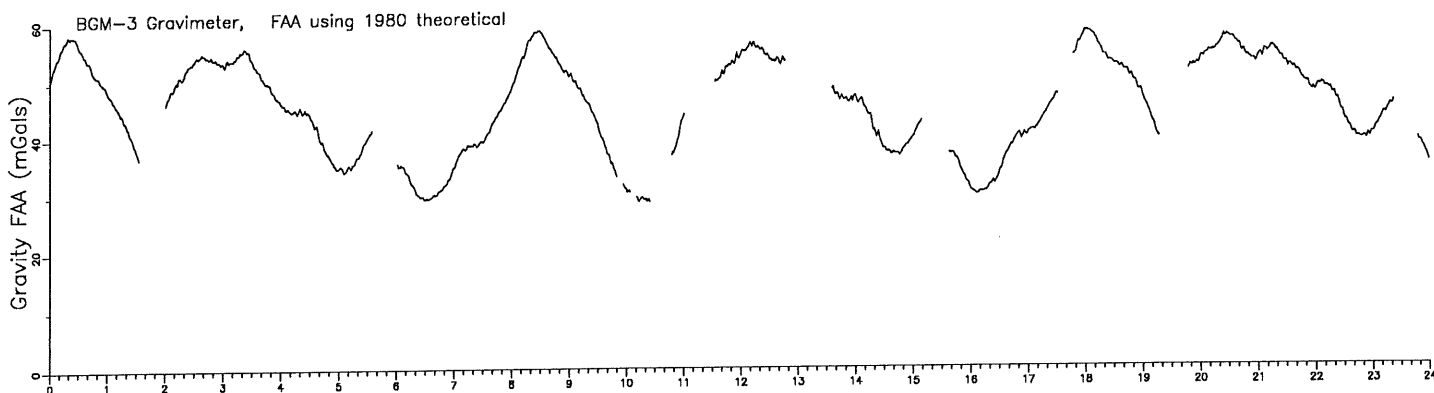
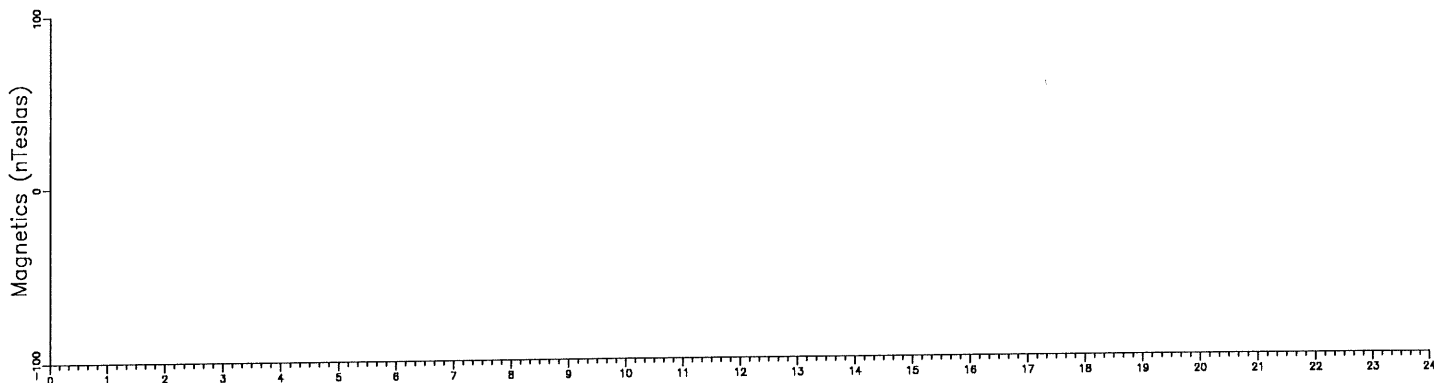
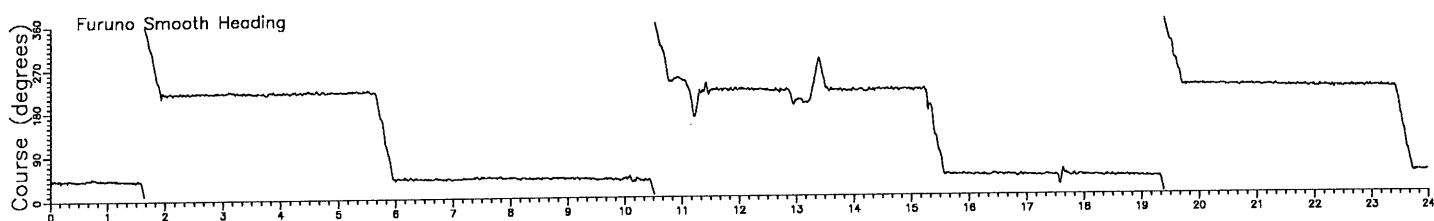
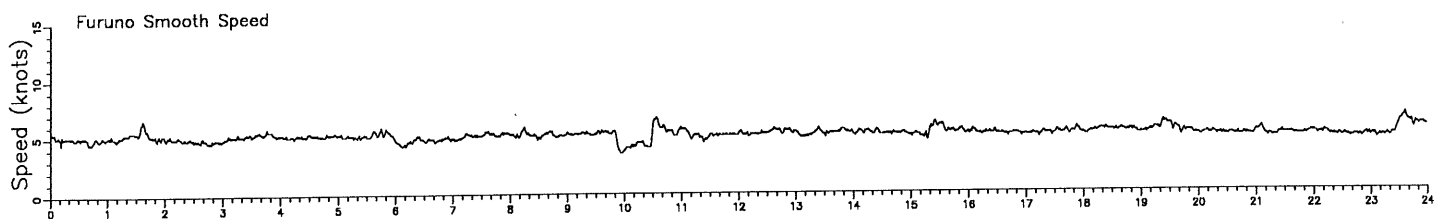
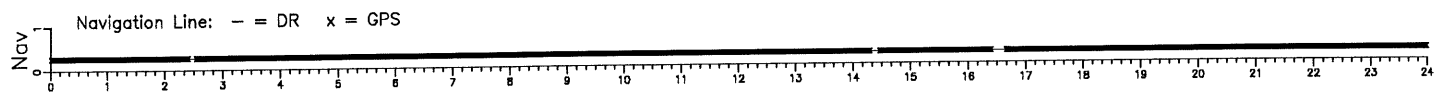
EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.100

