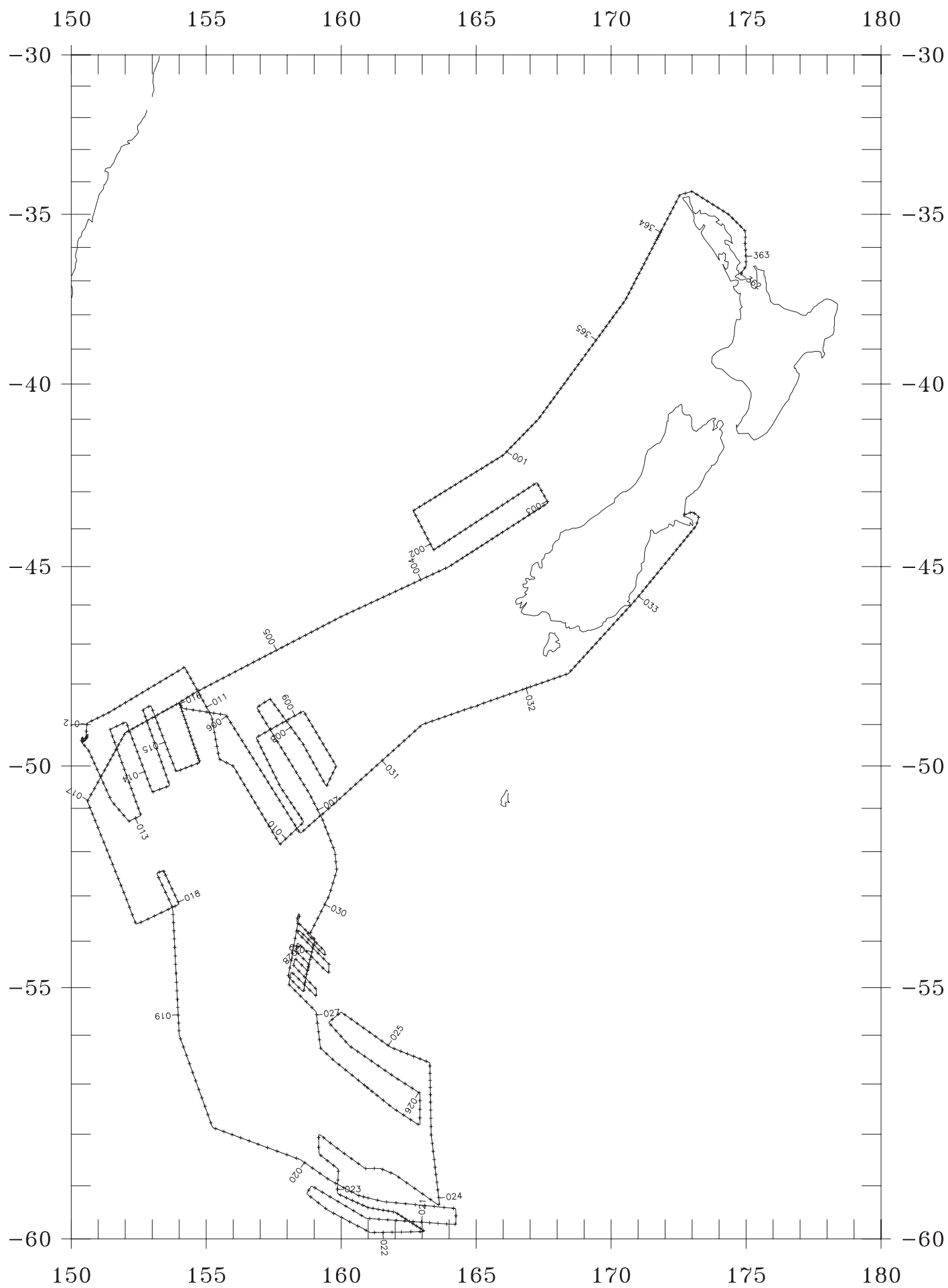


R/V MAURICE EWING

EW9513



Lamont-Doherty Earth Observatory
of Columbia University



EW9513 Auckland - Lyttelton Dec '95 - Feb '96

LAMONT DATA REDUCTION CRUISE SUMMARY
=====

CRUISE: EW9513

START: 28 December 1995 [363 GMT] Auckland, New Zealand

END: 03 February 1996 [033 GMT] Lyttelton, New Zealand

SURVEY AREA: Tasman Sea Plate Boundaries

CHIEF SCIENTIST(s): Steve Cande / Scripps Institute of Oceanography
Joann Stock / California Institute of Technology
Dietmar Muller / University of Sydney

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 synchronize the CPU clocks of the data logging computers

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) Data gaps:
018 0413-0441 - power failure

GPS SATELLITE FIXES:

Instrument: Magnavox MX-4200D Global Positioning System receiver

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 41 point running average

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 large errors, up to 4-5 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.

- (2) Data gaps:
018 0413-0441 - power failure

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
Notes:

- (1) Data gaps:
015 0649-0713 - bad data
015 1211-1239 - bad data
015 1437-1446 - bad data
018 0413-0441 - power failure

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) Data gaps:
364 0401-0412 - noisy data
364 0502-0508 - noisy data
012 0338-0100 - dredging
014 2021-2044 - noisy data cable problem
015 0446-0454 - noisy data
015 0456-0507 - noisy data
015 0555-0601 - noisy data
015 0646-0659 - noisy data
015 0729-0746 - noisy data

015 0806-0817 - noisy data
 015 0825-0828 - noisy data
 015 0858-0902 - noisy data
 015 0904-0917 - noisy data
 016 0003-0230
 016 0240-0303 - noisy data
 016 0944-1010 - noisy data
 016 1025-1039 - noisy data
 017 1738-1837 - noisy data
 018 0414-0441 - power failure; filled with 5 min readings
 031 0336-0439 - noisy data

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: 19.6 mGal from pre-cruise tie at Auckland, New Zealand

Drift rate: 0.0023 mGal per day

Pre-cruise Tie date: 23 December 1995 (day 357) at 2350Z, Auckland, New Zealand

Post-cruise Tie date: 04 February 1996 (day 035) at 0219Z, Lyttelton, New Zealand

Final data: Free Air Anomaly value at 00 seconds of each minute.

1980 theoretical gravity formula.

Notes:

(1) Data gaps:

018 0413-0441 - power failure

018 0442-0441 - table locked (after power failure) - bad data

019 0000-0538 - table locked (after power failure) - bad data

SEISMIC:

Instruments: Seismic streamer and R/V Ewing 2 water-gun array

Notes:

(1) the shot times put in the header records are from the TrueTime clock.

EW9513	1995-96
-----	-----
- 357	23 grvtie 2350Z
1 362	Dec 28 departure Auckland (2047 Z)
2 363	29
3 364	30
4 365	31
5 001	Jan 01
6 002	02
7 003	03
8 004	04
9 005	05
10 006	06
11 007	07
12 008	08
13 009	09
14 010	10
15 011	11
16 012	12
17 013	13
18 014	14
19 015	15
20 016	16
21 017	17
22 018	18
23 019	19
24 020	20
25 021	21
26 022	22
27 023	23
28 024	24
29 025	25
30 026	26
31 027	27
32 028	28
33 029	29
34 030	30
35 031	31
36 032	Feb 01
37 033	02 arrival Lyttelton (2030 Z)
38 034	03
- 035	04 grvtie 0219Z

EW9513.README
=====

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 "ew9513" or NULL
- (2) data id "gp3.r"
- (3) dayofyear "365"

example:

gp3.r365

Note: The cruise id is NULL for the data files for ew9513.

".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

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.

Note the variation in the positioning of these times as noted below in the Hydrosweep,

nav block (seismic) data use shot times instead of CPU times.

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, magnetics, sea temperature, meteorological data, thermosalinograph.

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

gpl.r - Trimble GPS after cleaning

same as gpl.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

Shot times (ts2):

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:

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

Partial Nav Block data (nb2) - has realtime navigation:

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:

==> 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 (ts2.n):

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

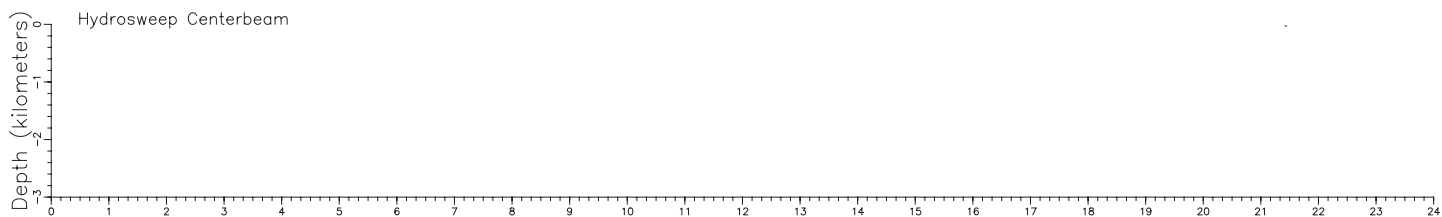
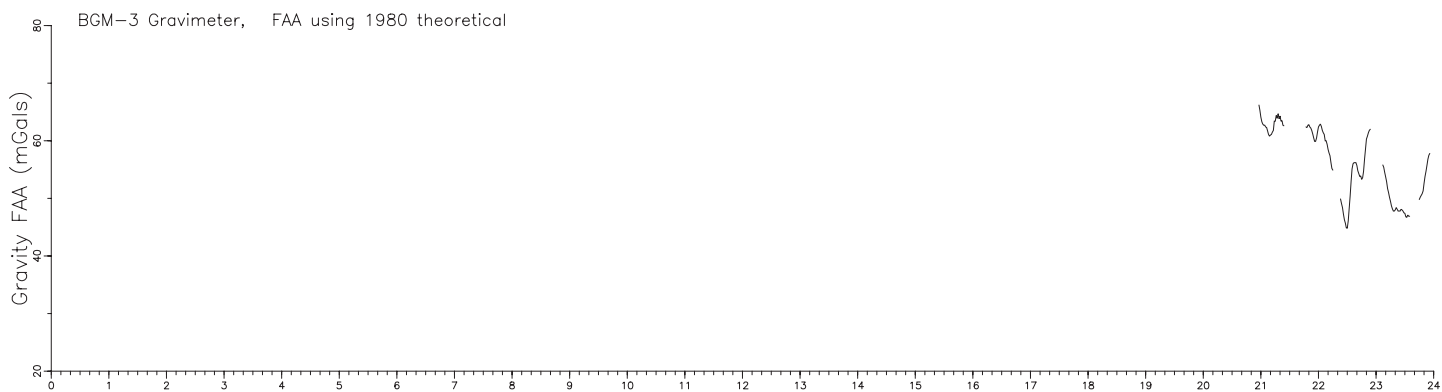
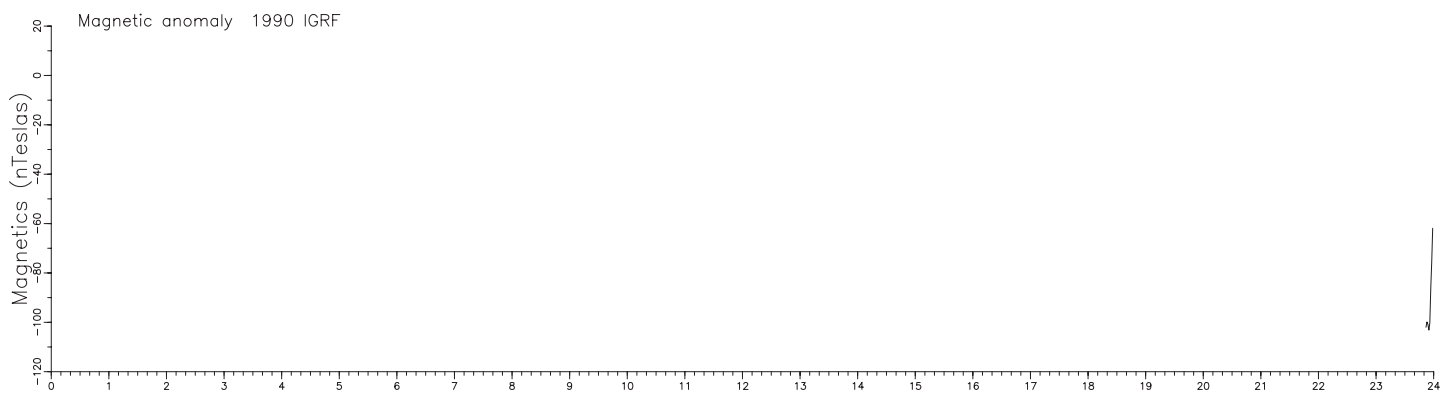
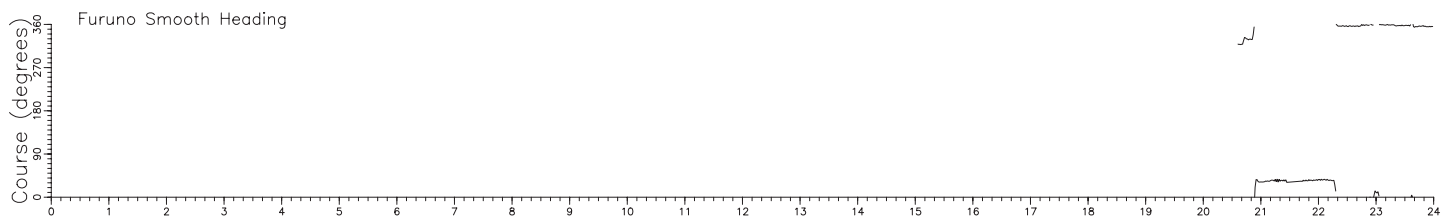
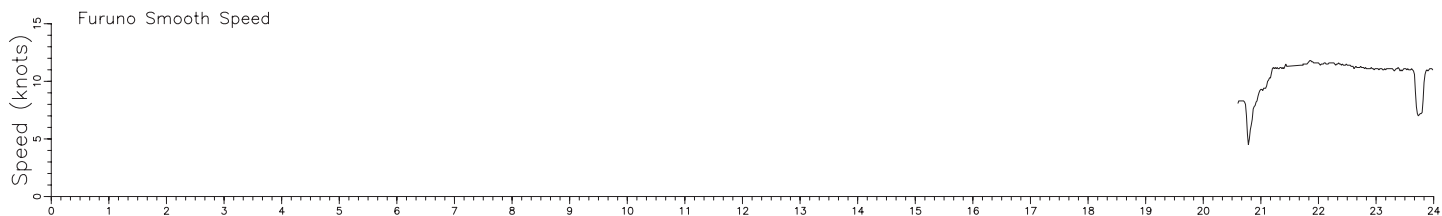
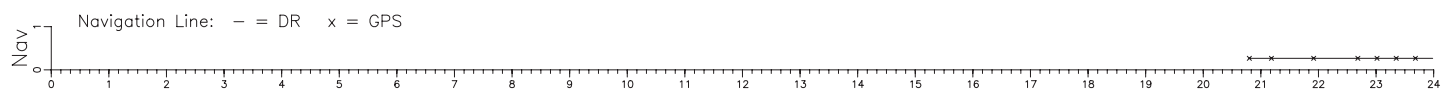
same as ct.r below

ct.r - sea temperature after cleaning stage

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

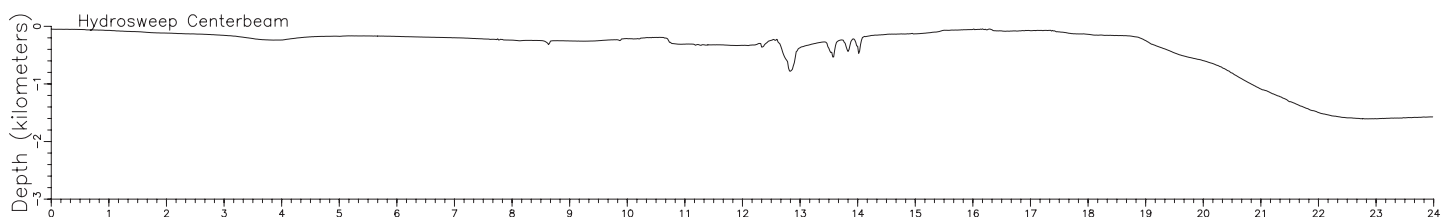
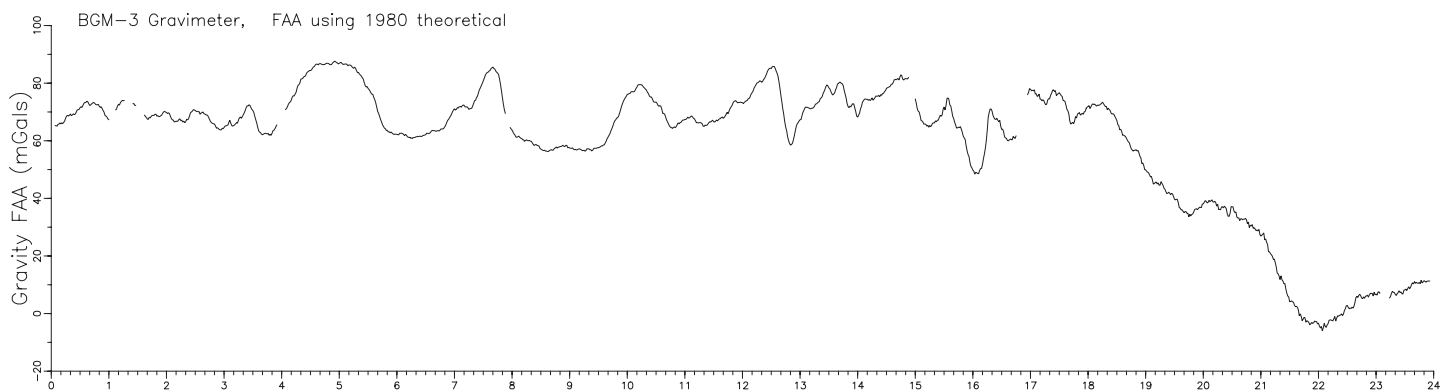
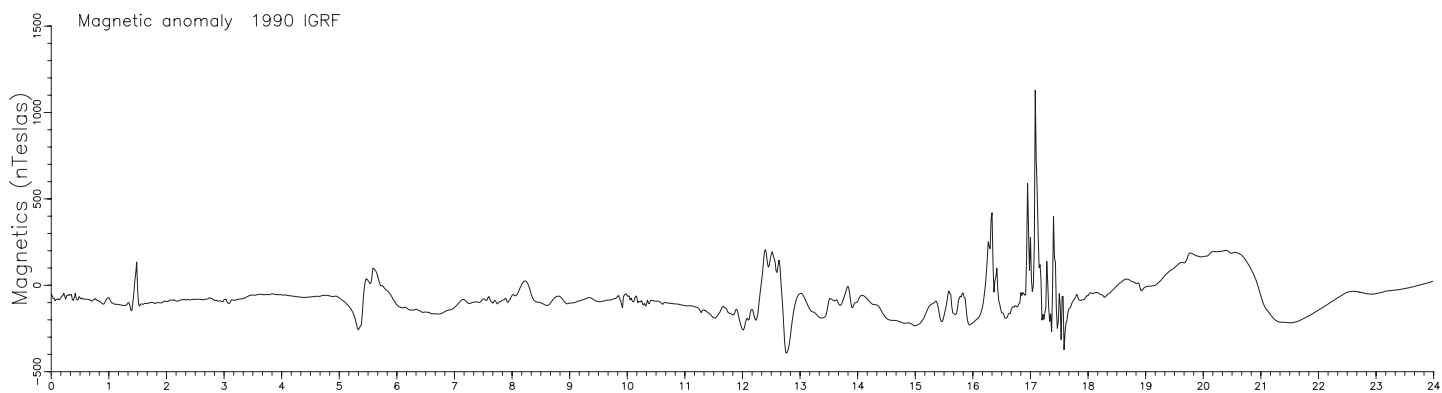
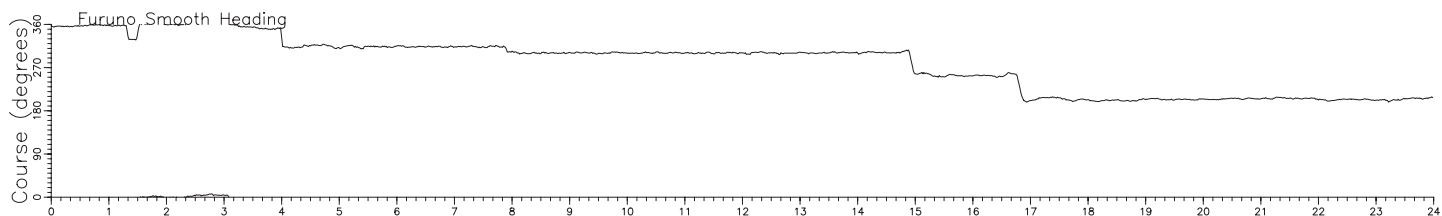
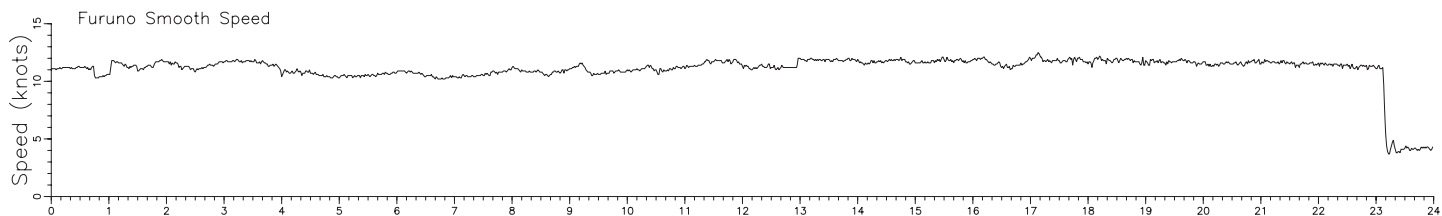
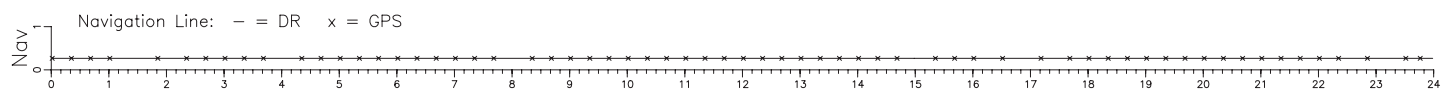
EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.362 Speed/Course file: fu.s362 Magnetics file: mg.n362 Gravity file: vt.n362 Bathymetry file: hb.n362