Speed/Course file: fu.s100

Gravity file: vt.n100

Bathymetry file: hb.n100



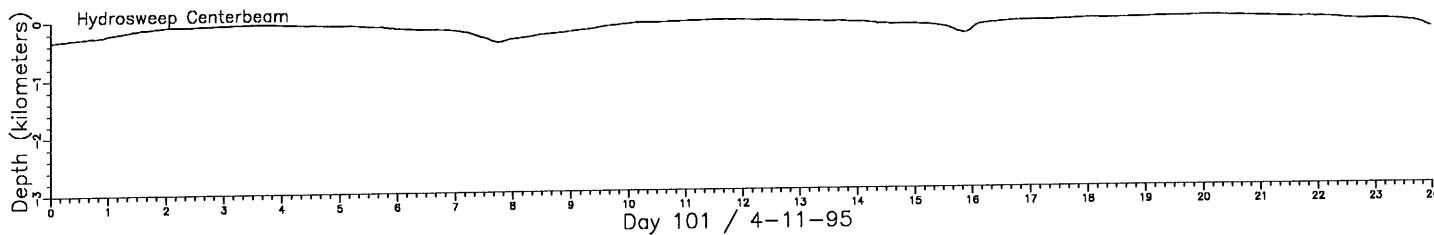
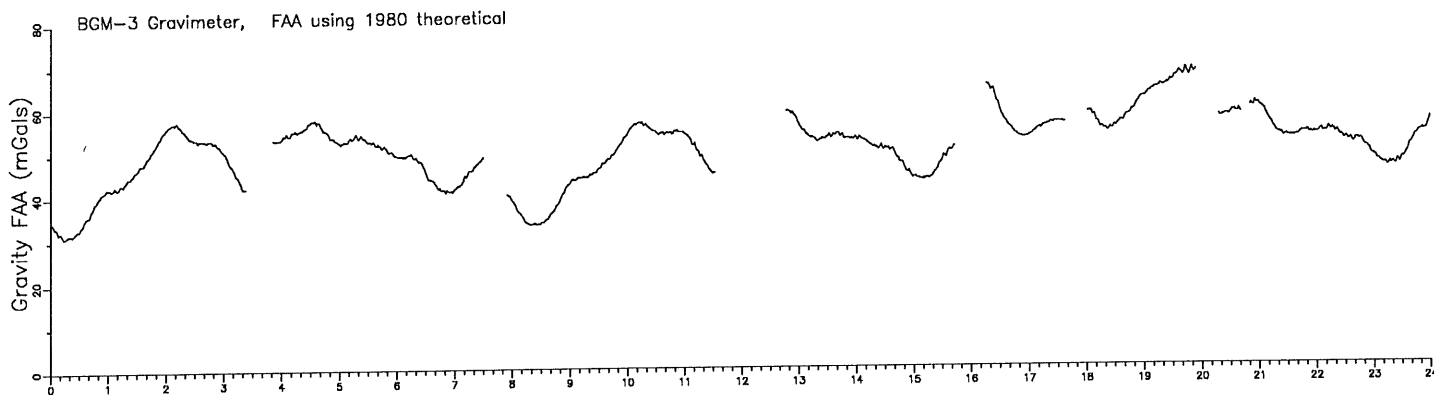
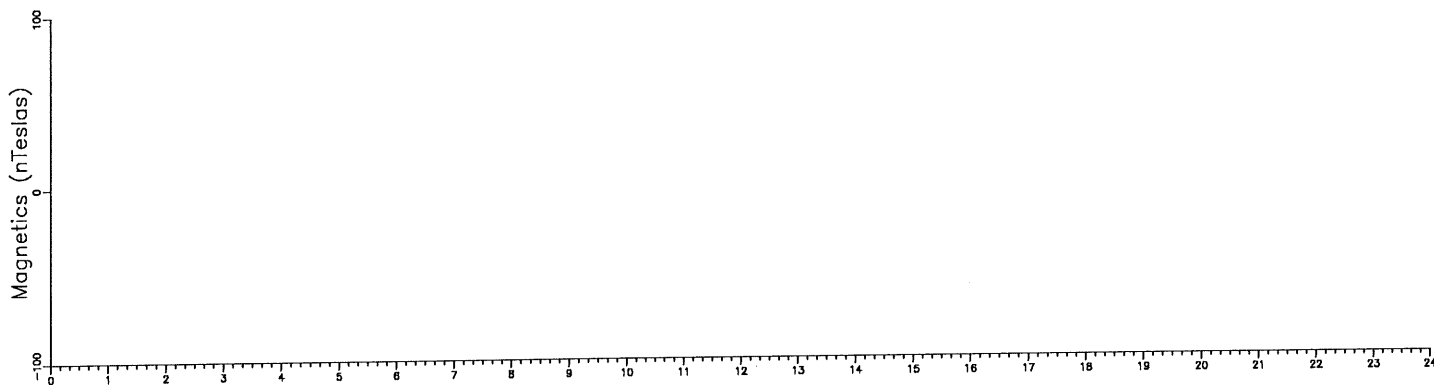
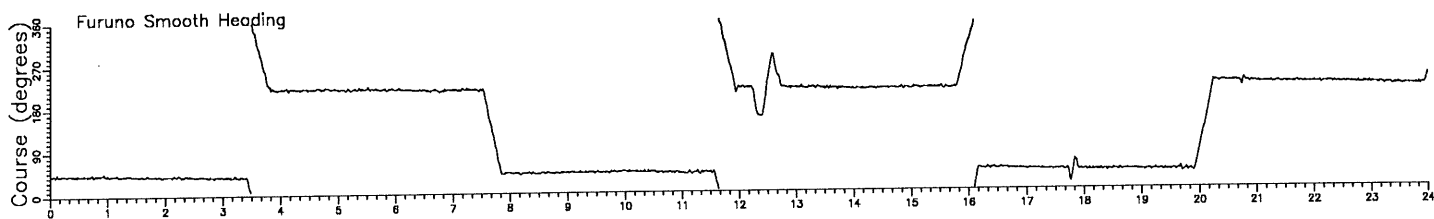
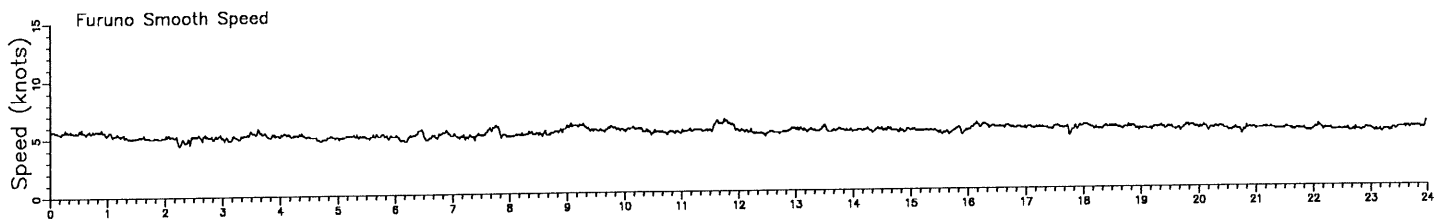
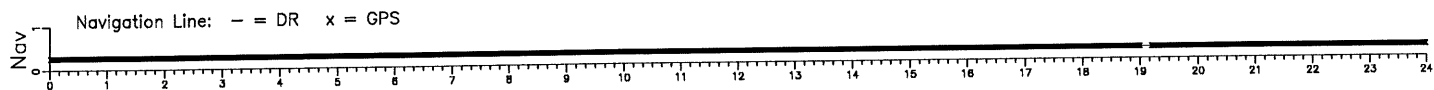
EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.101

Speed/Course file: fu.s101

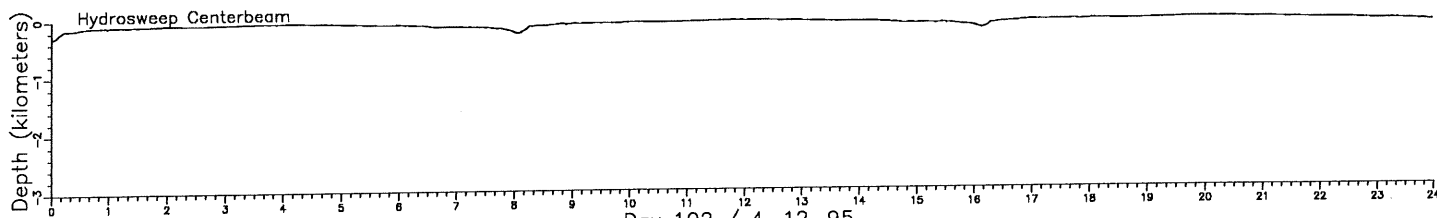
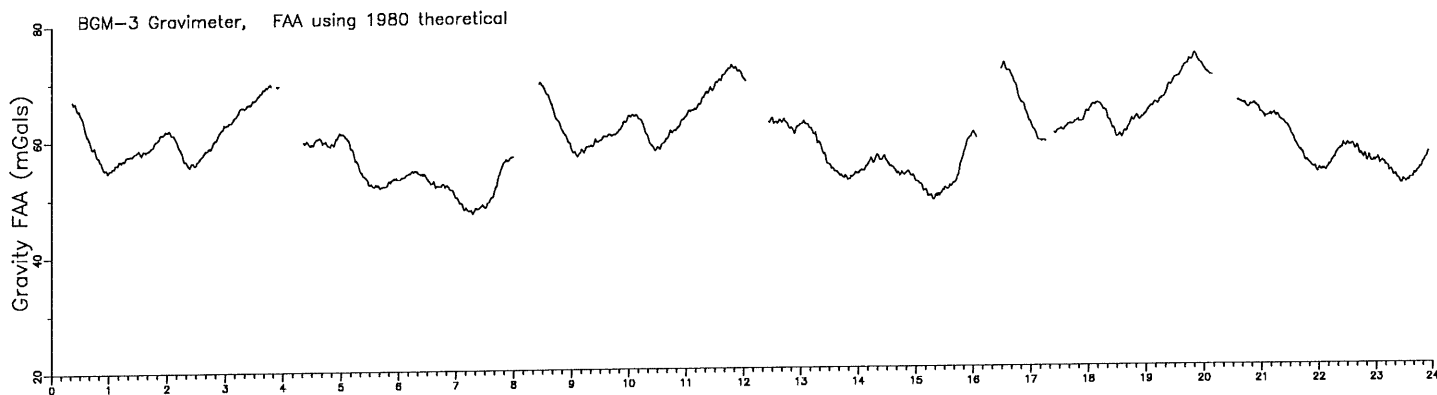
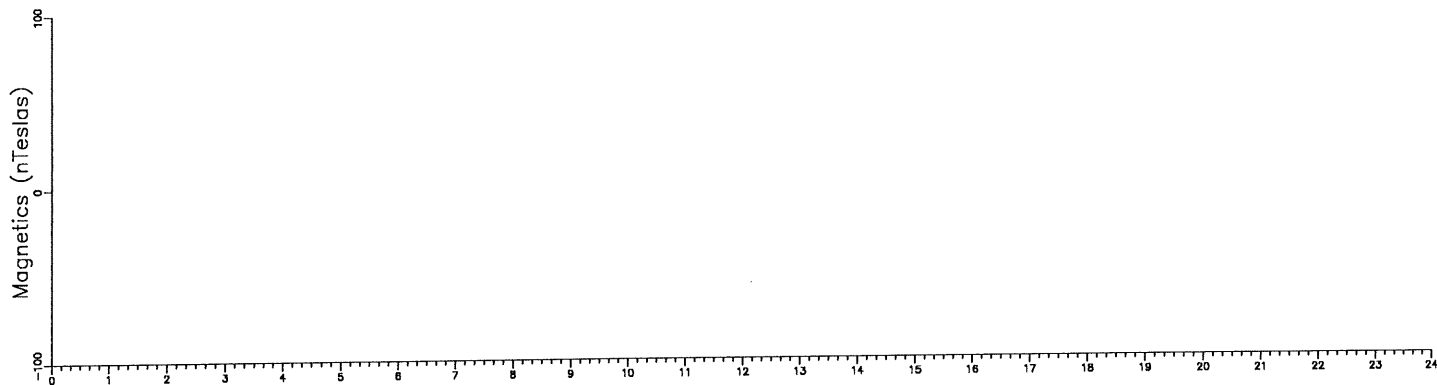
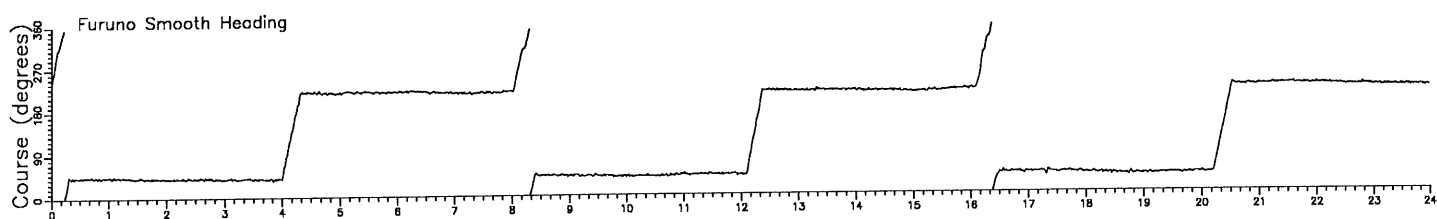
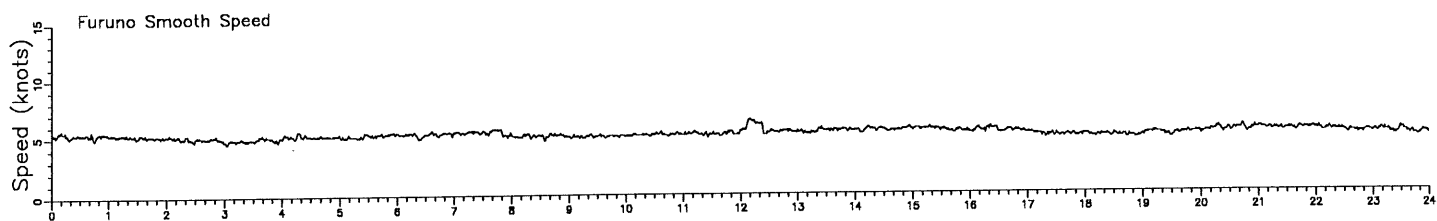
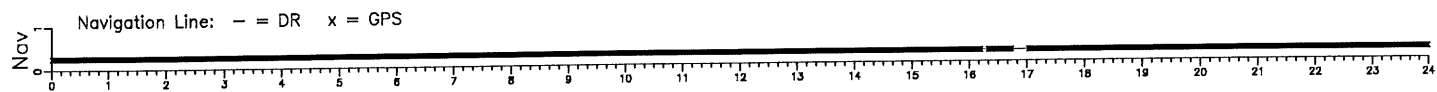
Gravity file: vt.n101

Bathymetry file: hb.n101



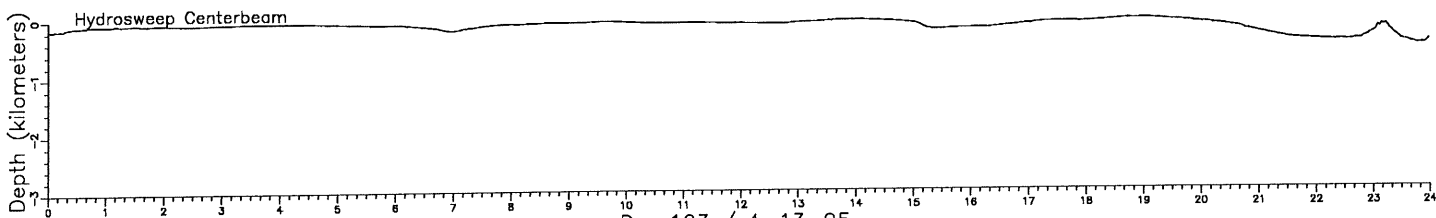
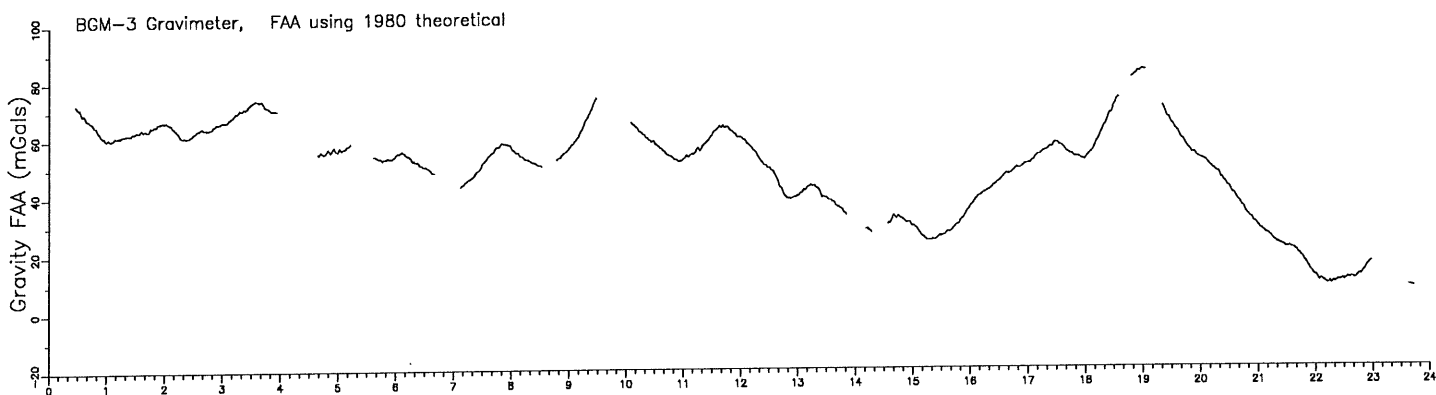
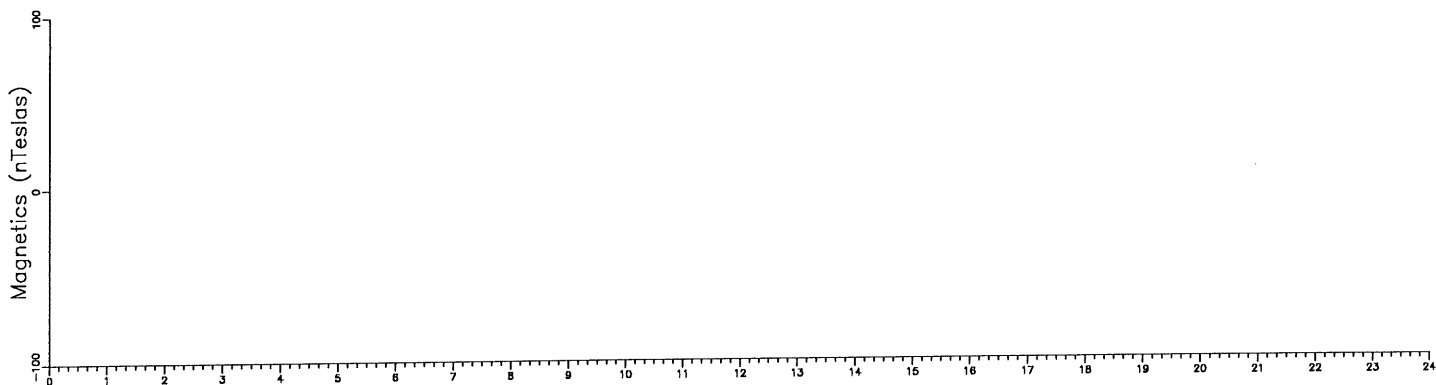
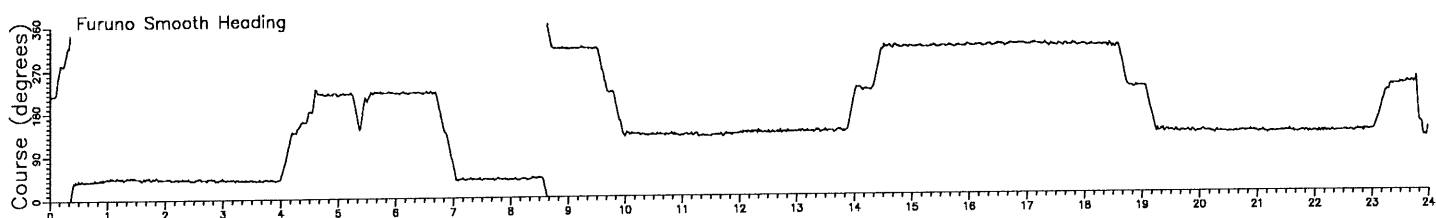
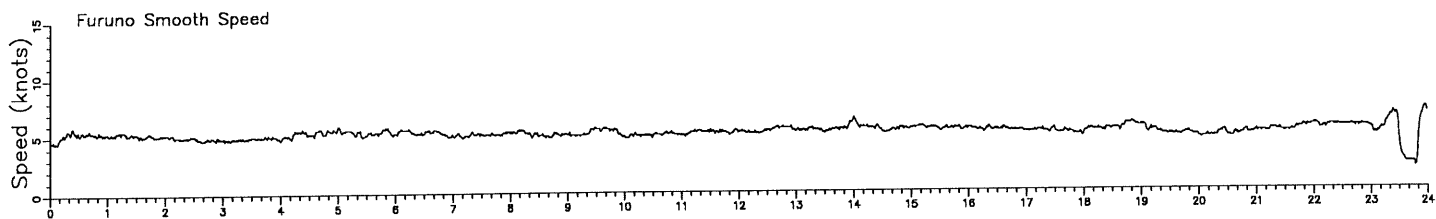
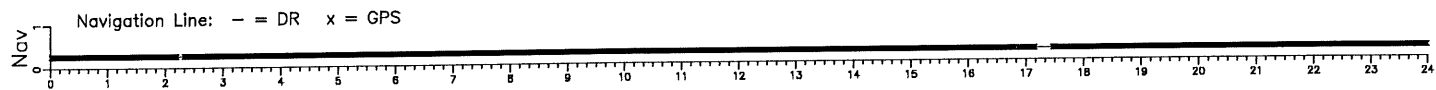
EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.102 Speed/Course file: fu.s102 Gravity file: vt.n102 Bathymetry file: hb.n102