EW9513 Auckland, New Zealand – Lyttelton, New Zealand

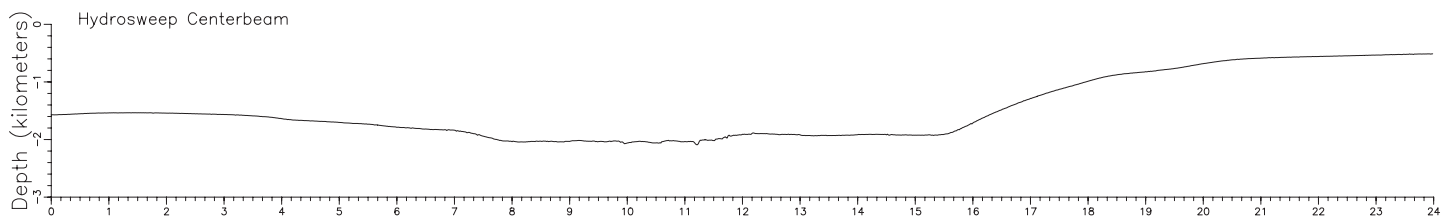
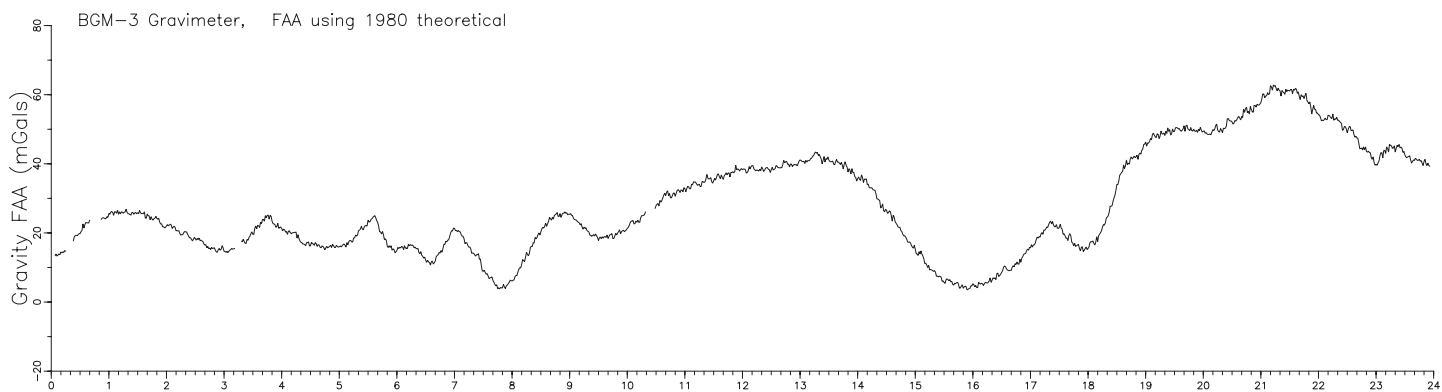
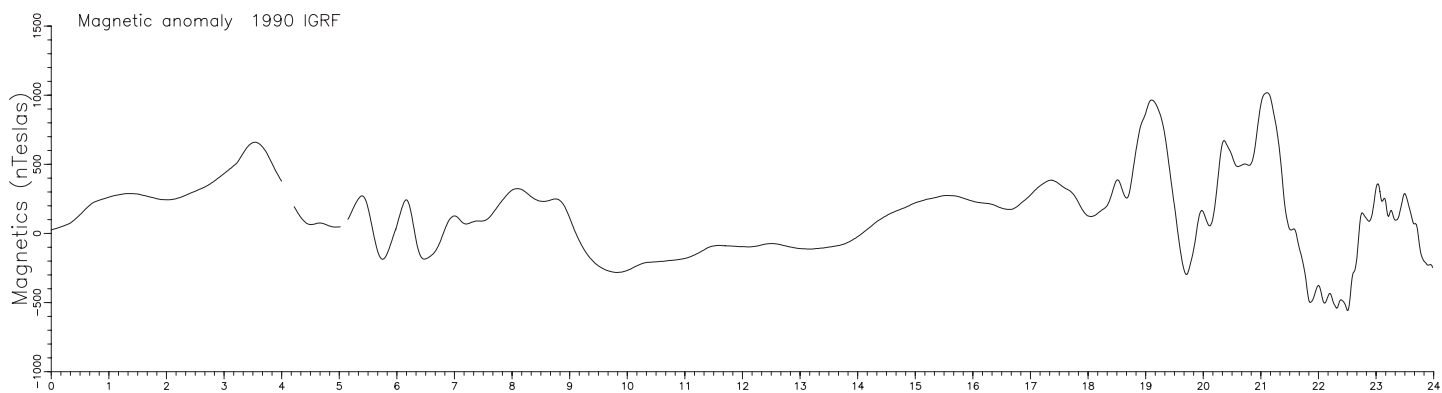
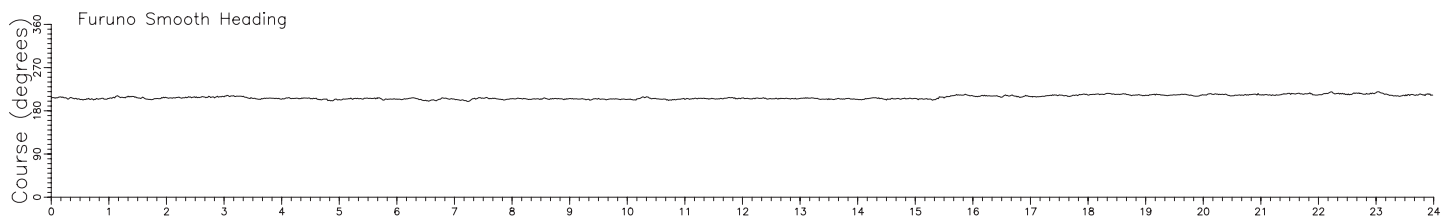
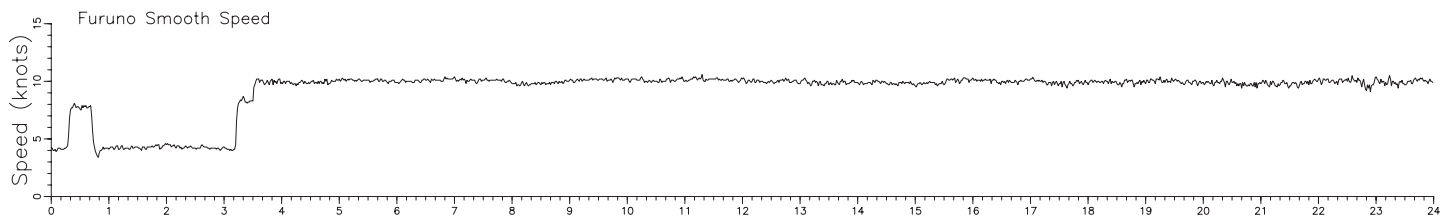
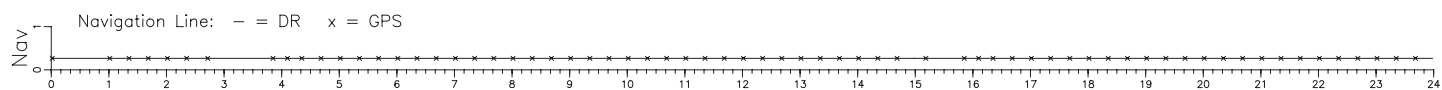
Navigation file: n.363 Speed/Course file: fu.s363 Magnetics file: mg.n363 Gravity file: vt.n363 Bathymetry file: hb.n363



Day 363 / 12-29-95

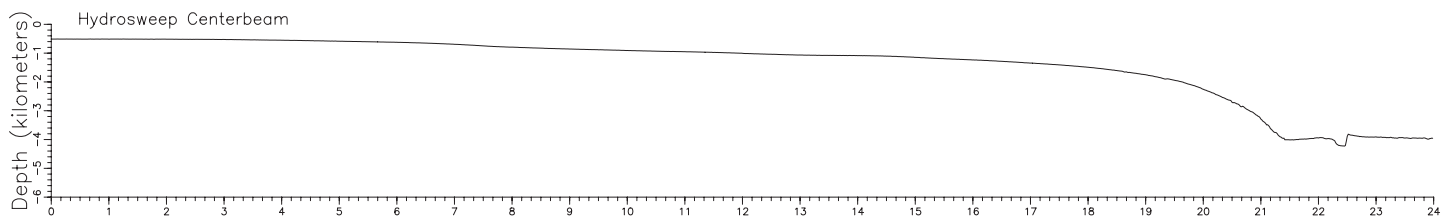
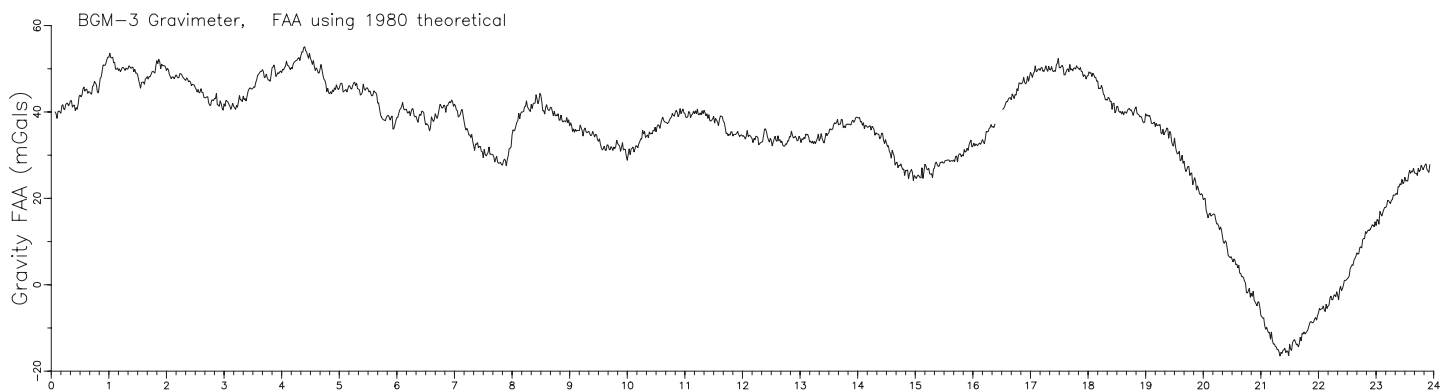
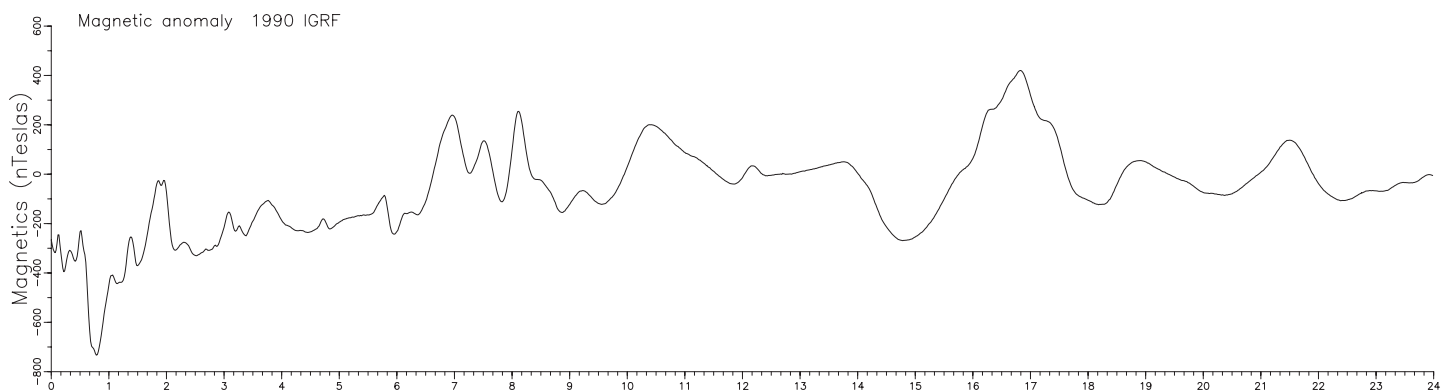
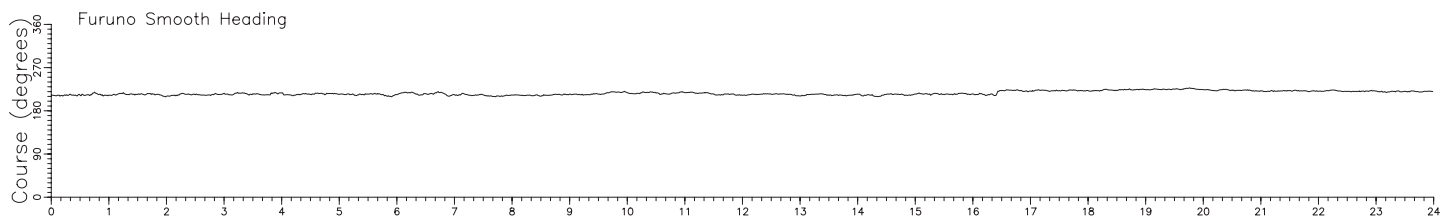
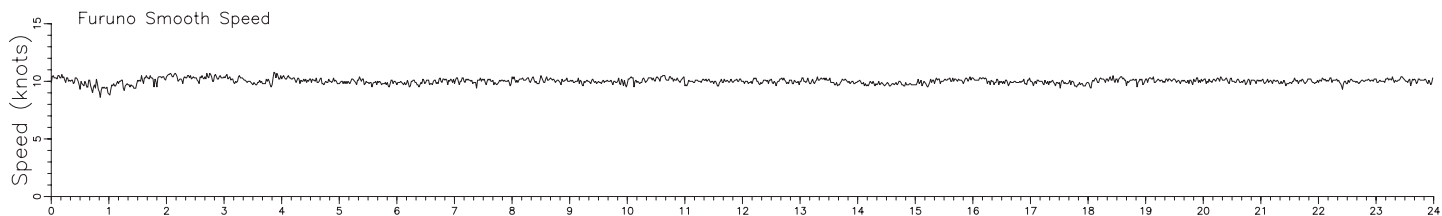
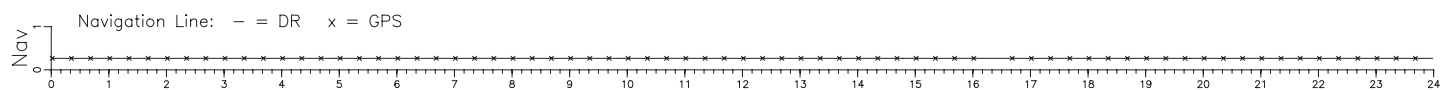
EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.364 Speed/Course file: fu.s364 Magnetics file: mg.n364 Gravity file: vt.n364 Bathymetry file: hb.n364



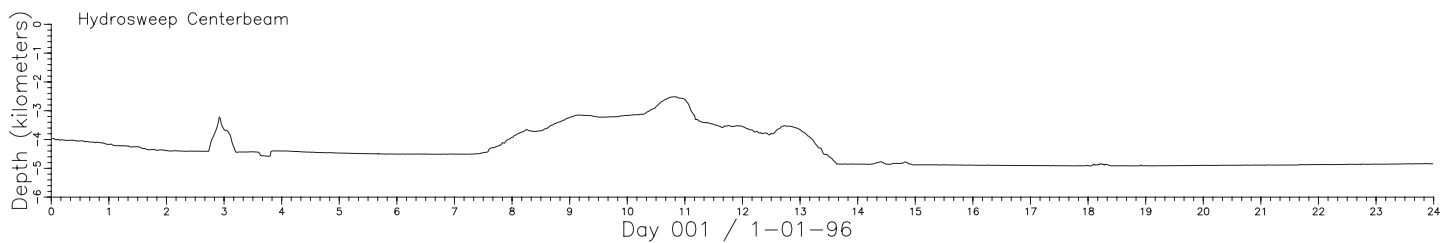
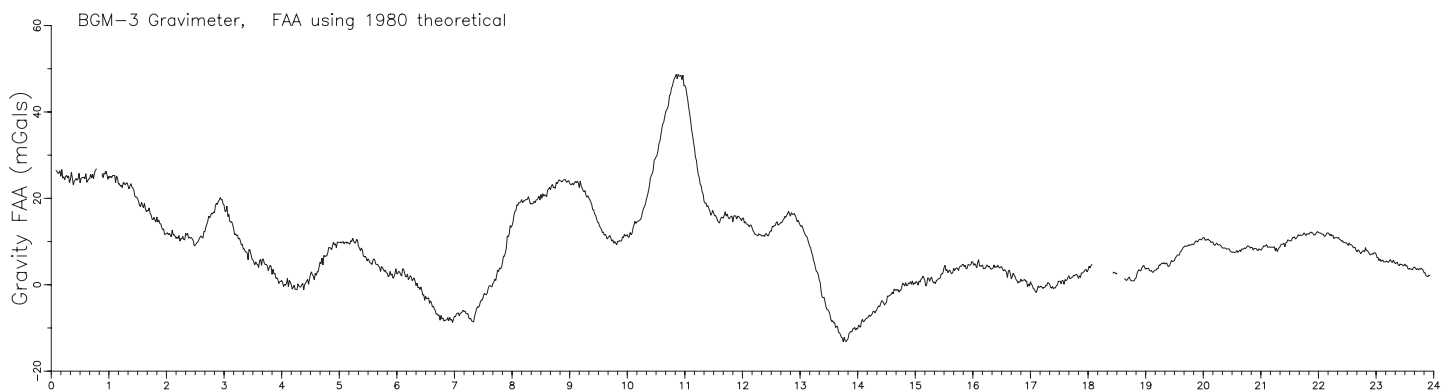
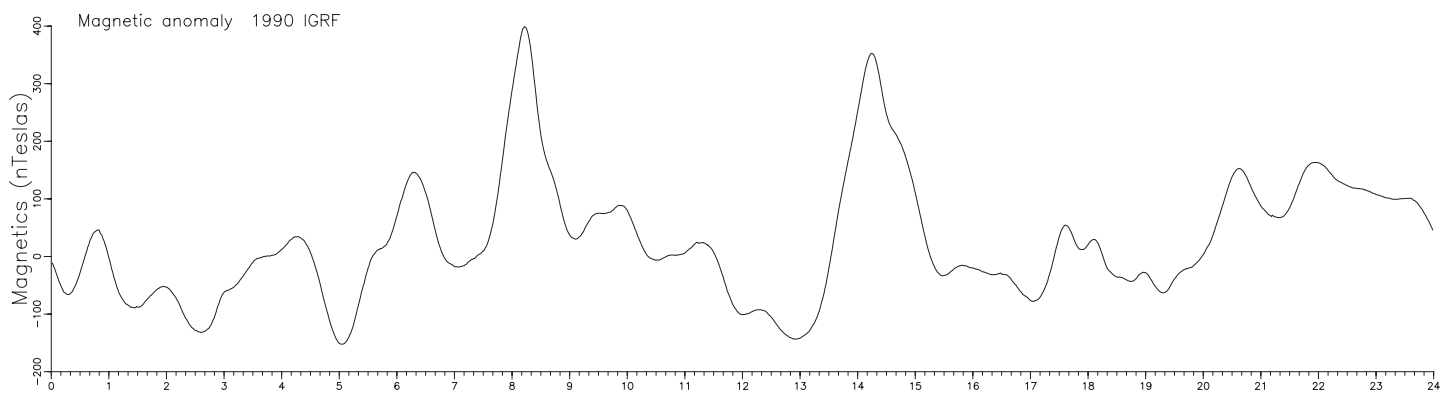
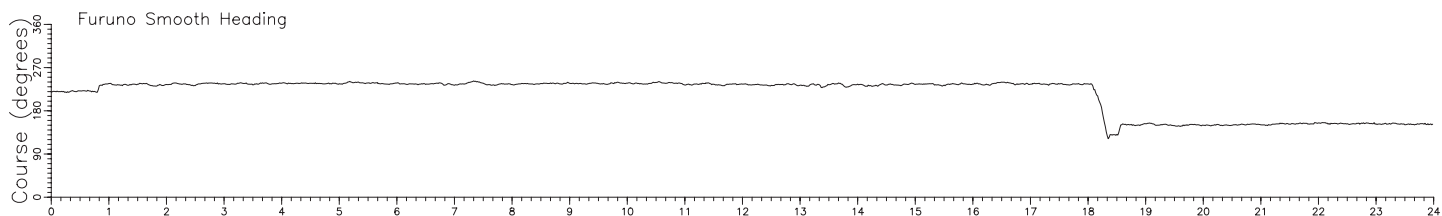
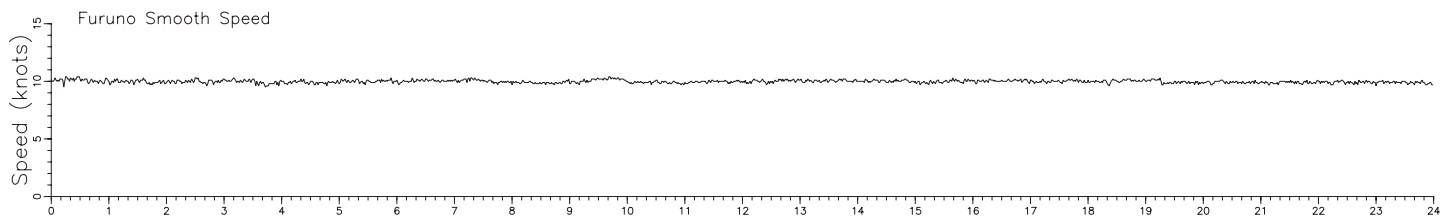
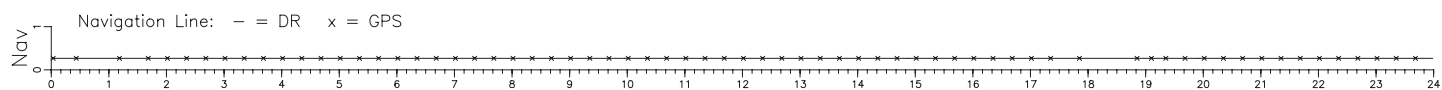
EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.365 Speed/Course file: fu.s365 Magnetics file: mg.n365 Gravity file: vt.n365 Bathymetry file: hb.n365



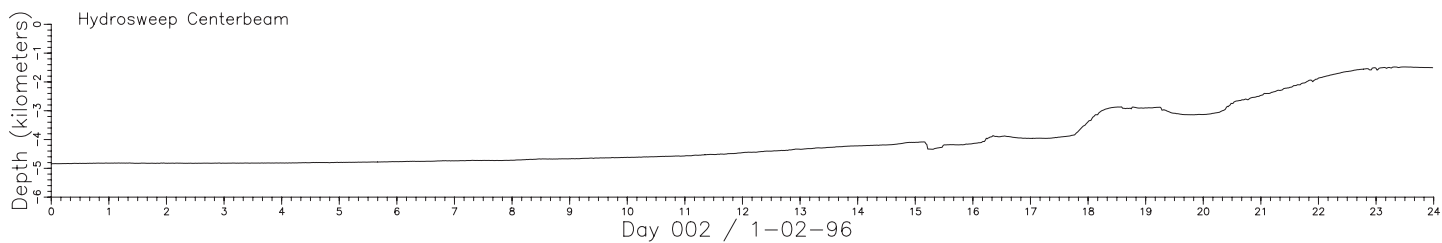
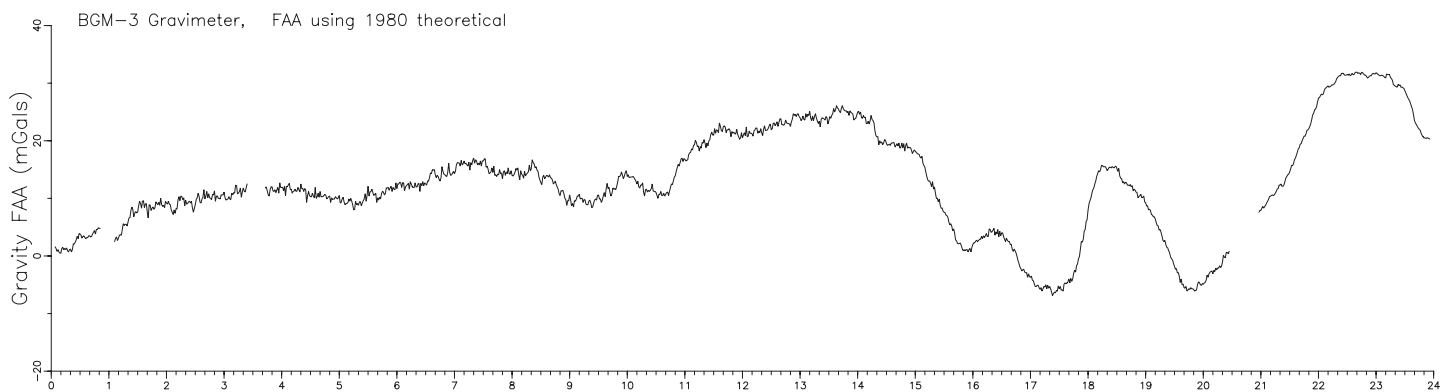
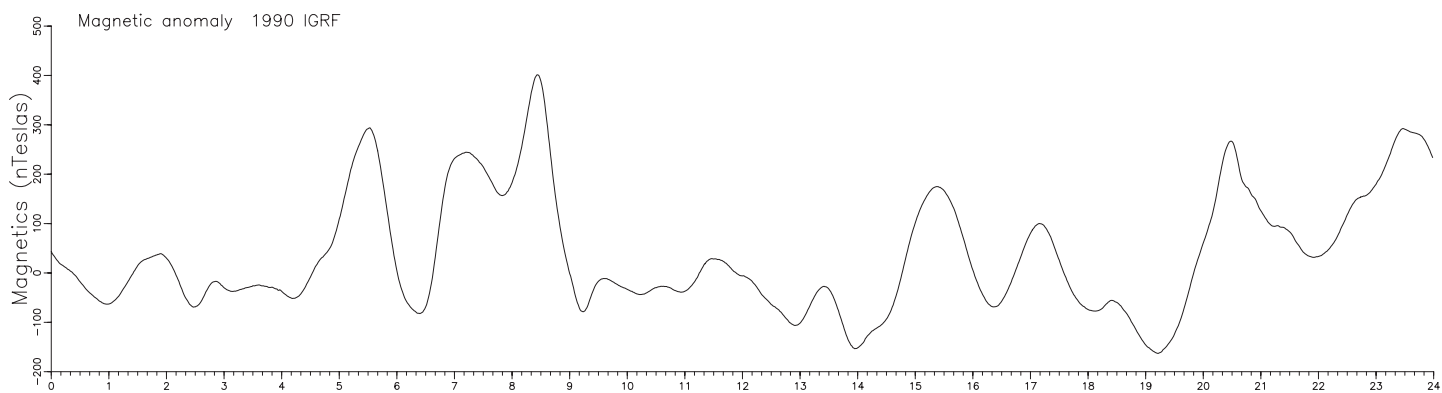
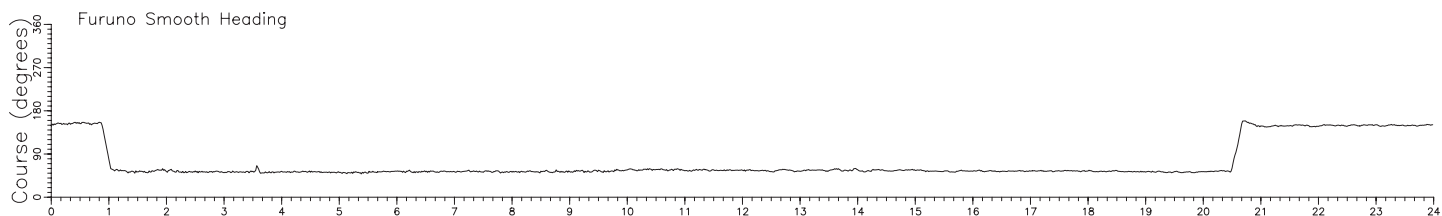
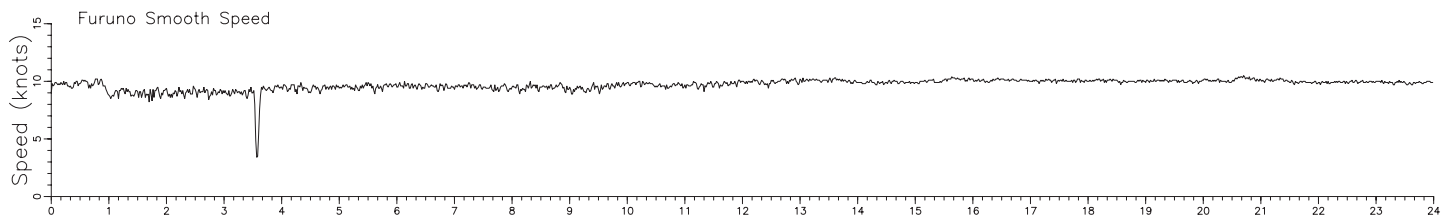
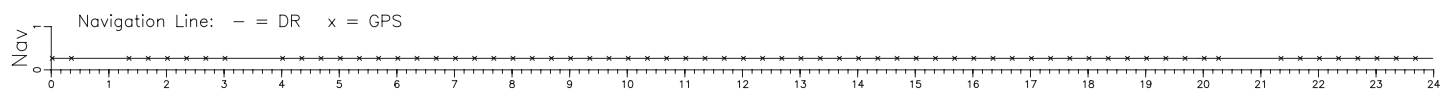
EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.001 Speed/Course file: fu.s001 Magnetics file: mg.n001 Gravity file: vt.n001 Bathymetry file: hb.n001



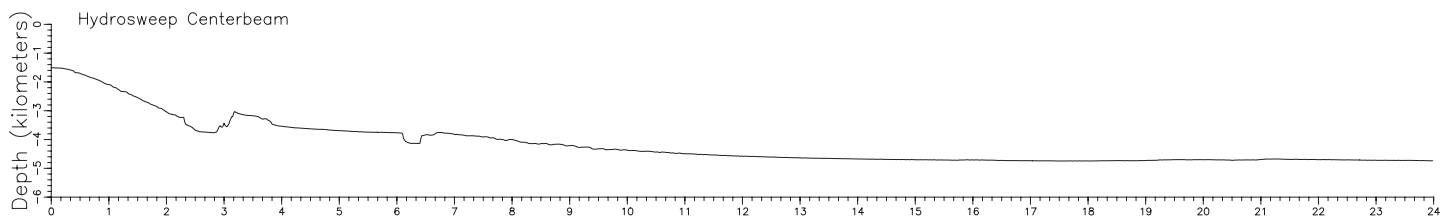
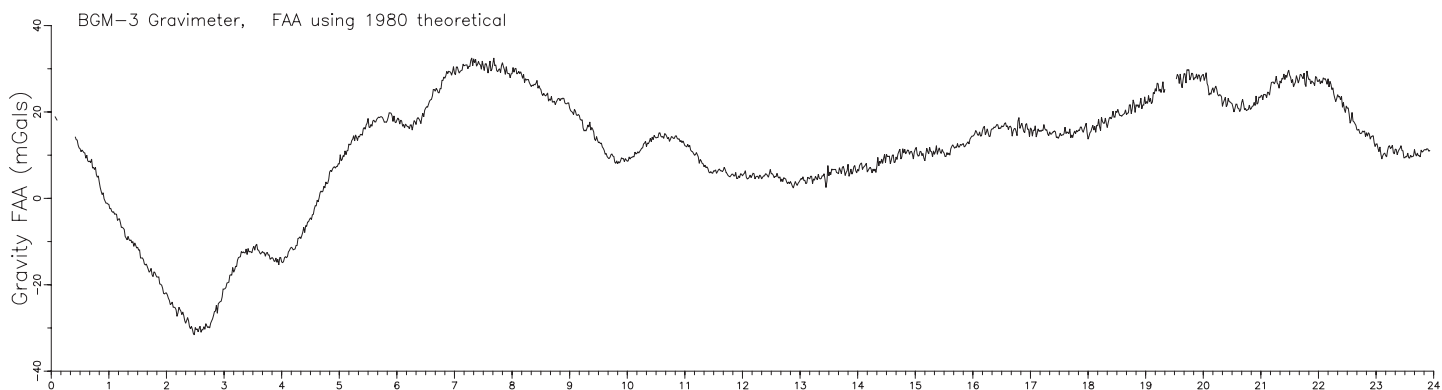
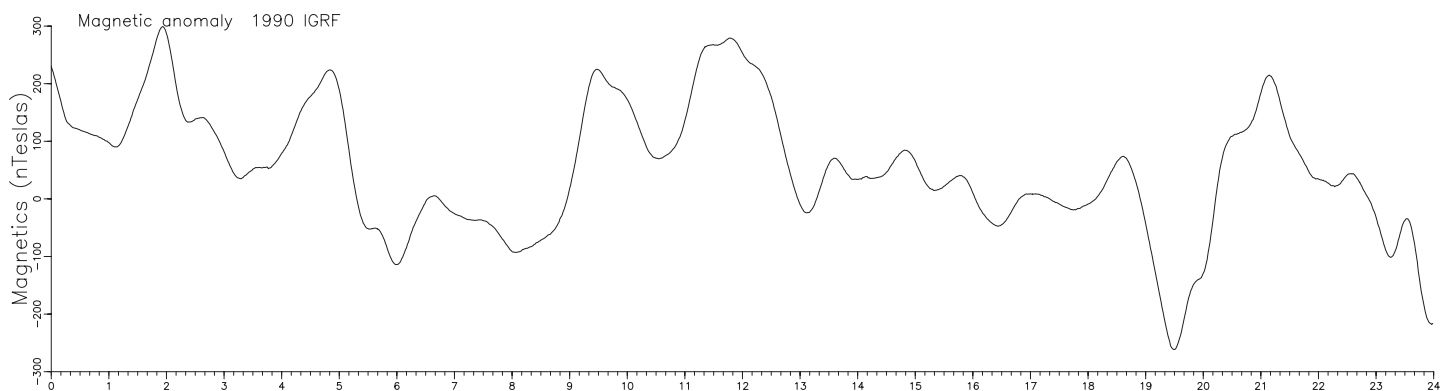
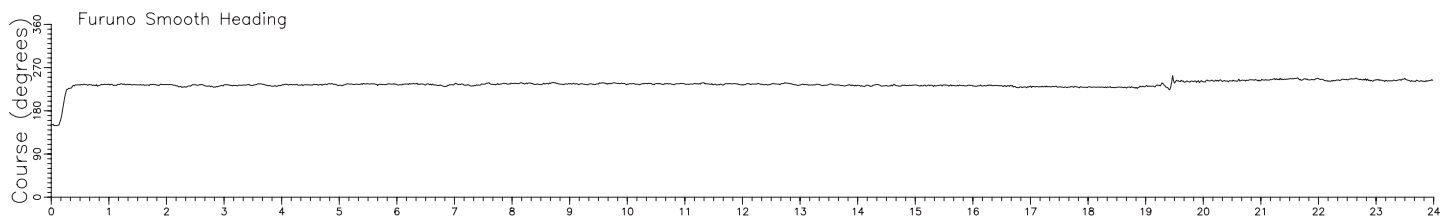
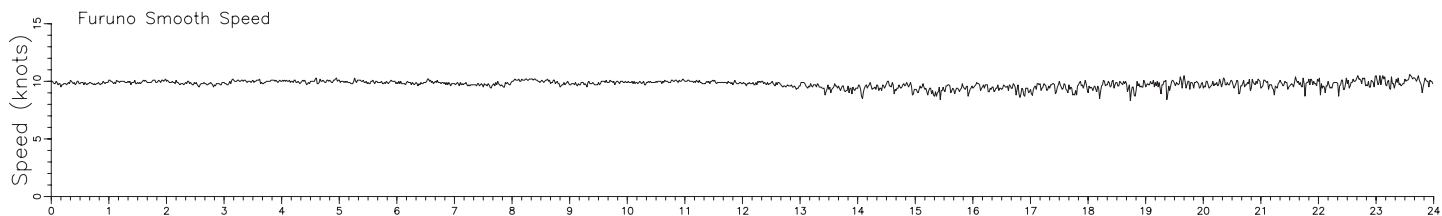
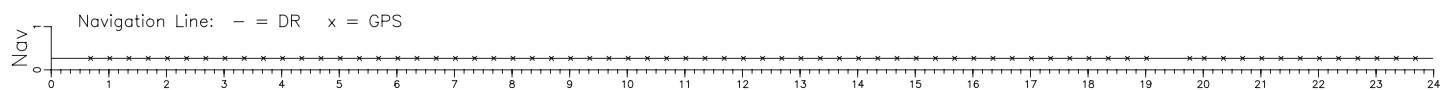
EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.002 Speed/Course file: fu.s002 Magnetics file: mg.n002 Gravity file: vt.n002 Bathymetry file: hb.n002



EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.003 Speed/Course file: fu.s003 Magnetics file: mg.n003 Gravity file: vt.n003 Bathymetry file: hb.n003



Day 003 / 1-03-96

EW9513 Auckland, New Zealand – Lyttelton, New Zealand

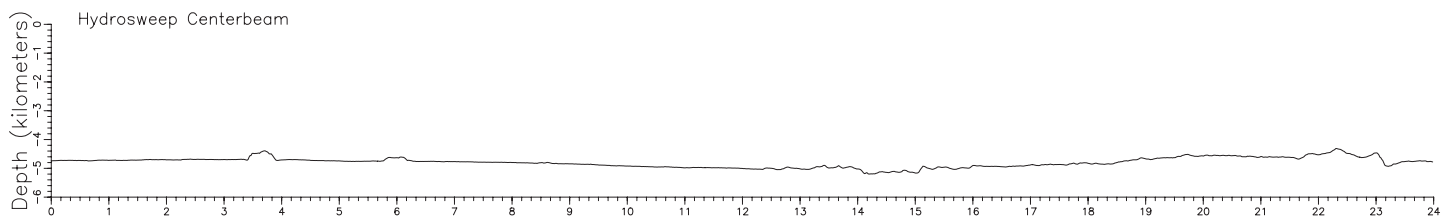
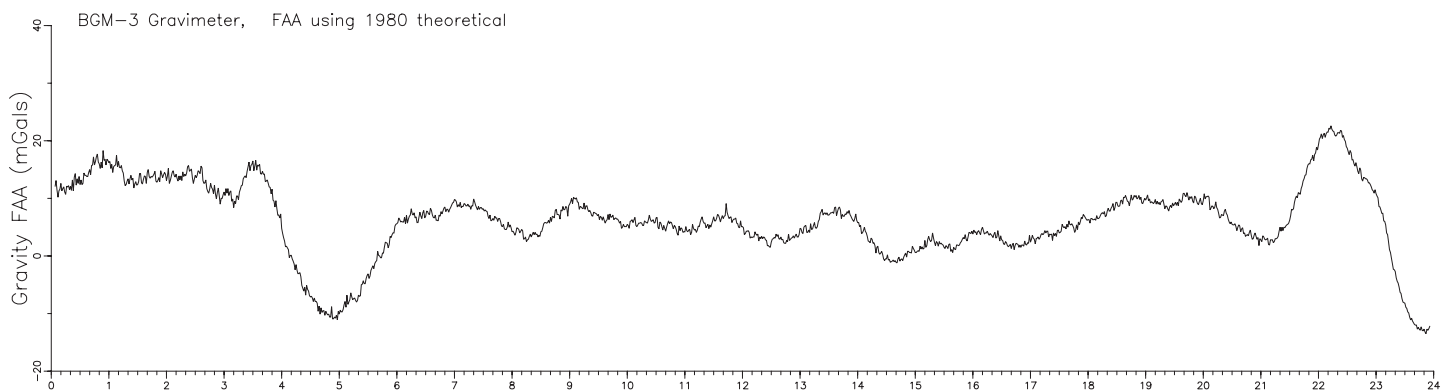
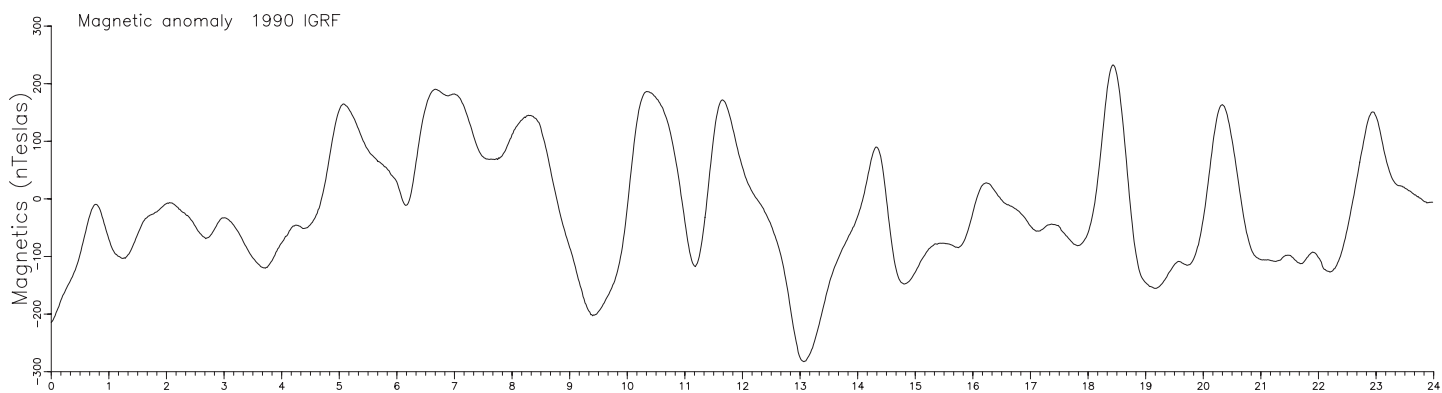
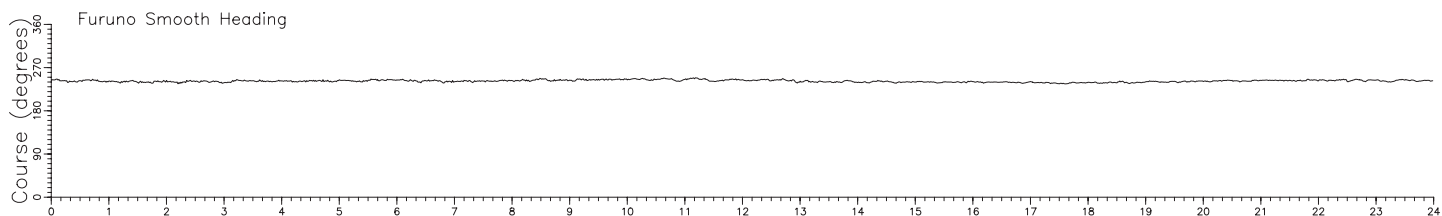
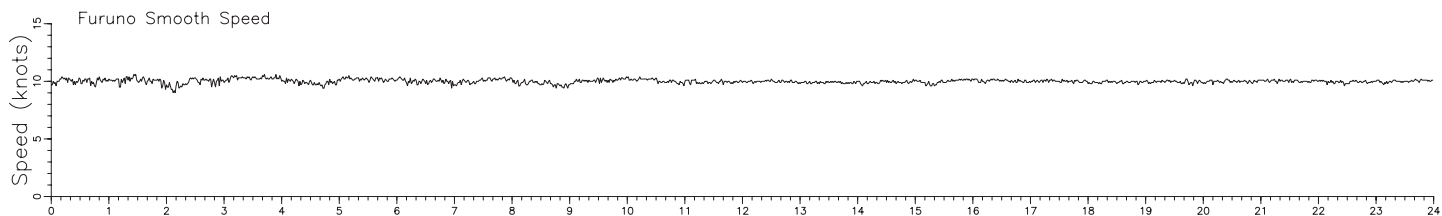
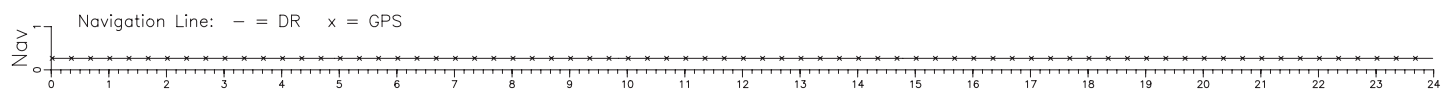
Navigation file: n.004

Speed/Course file: fu.s004

Magnetics file: mg.n004

Gravity file: vt.n004

Bathymetry file: hb.n004



Day 004 / 1-04-96

EW9513 Auckland, New Zealand – Lyttelton, New Zealand

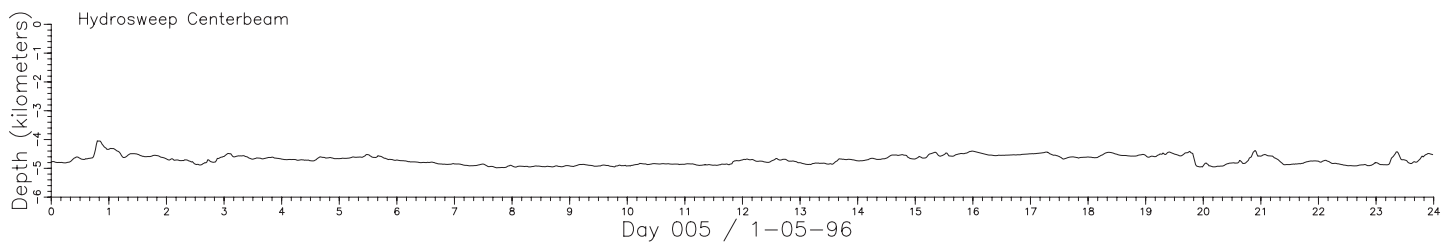
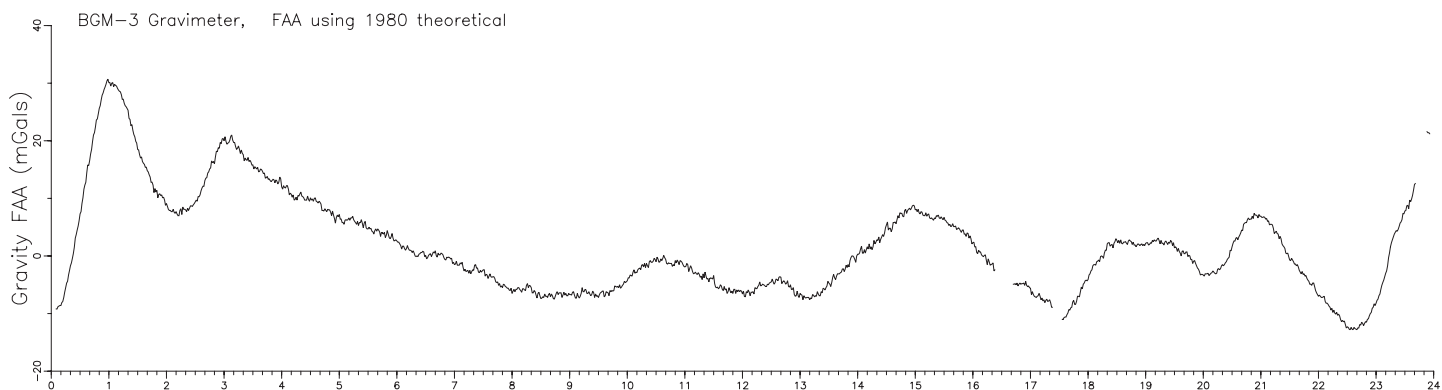
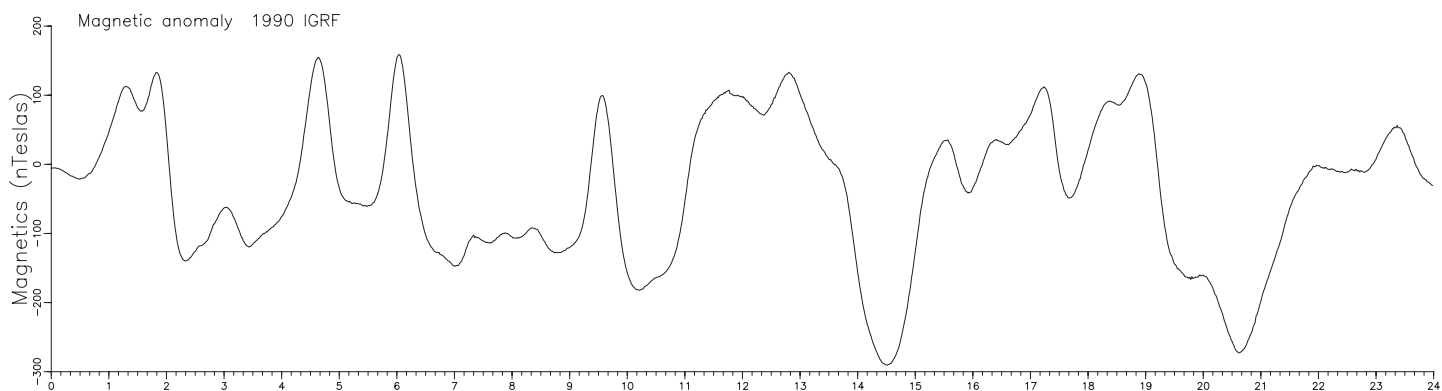
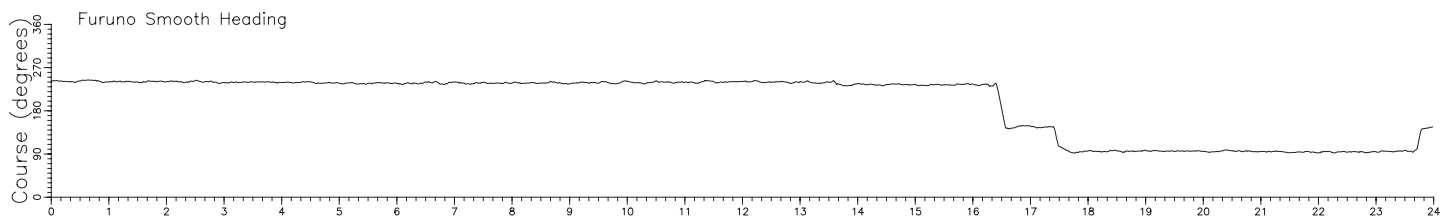
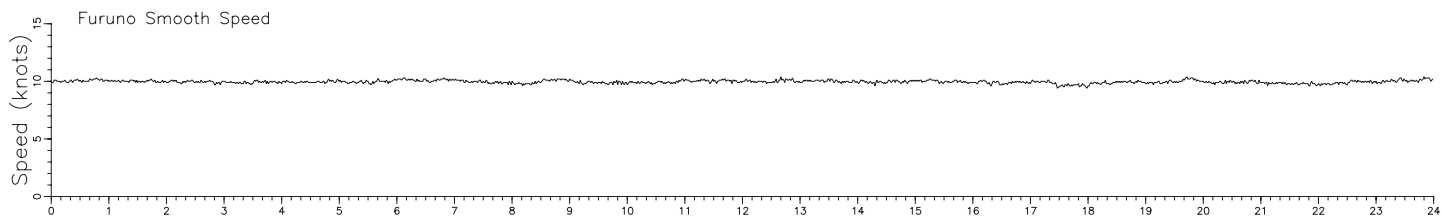
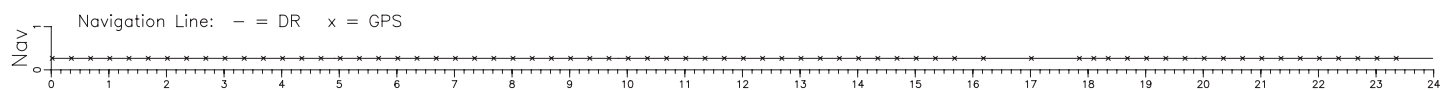
Navigation file: n.005