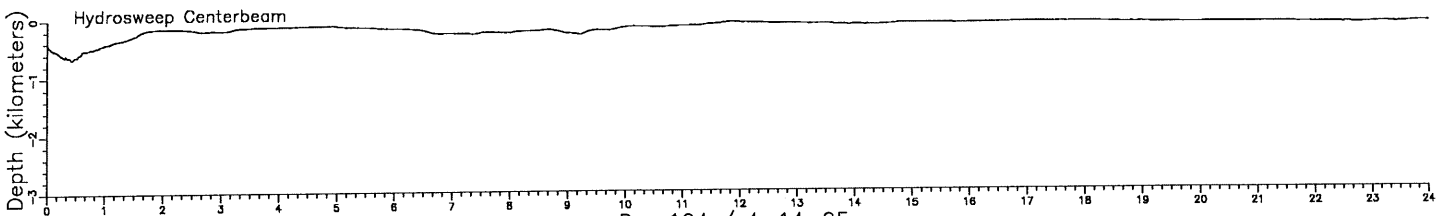
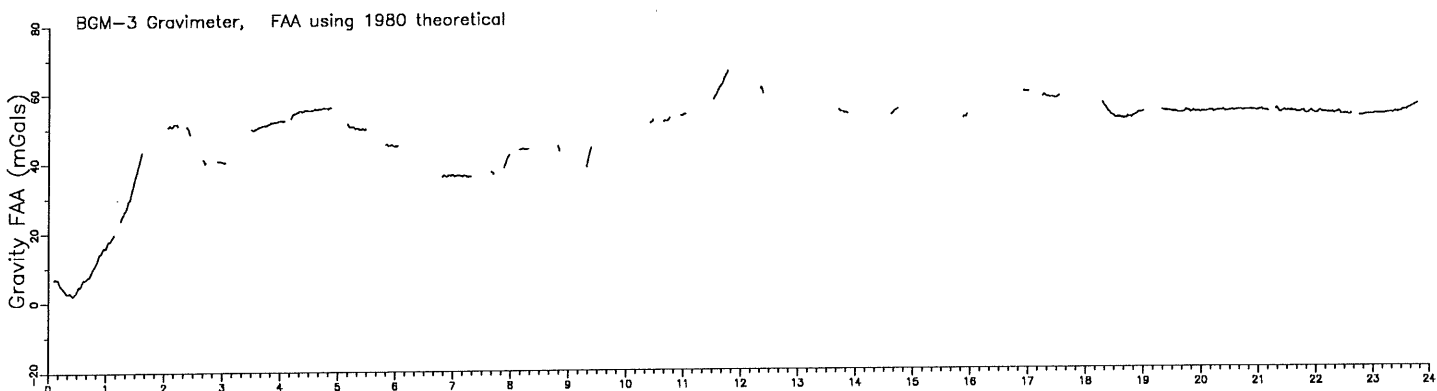
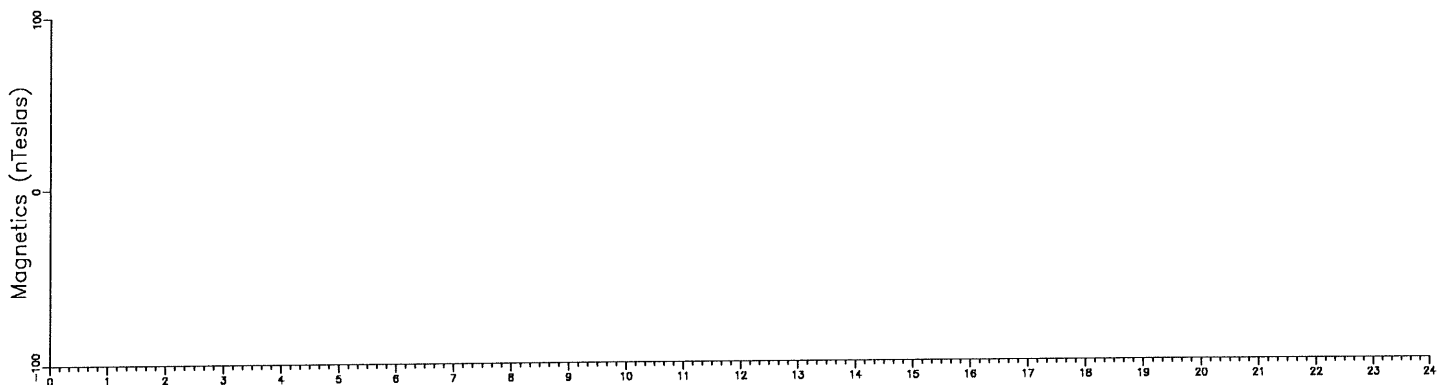
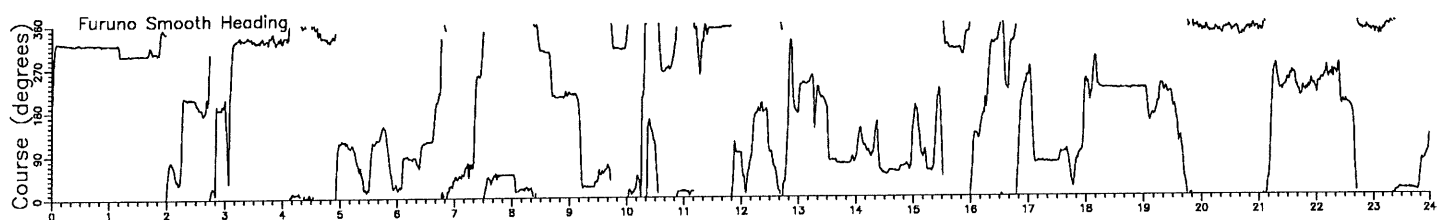
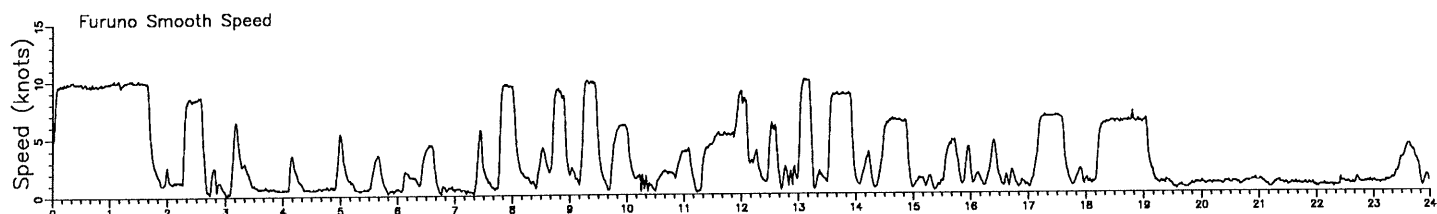
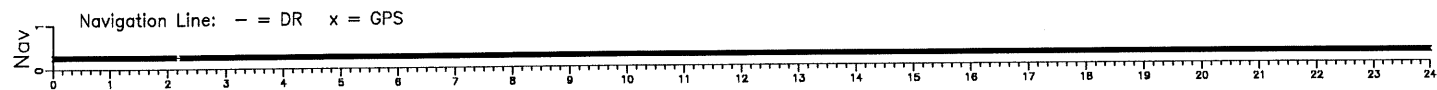
EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.103 Speed/Course file: fu.s103 Gravity file: vt.n103 Bathymetry file: hb.n103



EW9502 Balboa, Panama — Manzanillo, Mexico

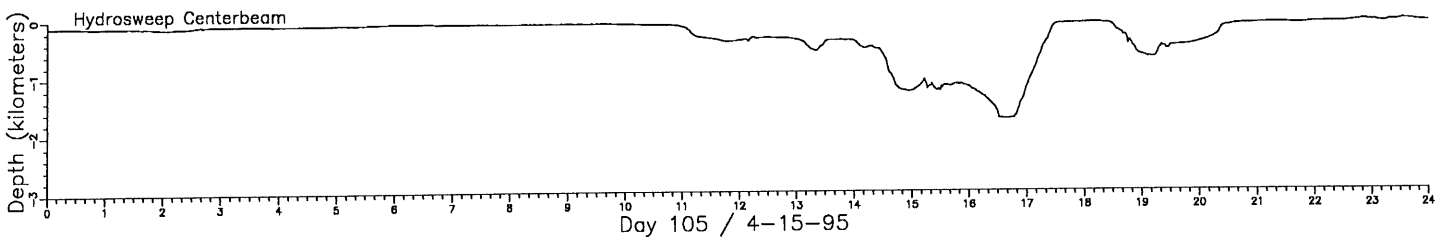
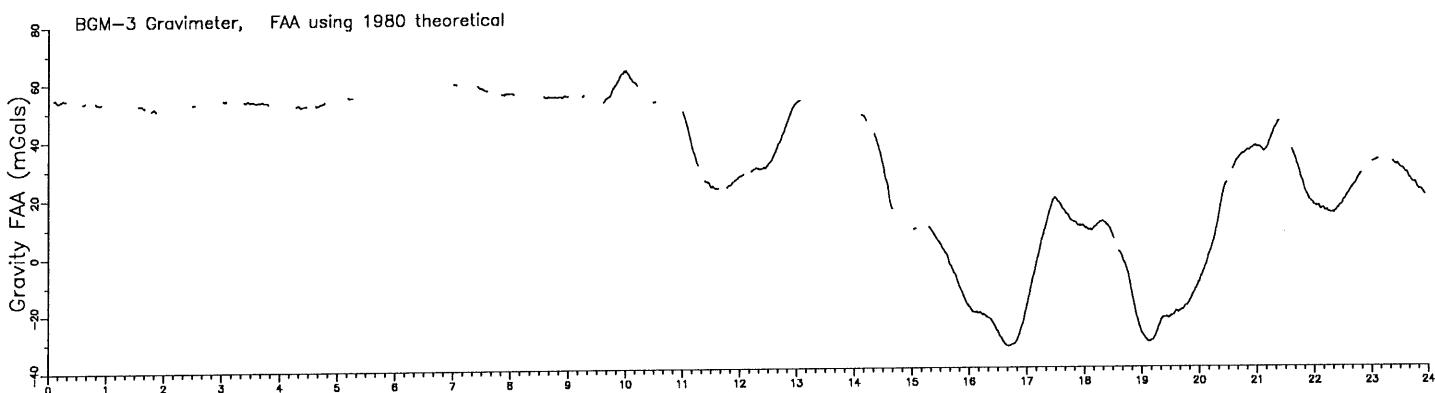
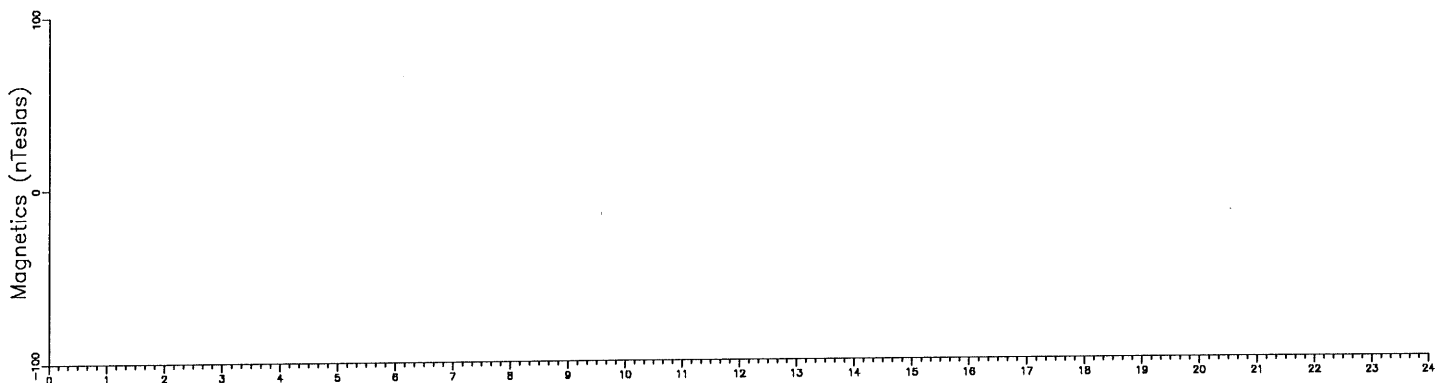
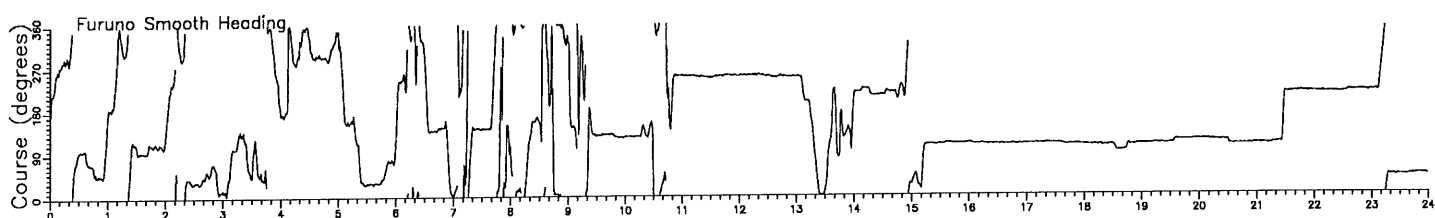
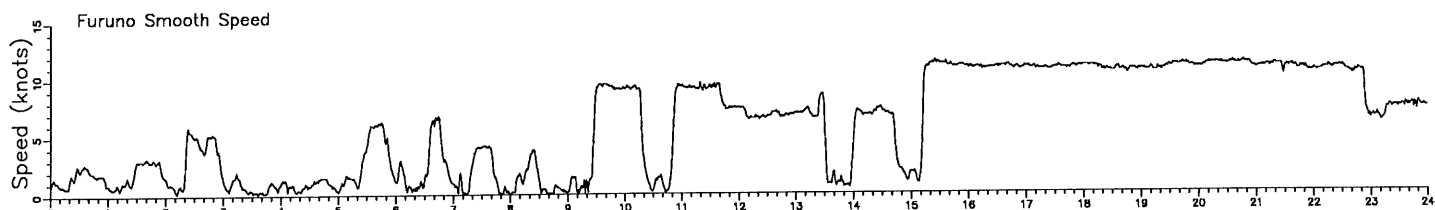
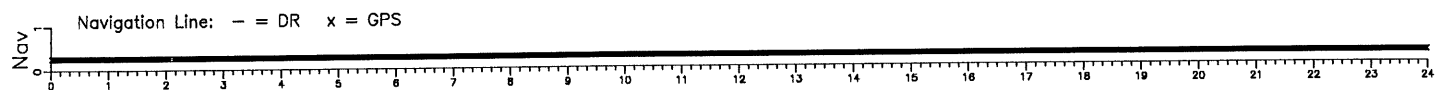
Navigation file: n.104 Speed/Course file: fu.s104 Gravity file: vt.n104 Bothymetry file: hb.n104



Day 104 / 4-14-95

EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.105 Speed/Course file: fu.s105 Gravity file: vt.n105 Bathymetry file: hb.n105