Speed/Course file: fu.s005

Magnetics file: mg.n005

Gravity file: vt.n005

Bathymetry file: hb.n005



EW9513 Auckland, New Zealand – Lyttelton, New Zealand

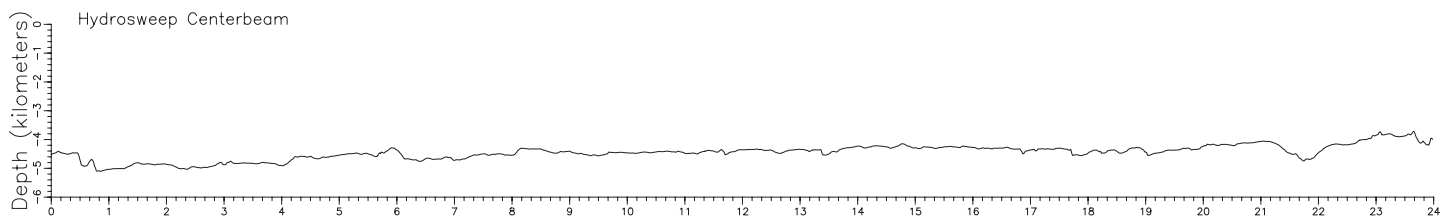
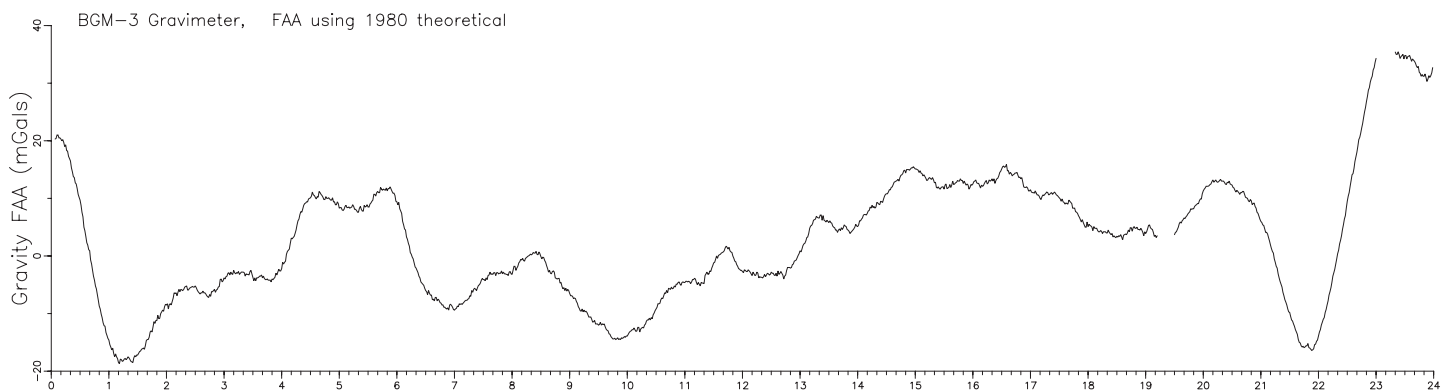
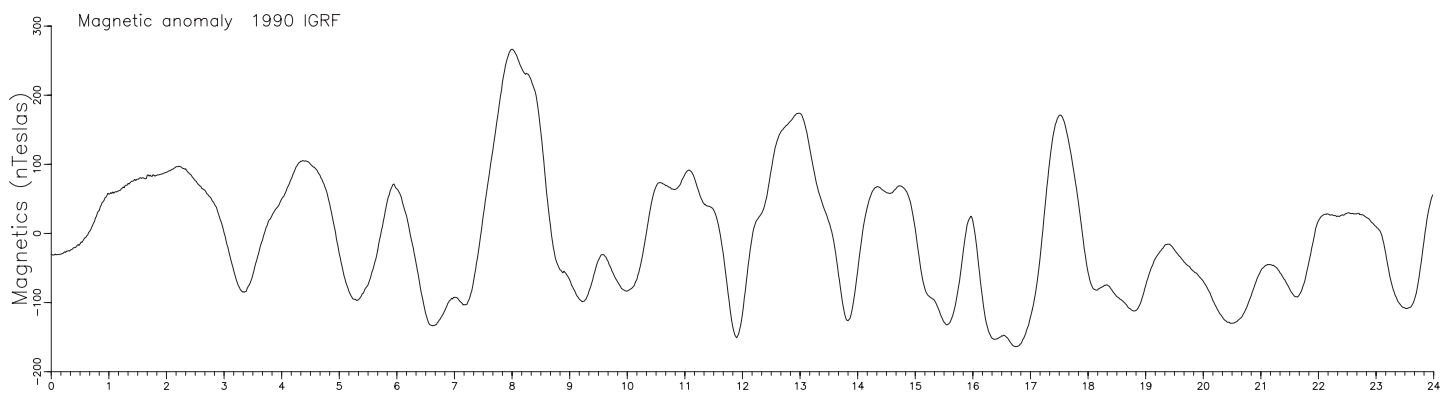
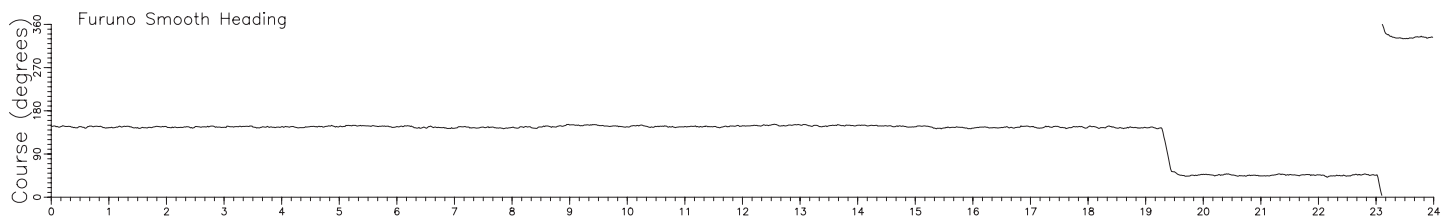
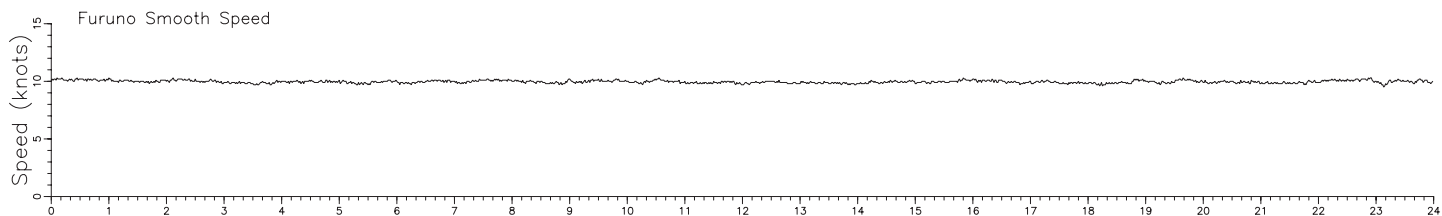
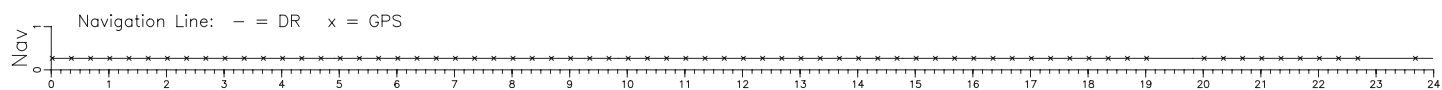
Navigation file: n.006

Speed/Course file: fu.s006

Magnetics file: mg.n006

Gravity file: vt.n006

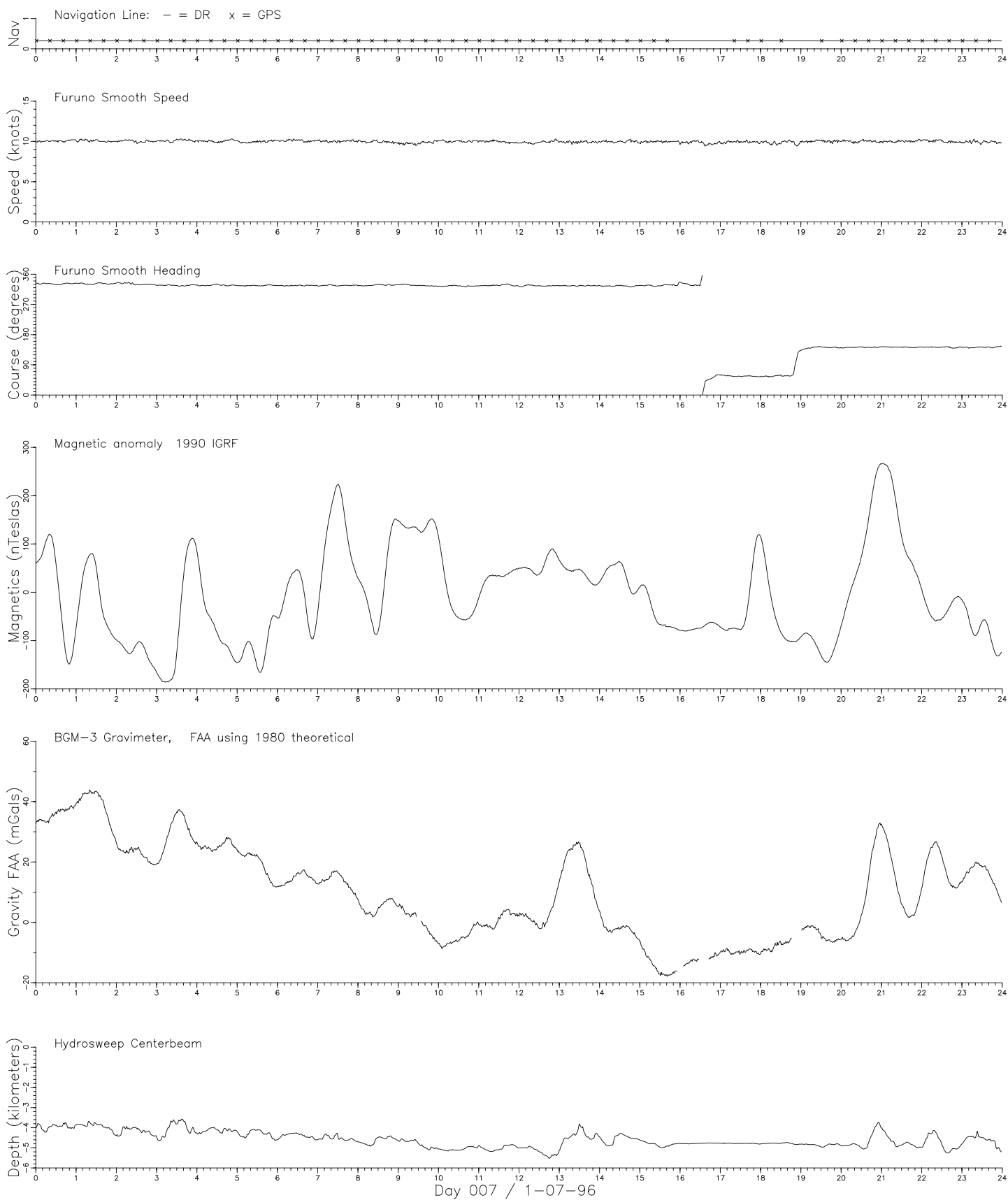
Bathymetry file: hb.n006



Day 006 / 1-06-96

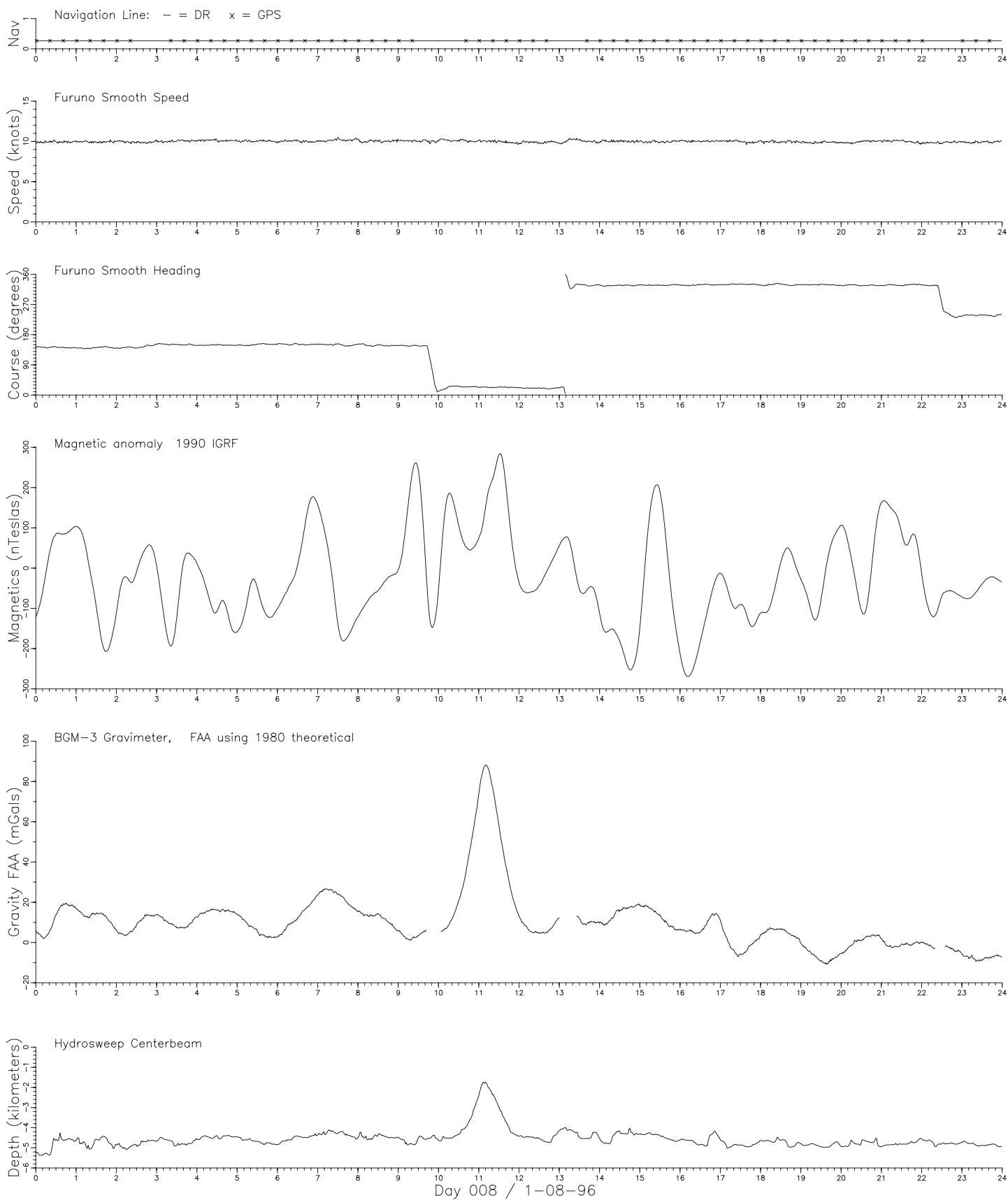
EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.007 Speed/Course file: fu.s007 Magnetics file: mg.n007 Gravity file: vt.n007 Bathymetry file: hb.n007



EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.008 Speed/Course file: fu.s008 Magnetics file: mg.n008 Gravity file: vt.n008 Bathymetry file: hb.n008



EW9513 Auckland, New Zealand – Lyttelton, New Zealand

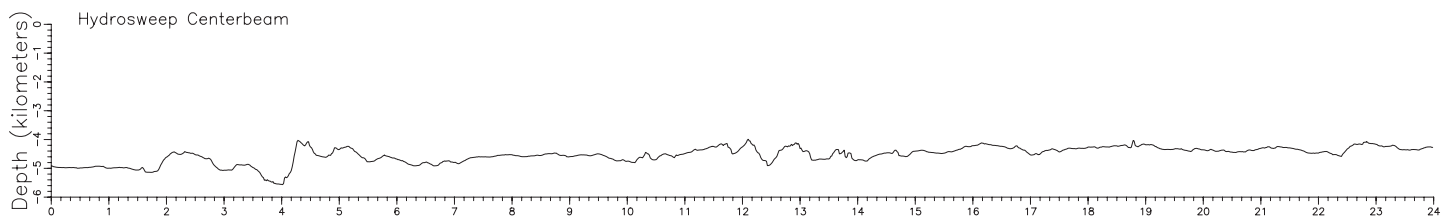
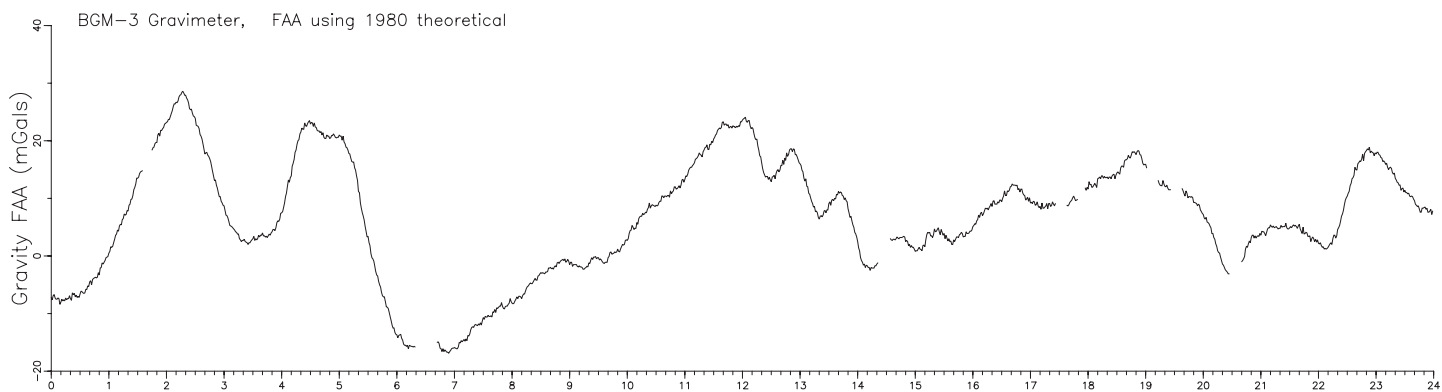
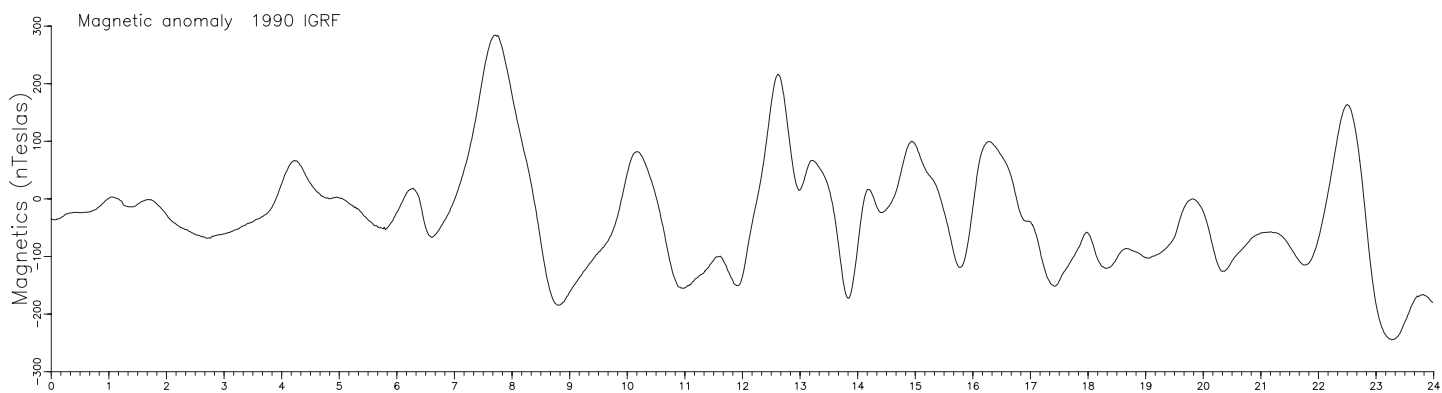
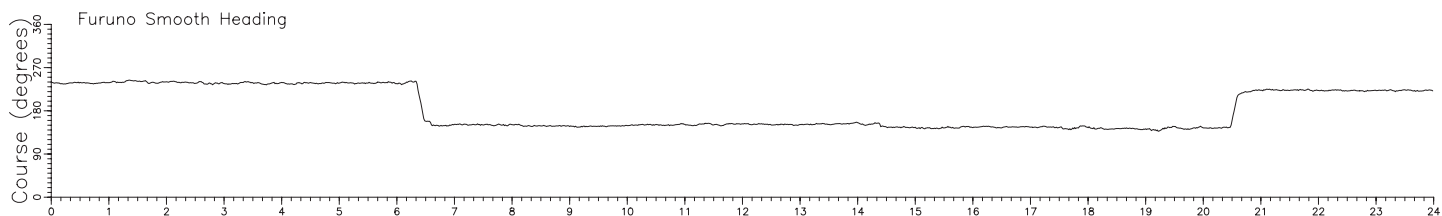
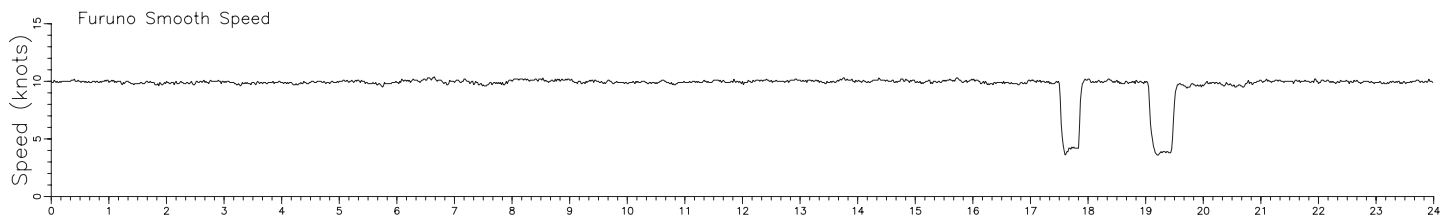
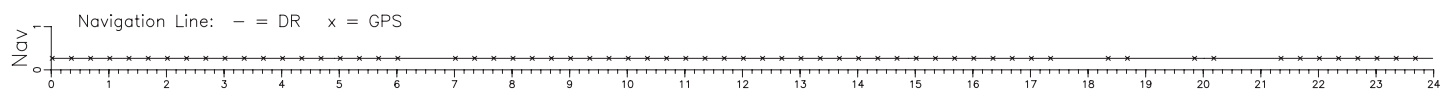
Navigation file: n.009