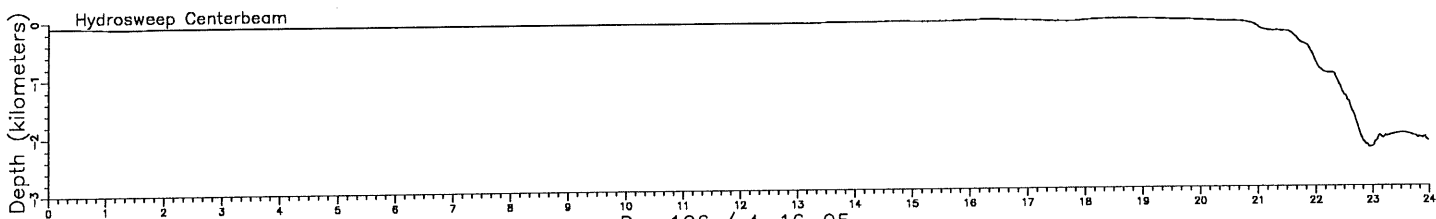
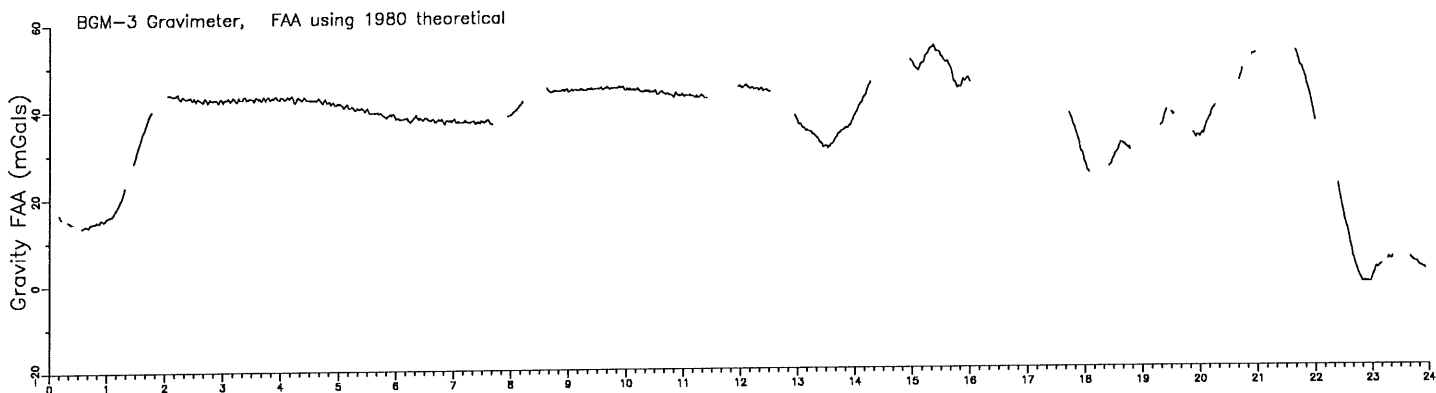
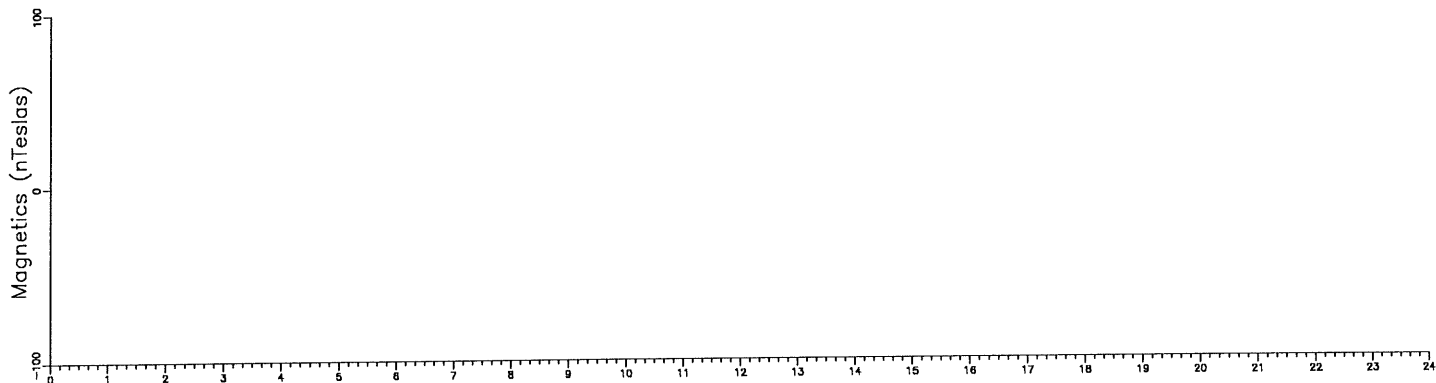
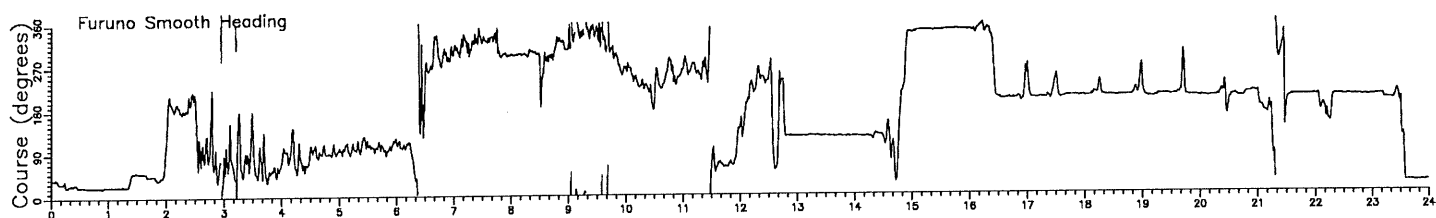
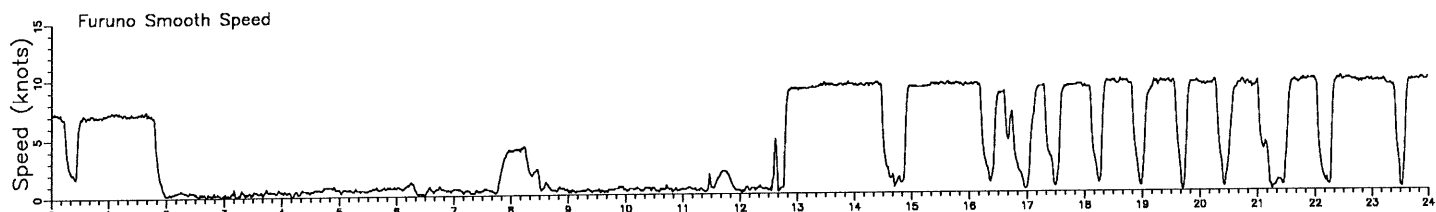
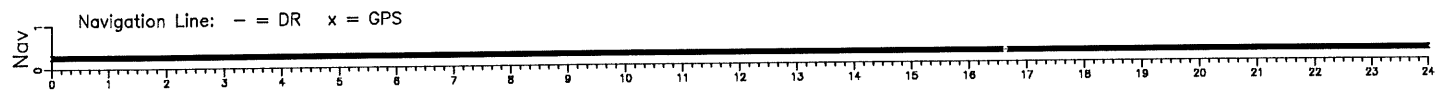
EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.106

Speed/Course file: fu.s106

Gravity file: vt.n106

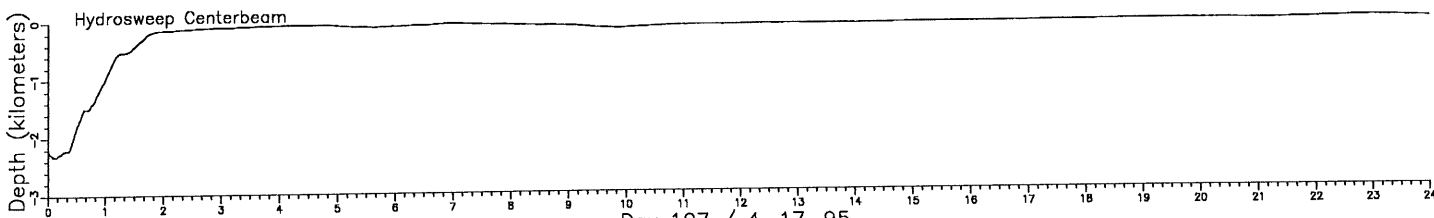
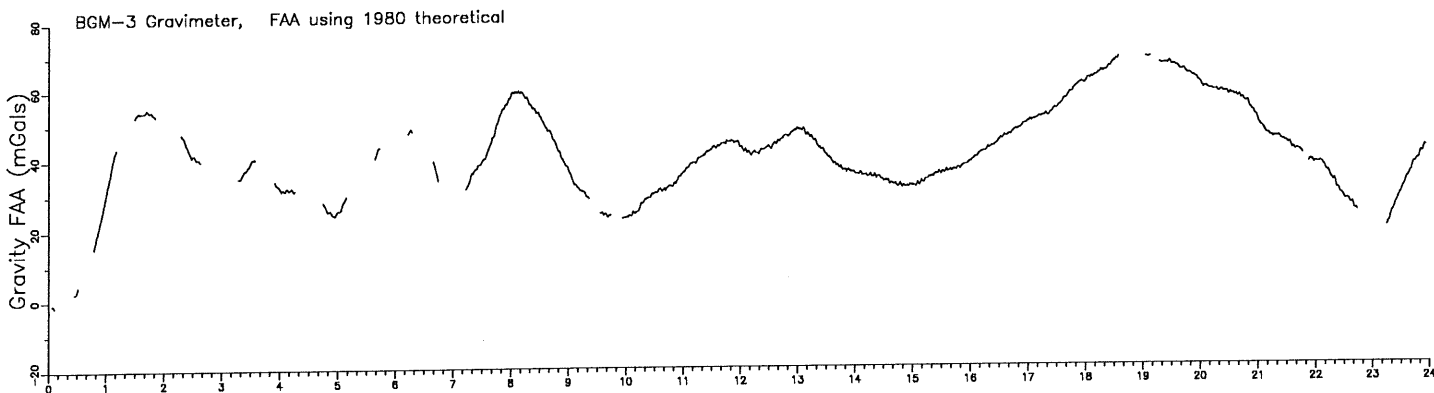
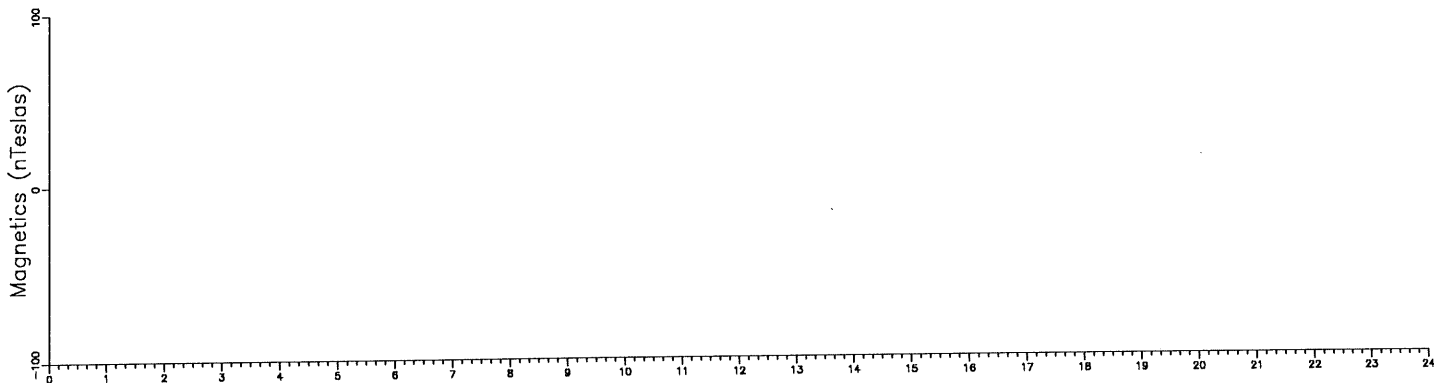
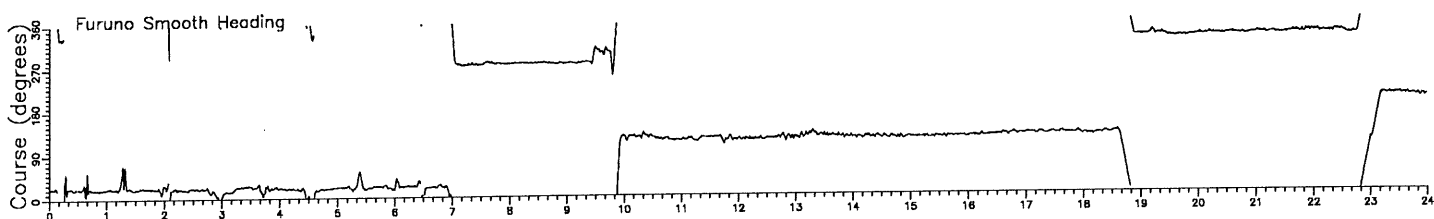
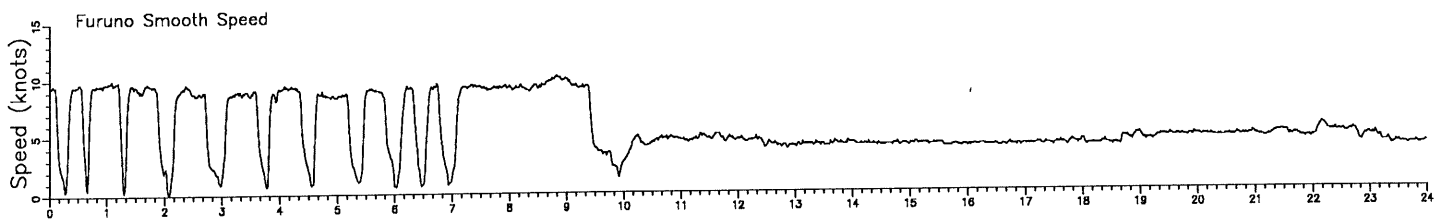
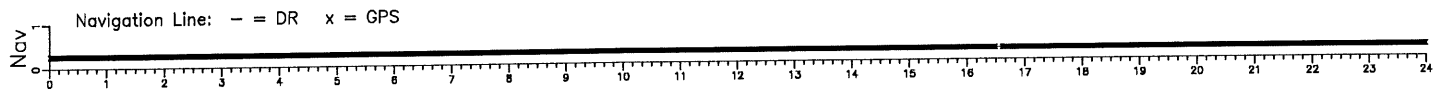
Bathymetry file: hb.n106