Speed/Course file: fu.s009

Magnetics file: mg.n009

Gravity file: vt.n009

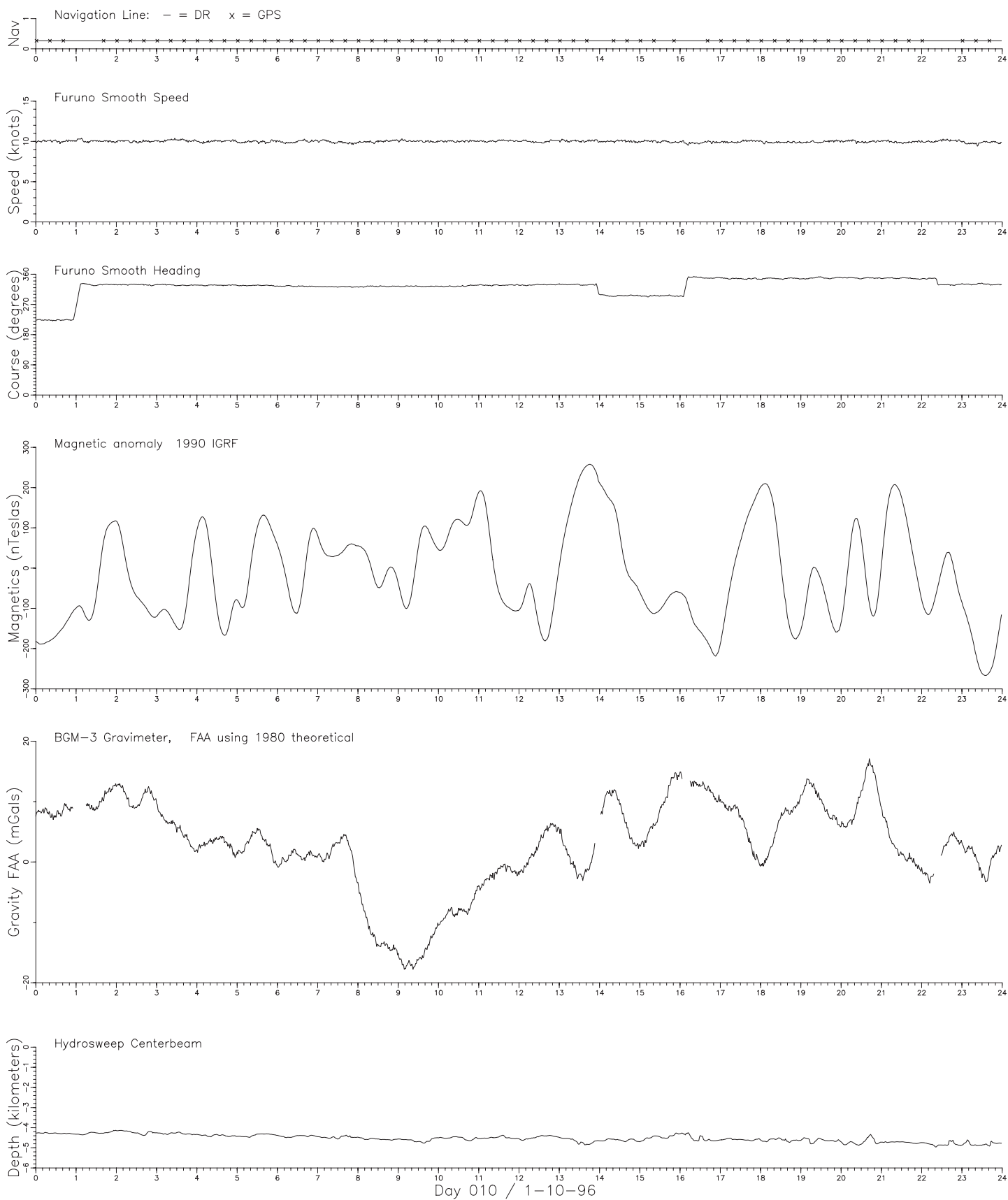
Bathymetry file: hb.n009



Day 009 / 1-09-96

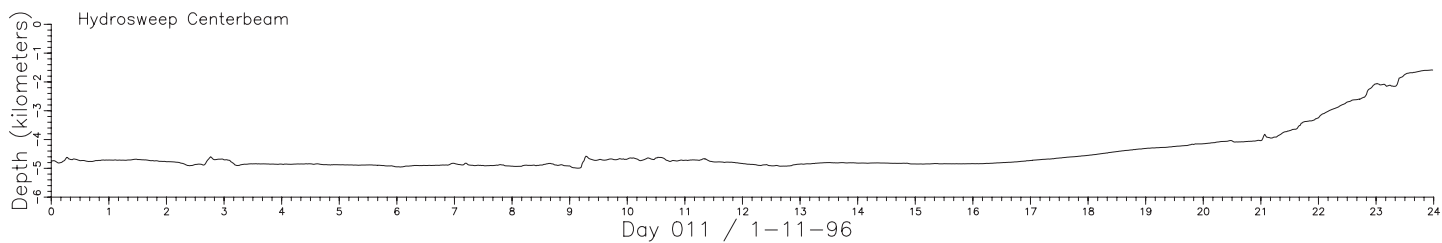
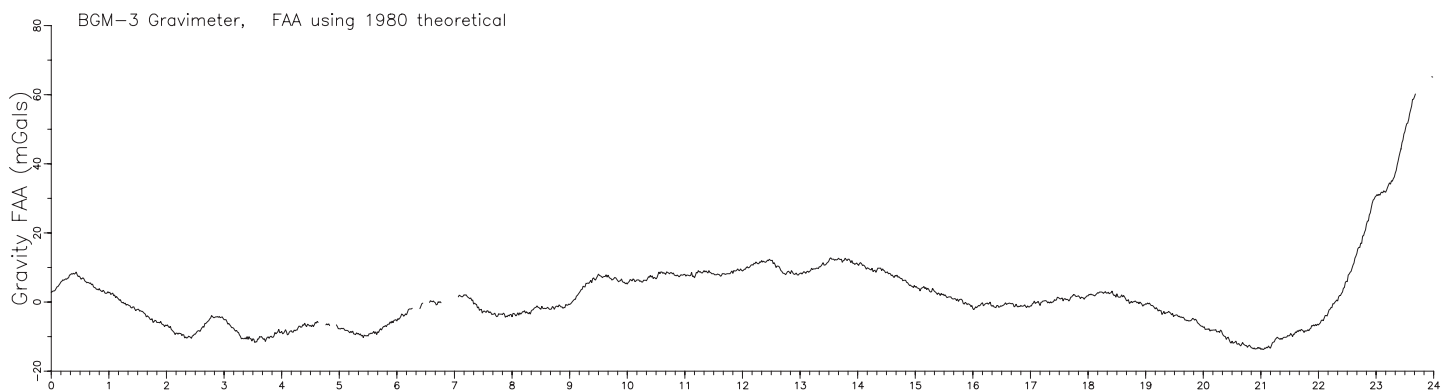
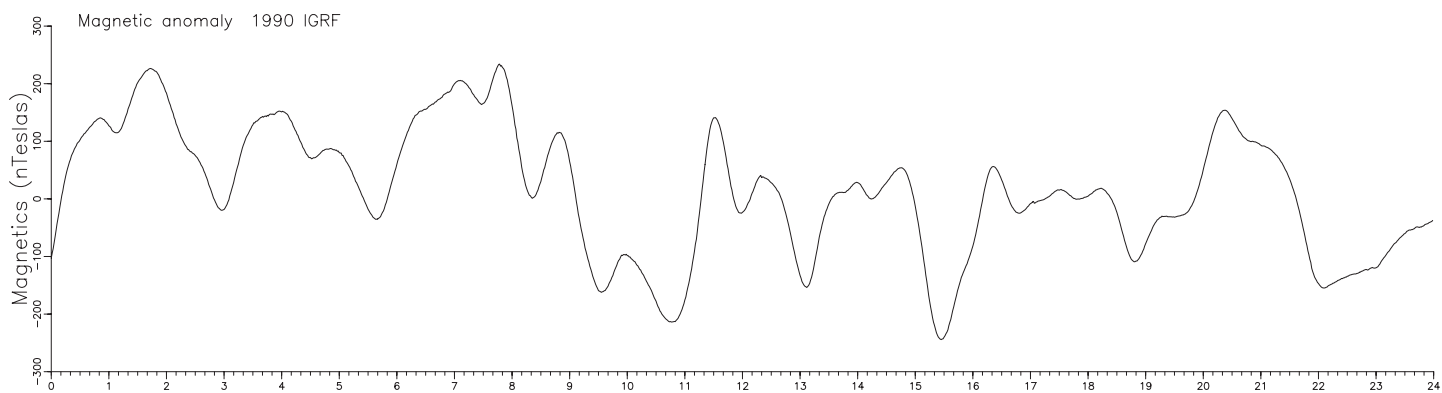
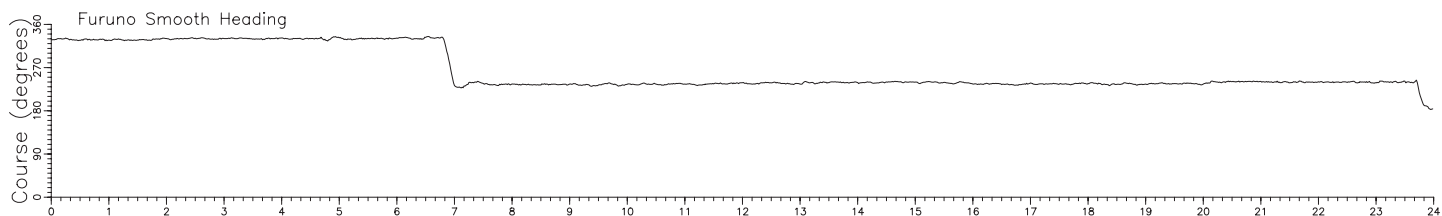
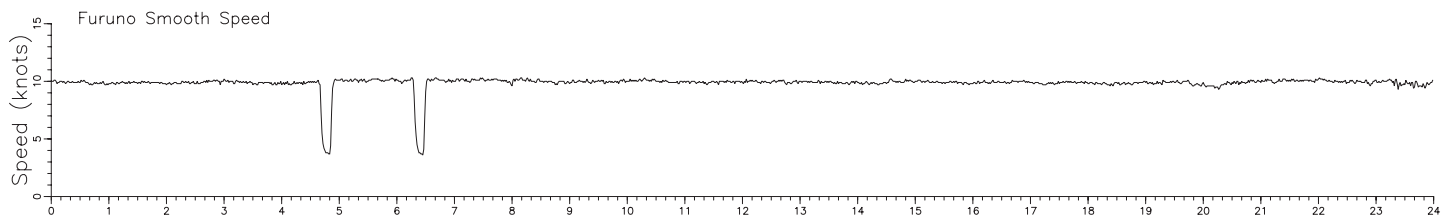
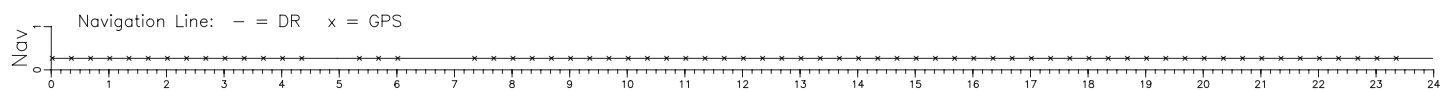
EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.010 Speed/Course file: fu.s010 Magnetics file: mg.n010 Gravity file: vt.n010 Bathymetry file: hb.n010



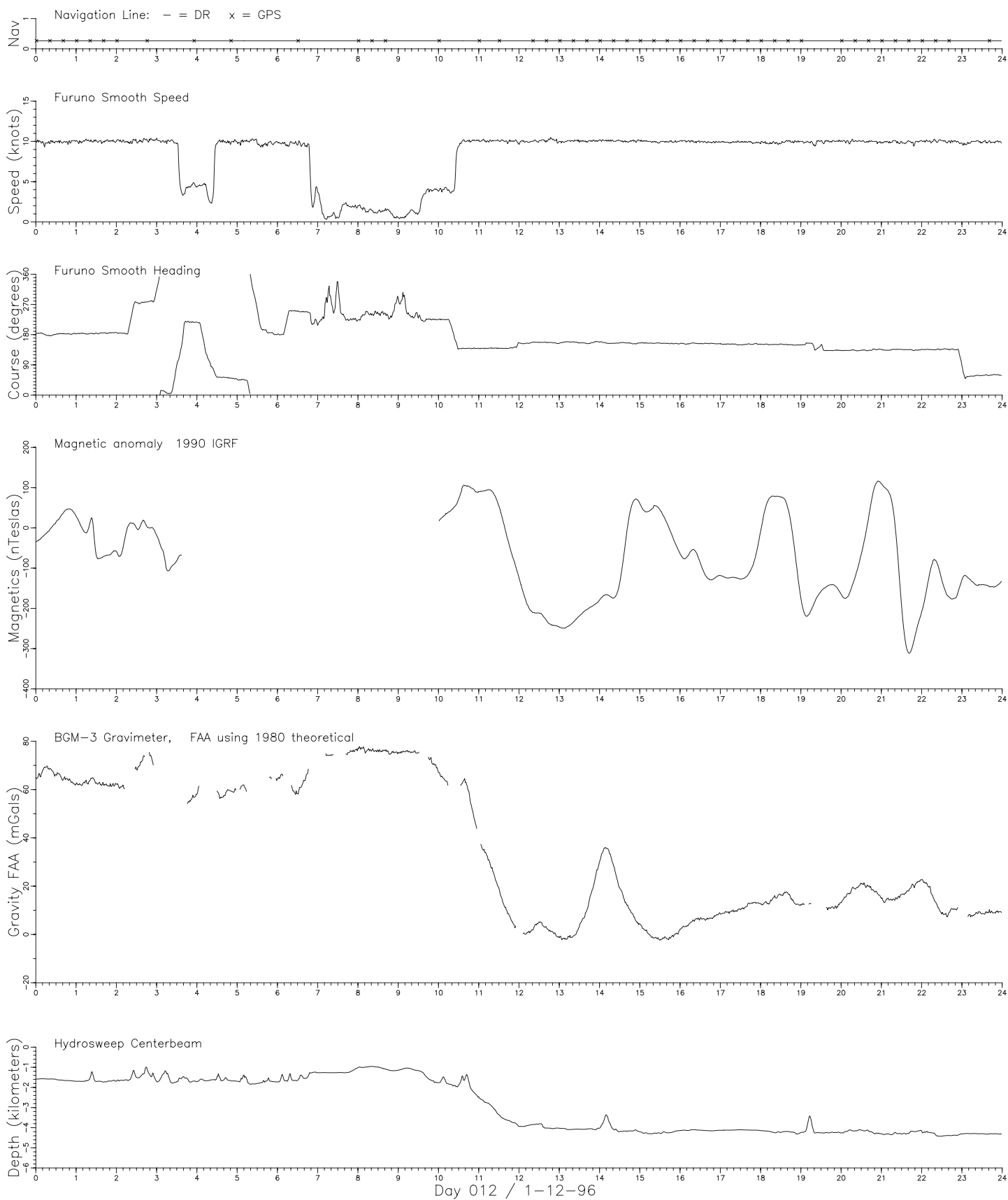
EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.011 Speed/Course file: fu.s011 Magnetics file: mg.n011 Gravity file: vt.n011 Bathymetry file: hb.n011



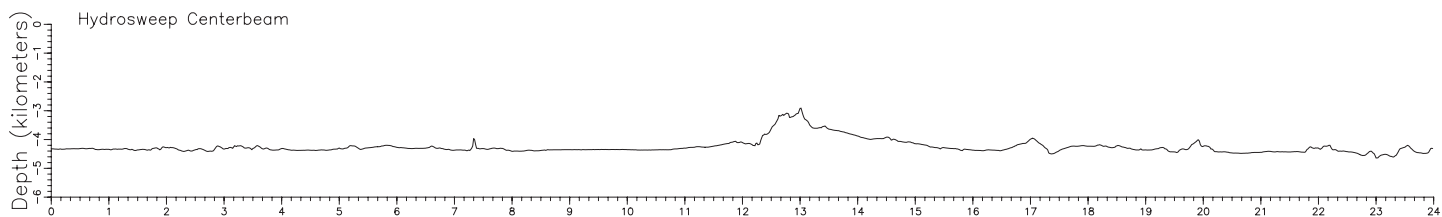
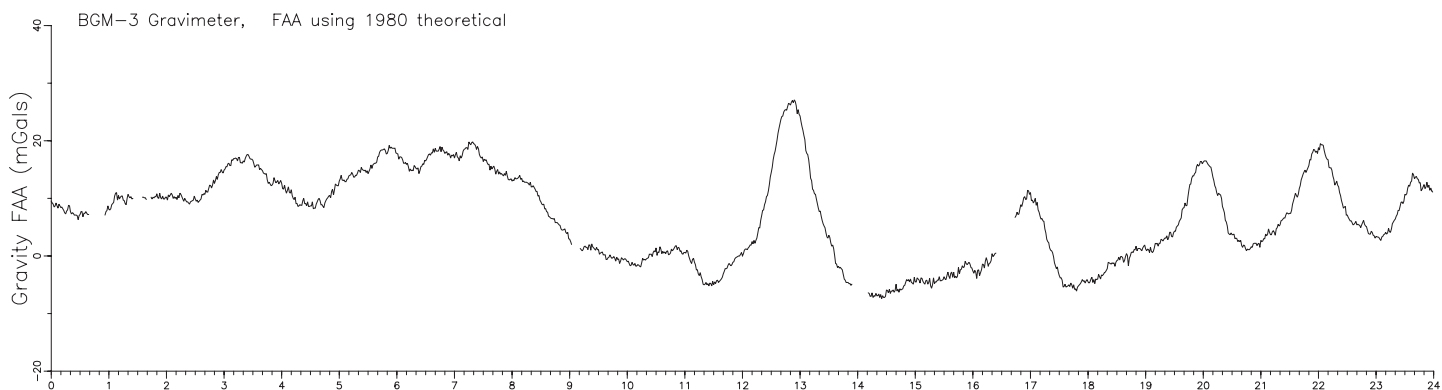
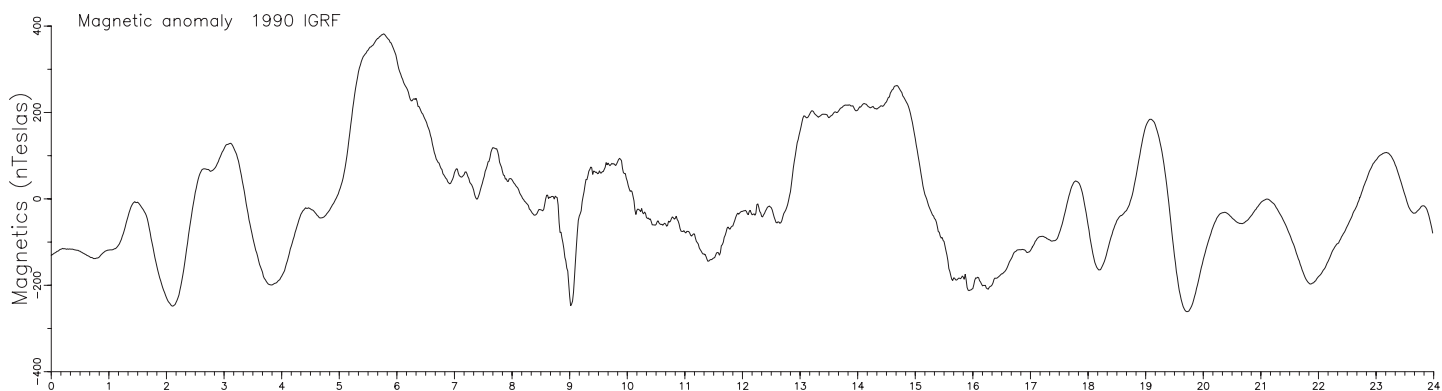
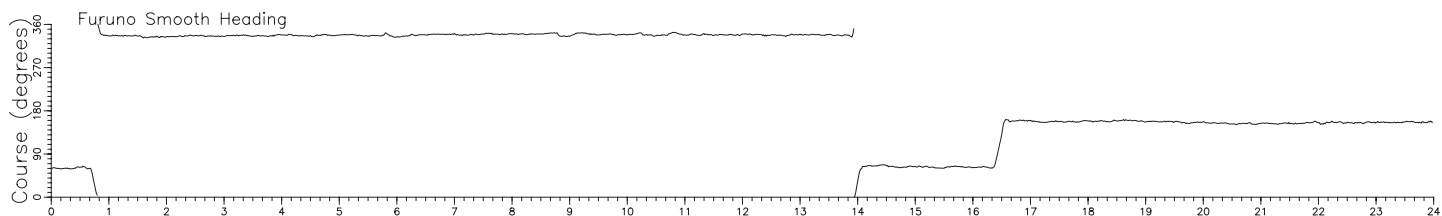
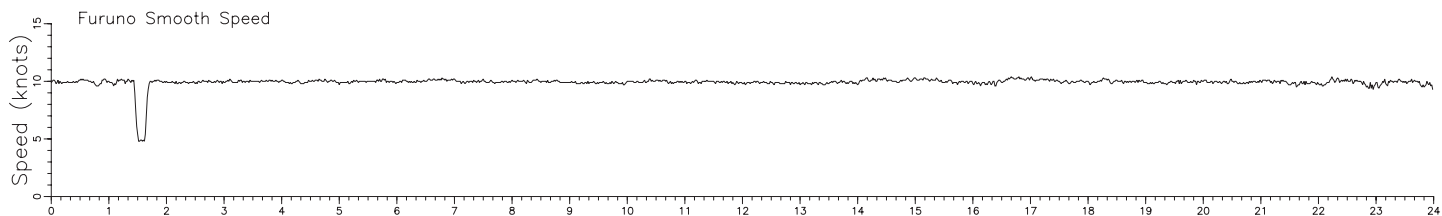
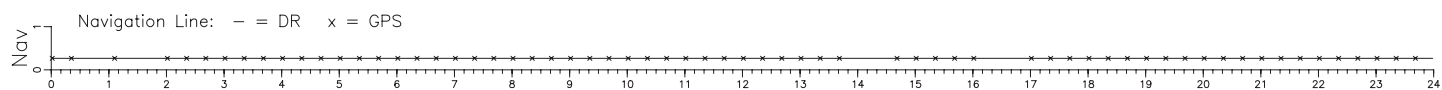
EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.012 Speed/Course file: fu.s012 Magnetics file: mg.n012 Gravity file: vt.n012 Bathymetry file: hb.n012