Day 106 / 4-16-95

EW9502 Balboa, Panama — Manzanillo, Mexico

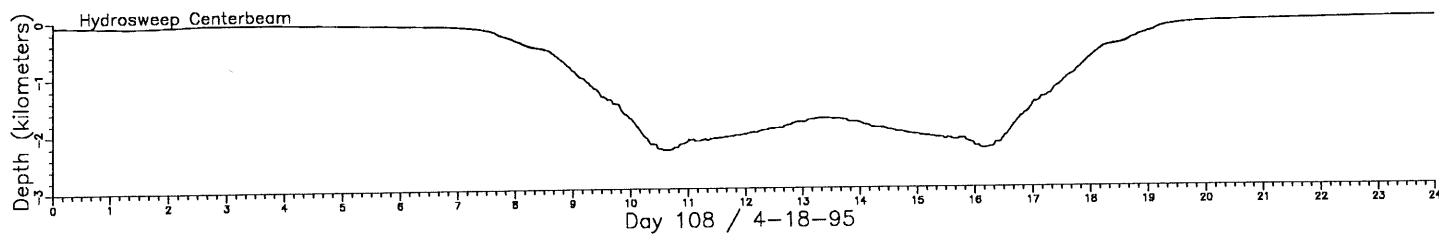
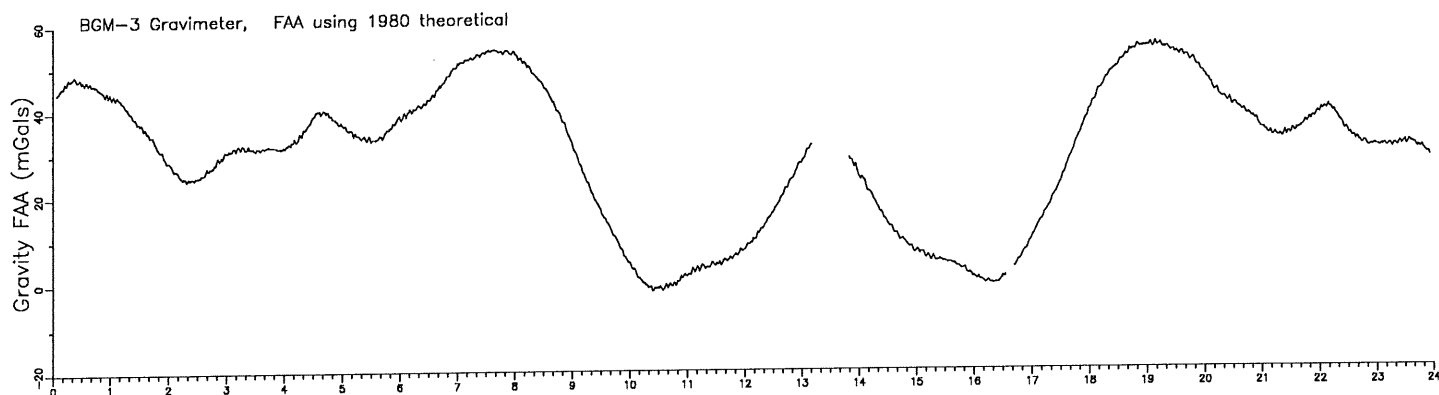
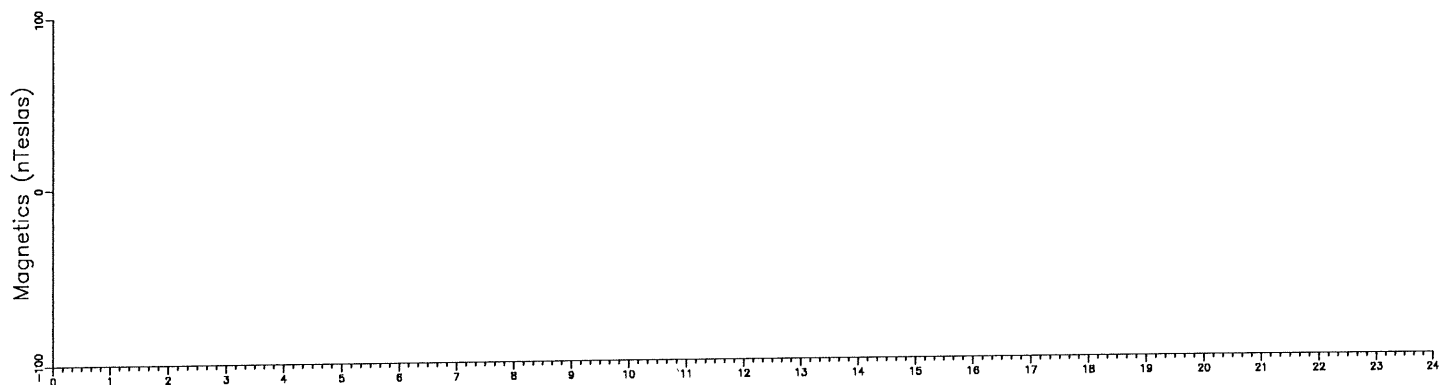
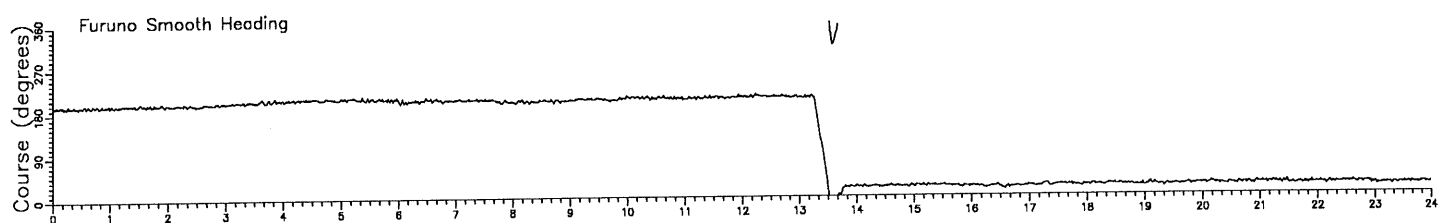
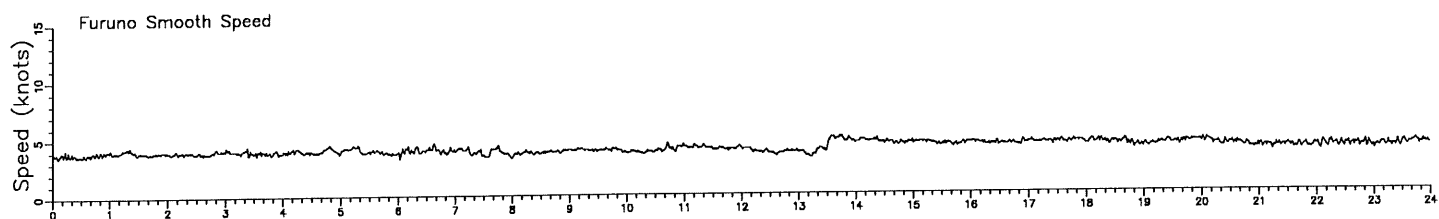
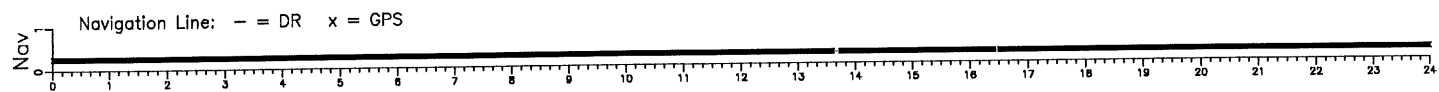
Navigation file: n.107 Speed/Course file: fu.s107 Gravity file: vt.n107 Bathymetry file: hb.n107