EW9513 Auckland, New Zealand – Lyttelton, New Zealand

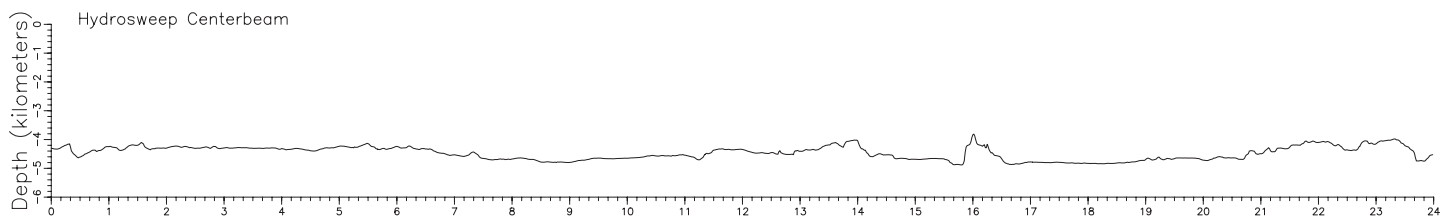
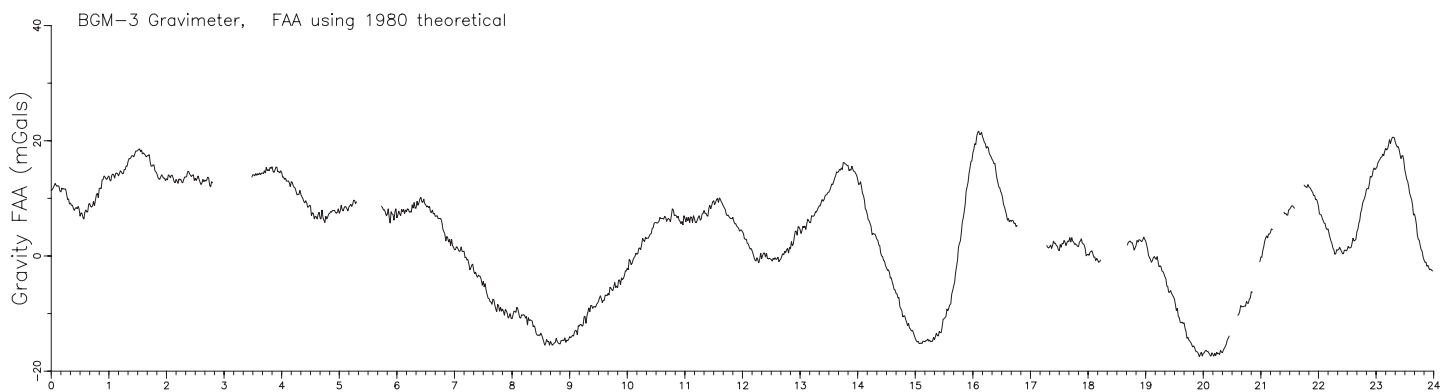
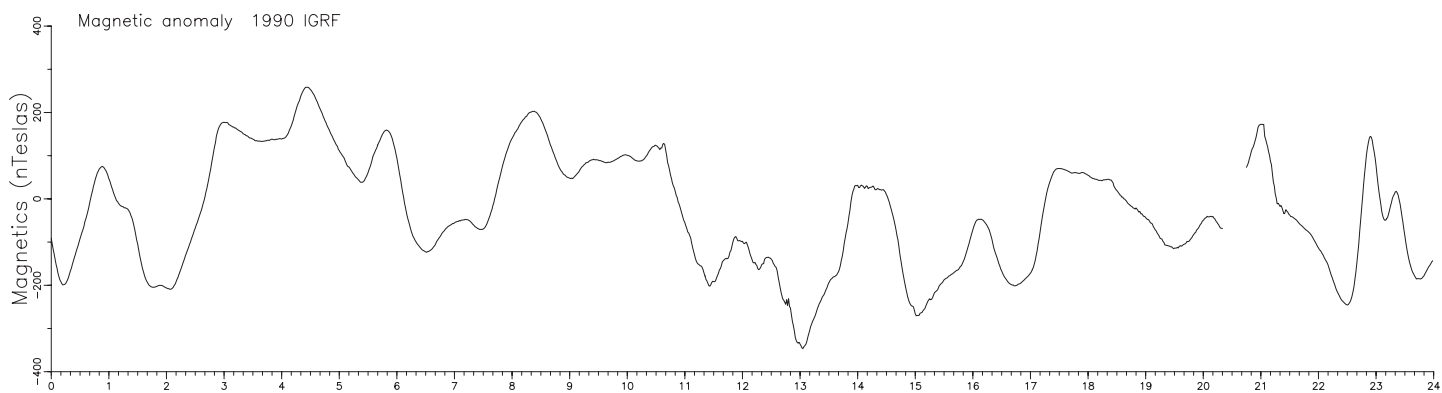
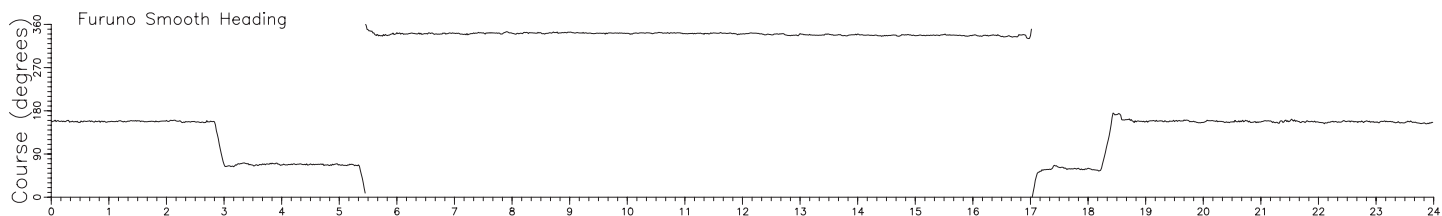
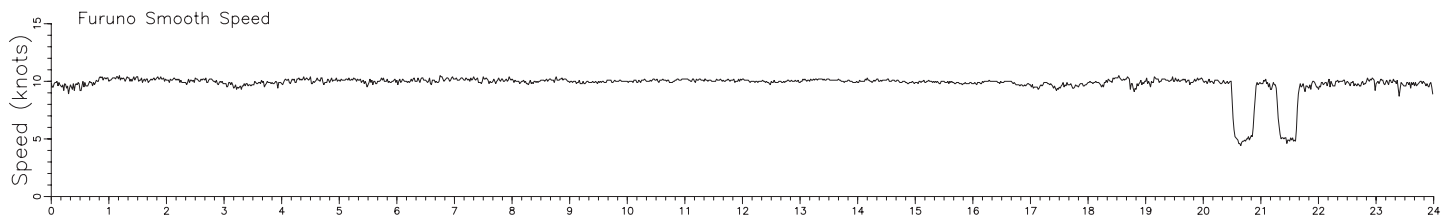
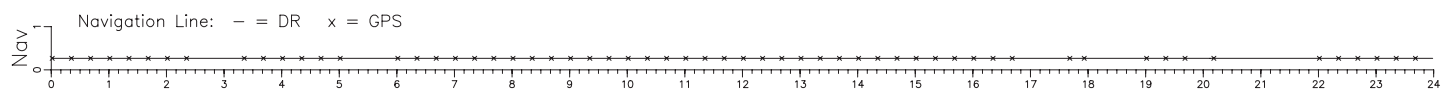
Navigation file: n.013 Speed/Course file: fu.s013 Magnetics file: mg.n013 Gravity file: vt.n013 Bathymetry file: hb.n013



Day 013 / 1-13-96

EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.014 Speed/Course file: fu.s014 Magnetics file: mg.n014 Gravity file: vt.n014 Bathymetry file: hb.n014



Day 014 / 1-14-96

EW9513 Auckland, New Zealand – Lyttelton, New Zealand

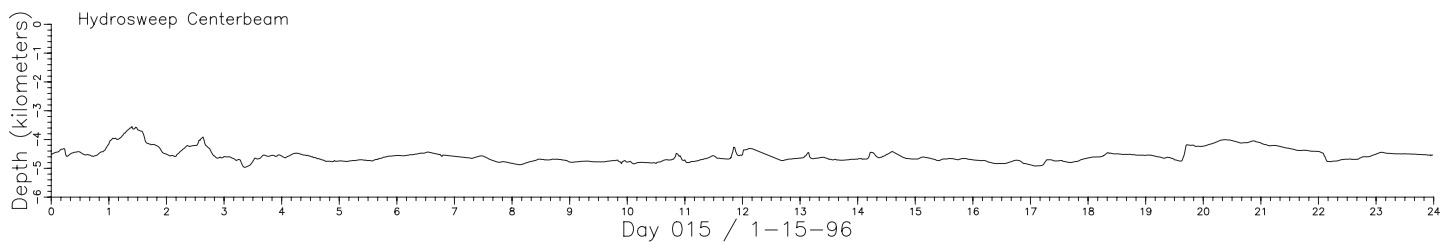
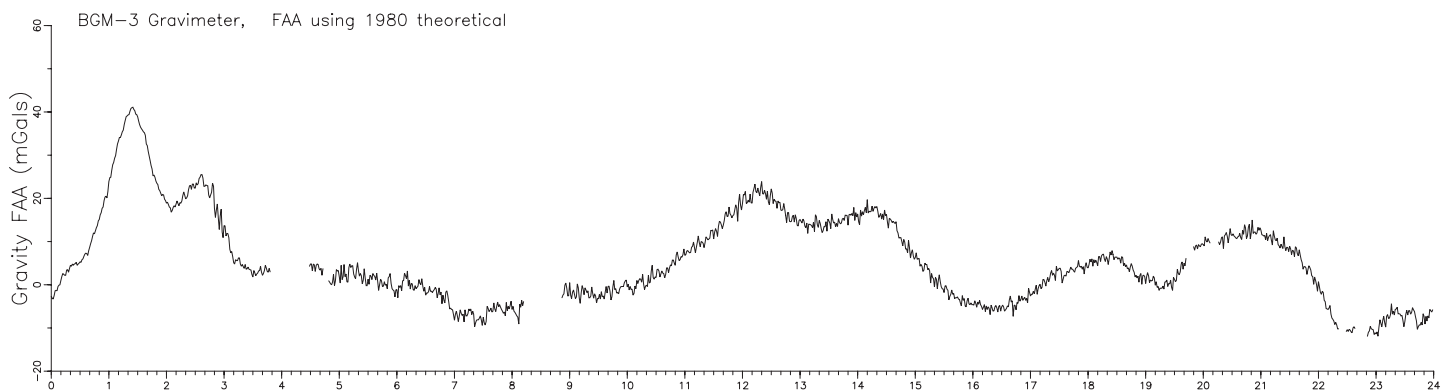
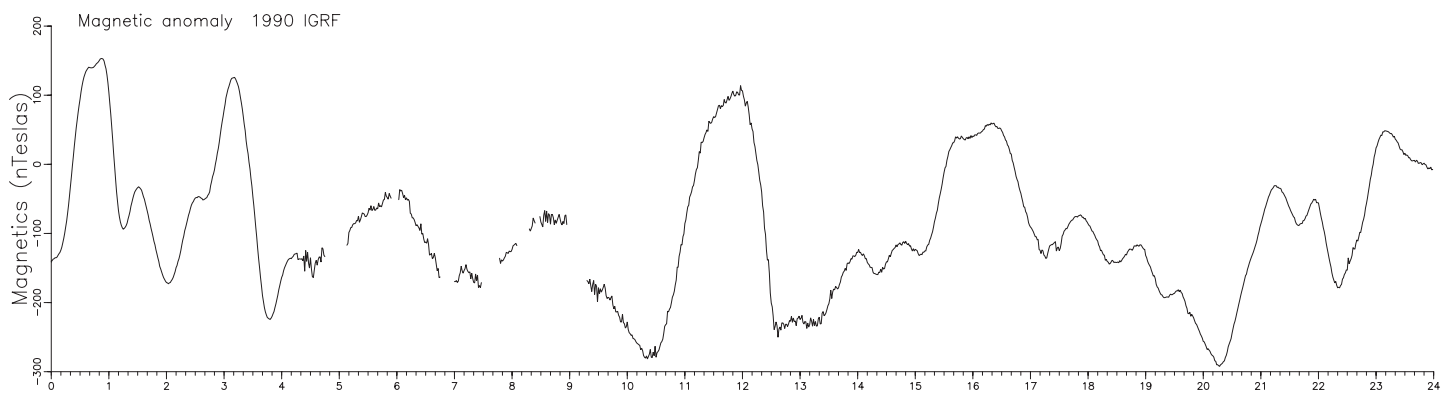
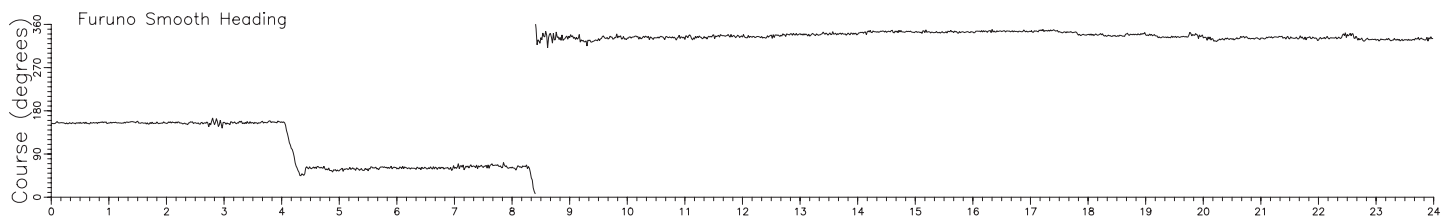
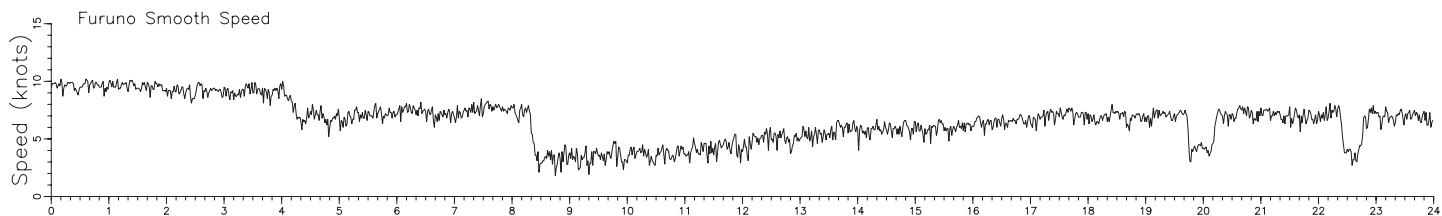
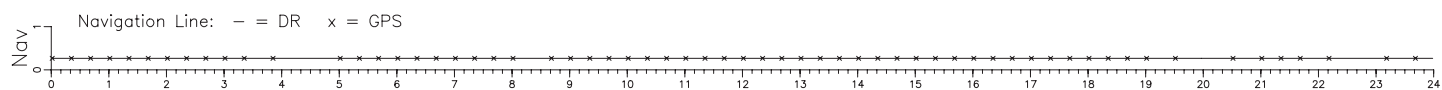
Navigation file: n.015