Day 107 / 4-17-95

EW9502 Balboa, Panama — Manzanillo, Mexico

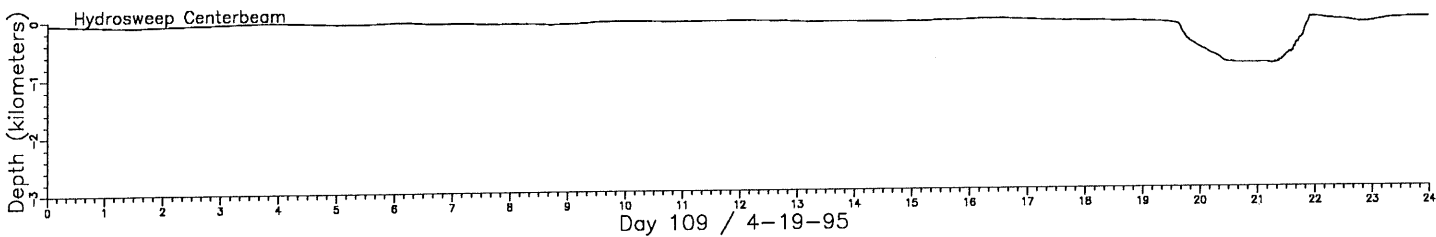
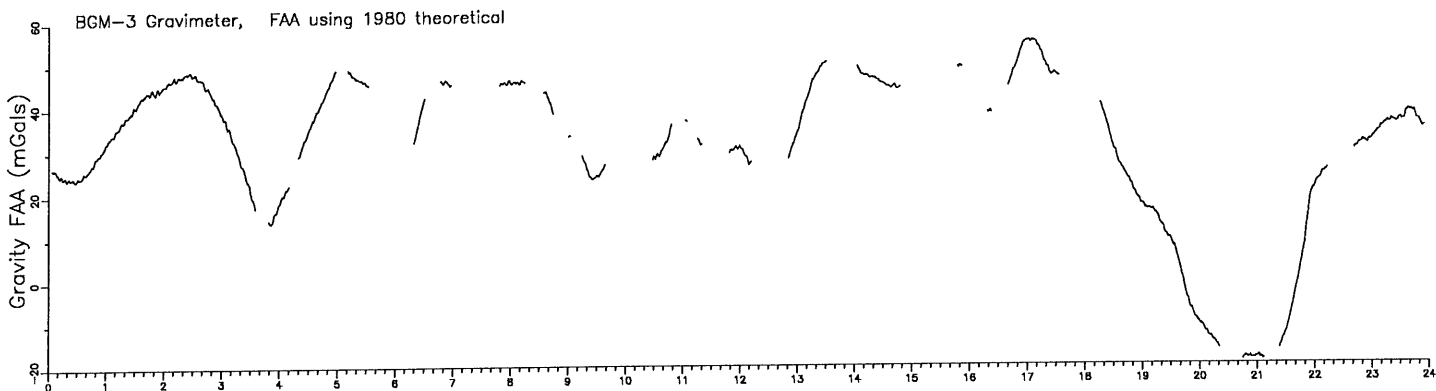
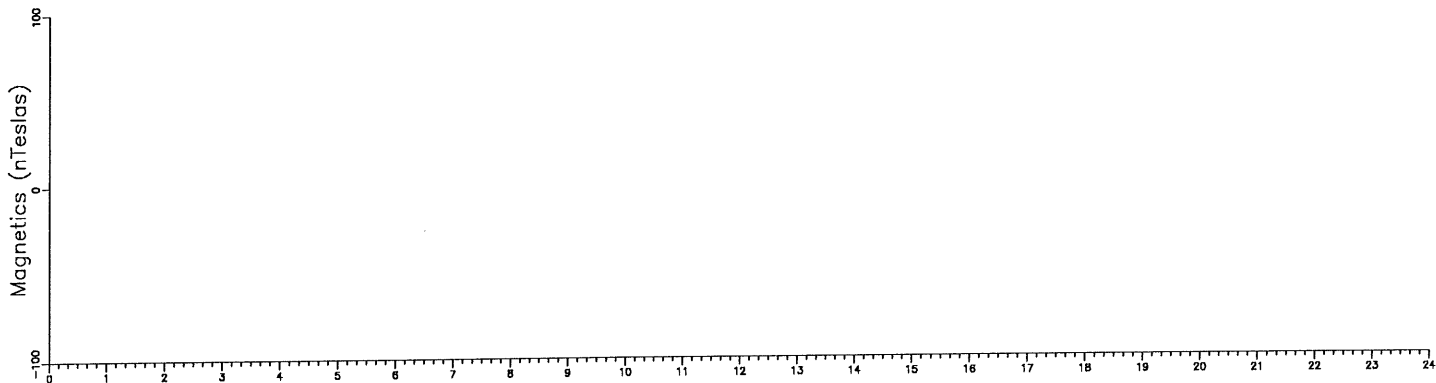
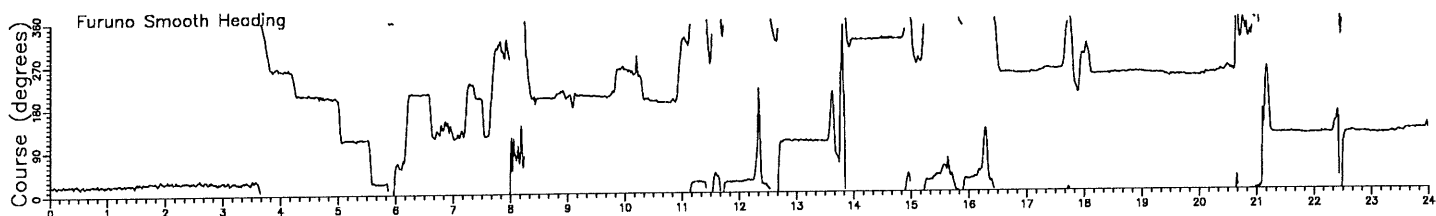
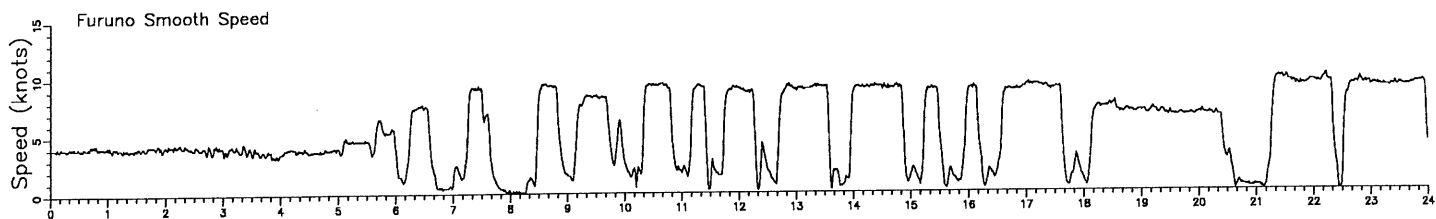
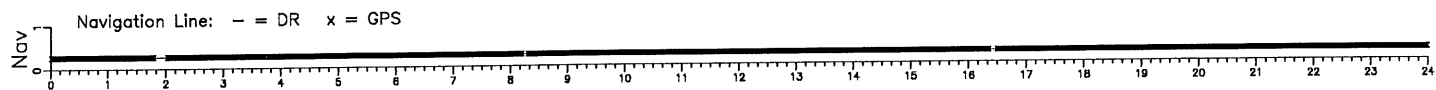
Navigation file: n.108 Speed/Course file: fu.s108 Gravity file: vt.n108 Bathymetry file: hb.n108



Day 108 / 4-18-95

EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.109 Speed/Course file: fu.s109 Gravity file: vt.n109 Bathymetry file: hb.n109



Day 109 / 4-19-95

EW9502 Balboa, Panama — Manzanillo, Mexico

Navigation file: n.110 Speed/Course file: fu.s110 Gravity file: vt.n110 Bathymetry file: hb.n110