Speed/Course file: fu.s015

Magnetics file: mg.n015

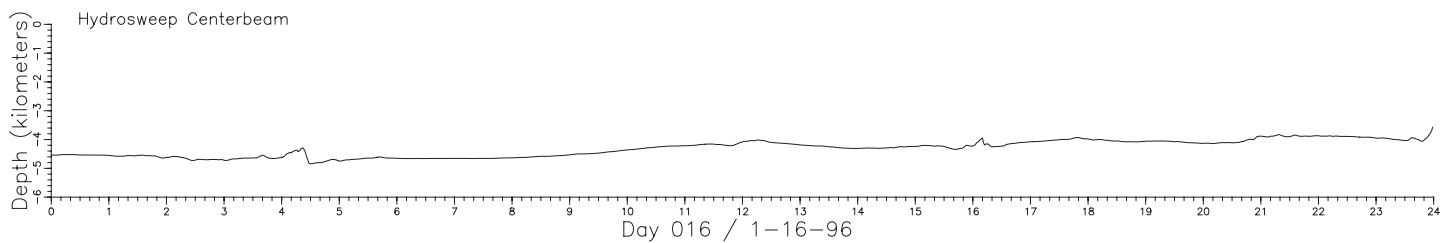
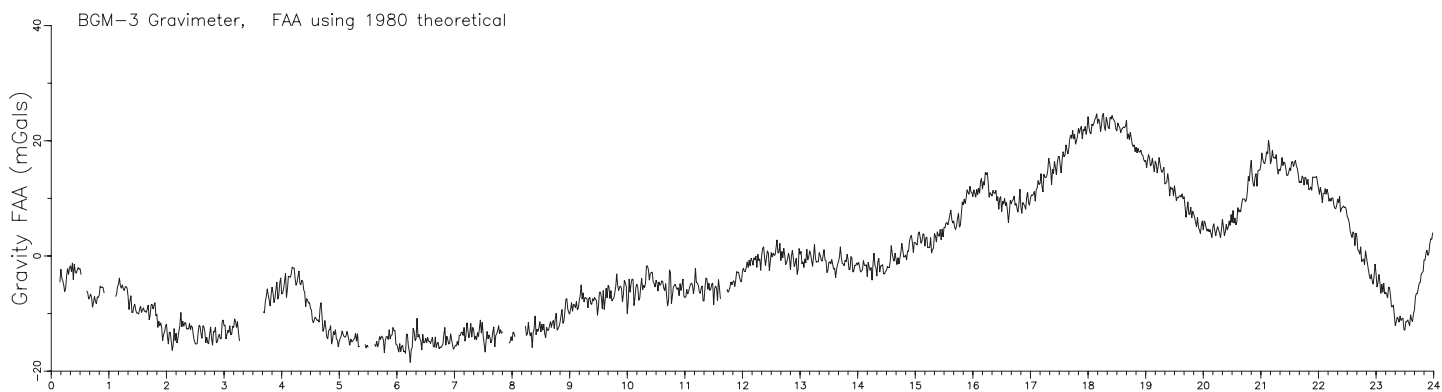
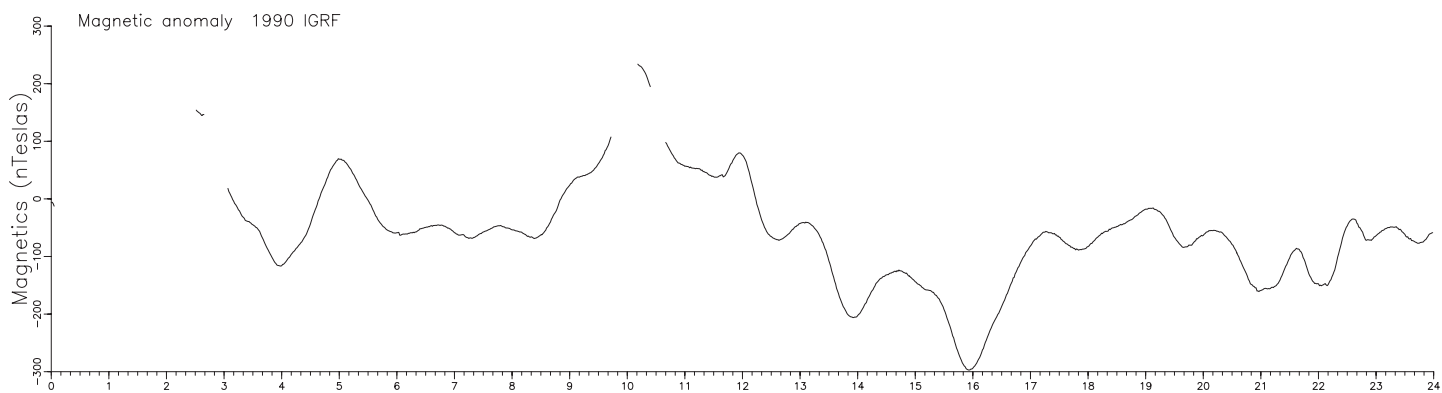
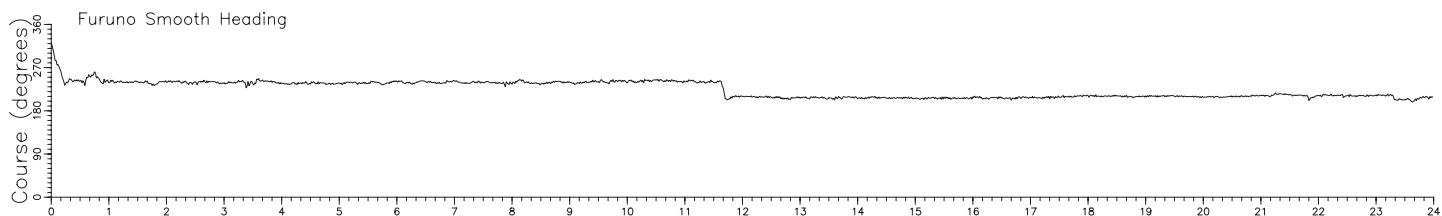
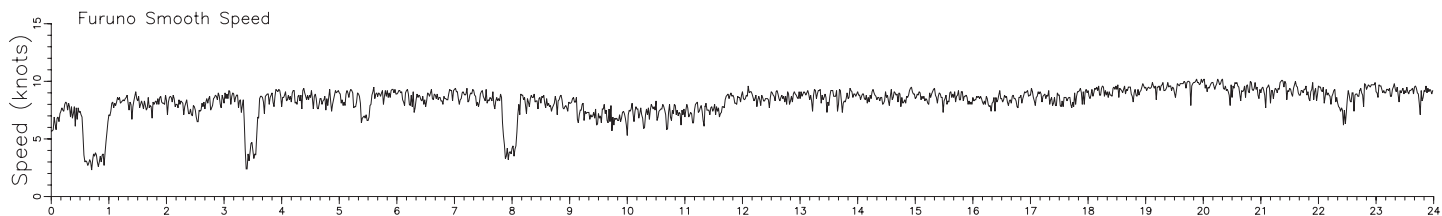
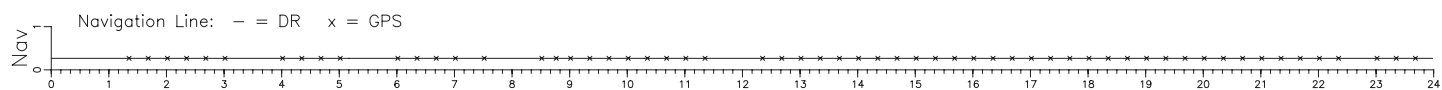
Gravity file: vt.n015

Bathymetry file: hb.n015



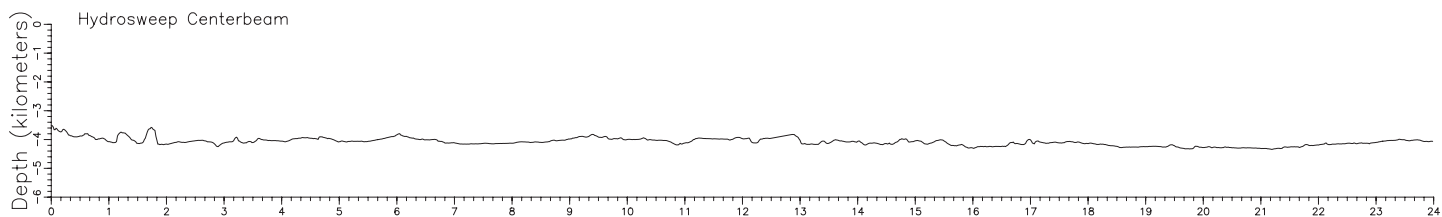
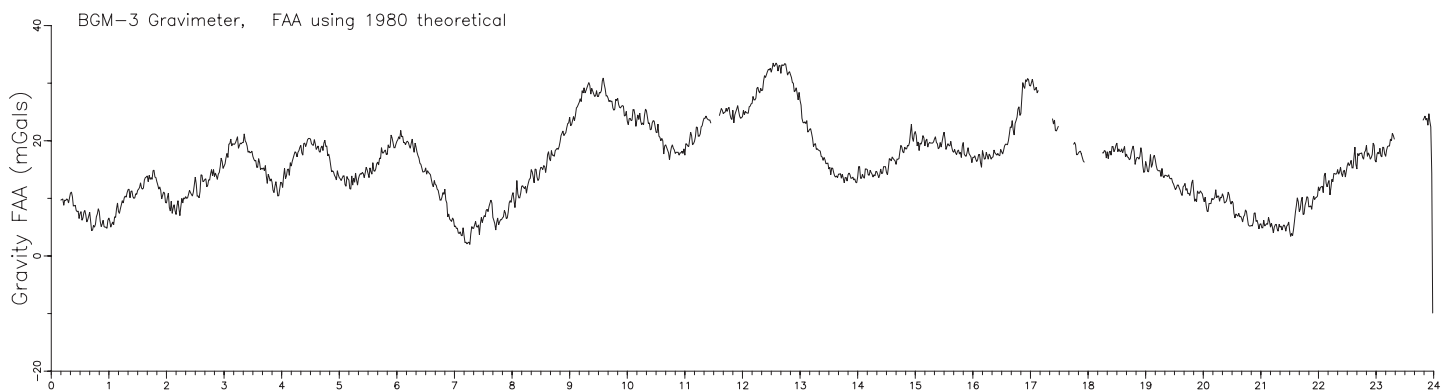
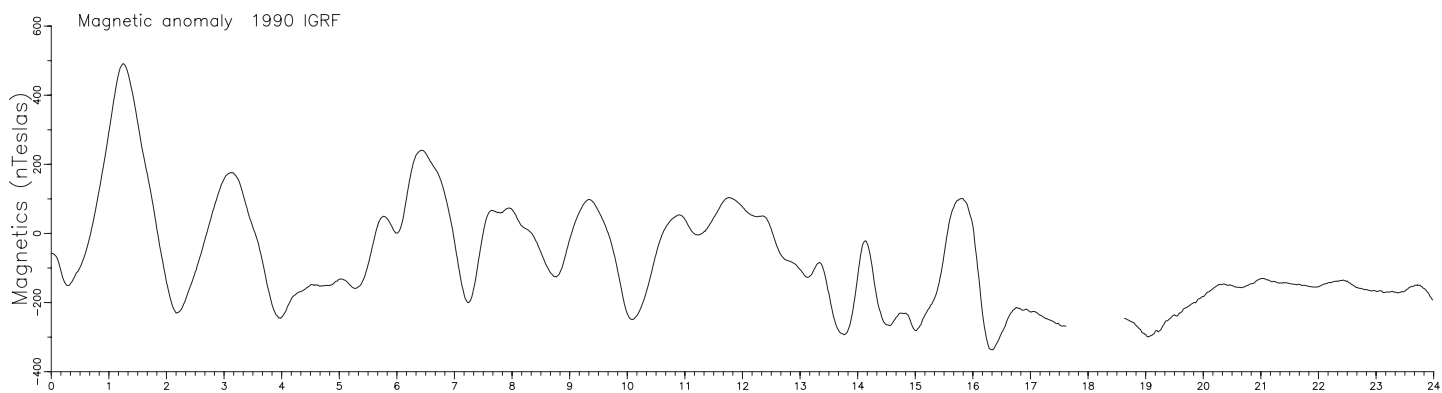
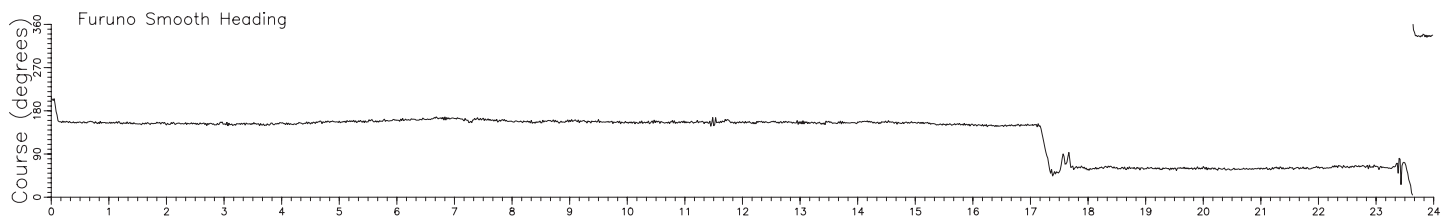
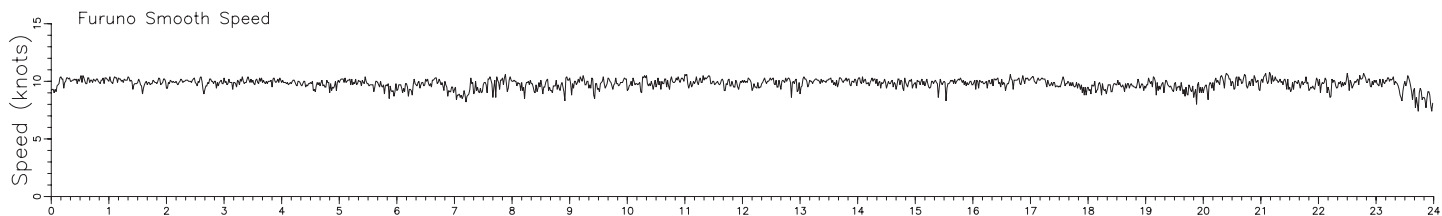
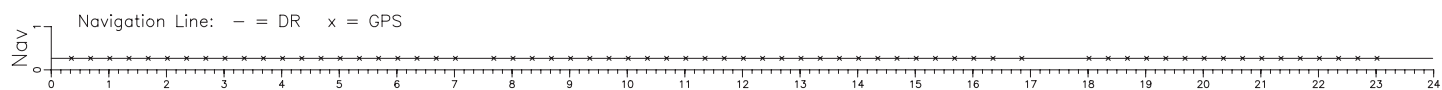
EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.016 Speed/Course file: fu.s016 Magnetics file: mg.n016 Gravity file: vt.n016 Bathymetry file: hb.n016



EW9513 Auckland, New Zealand – Lyttelton, New Zealand

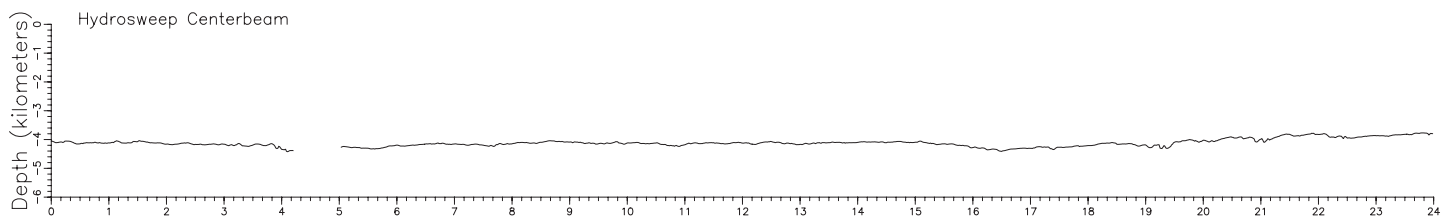
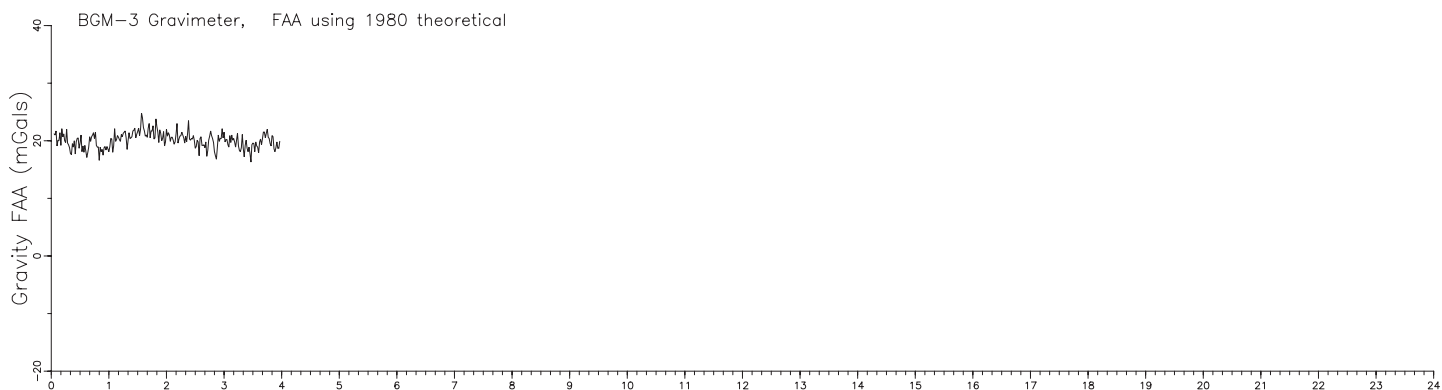
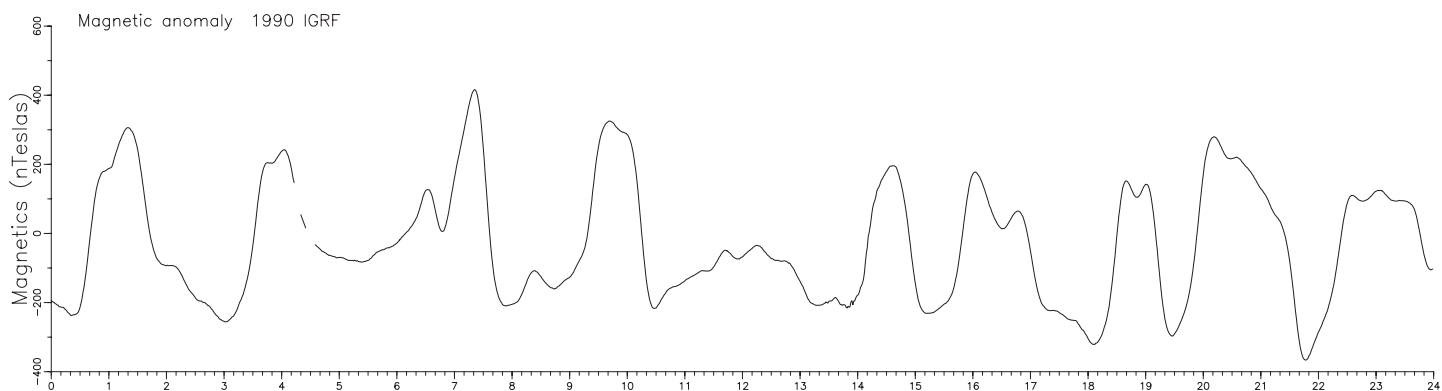
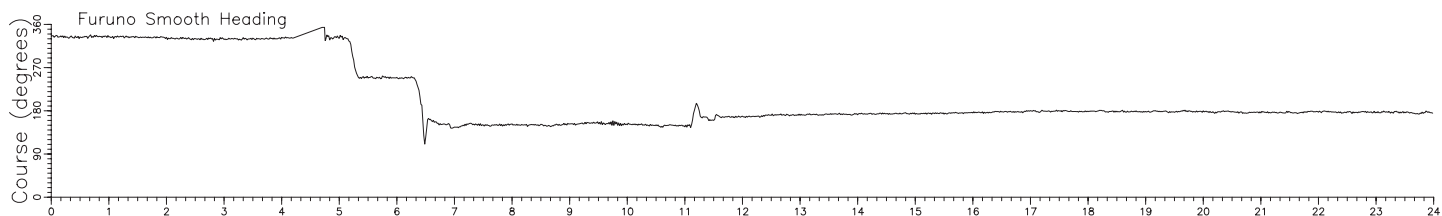
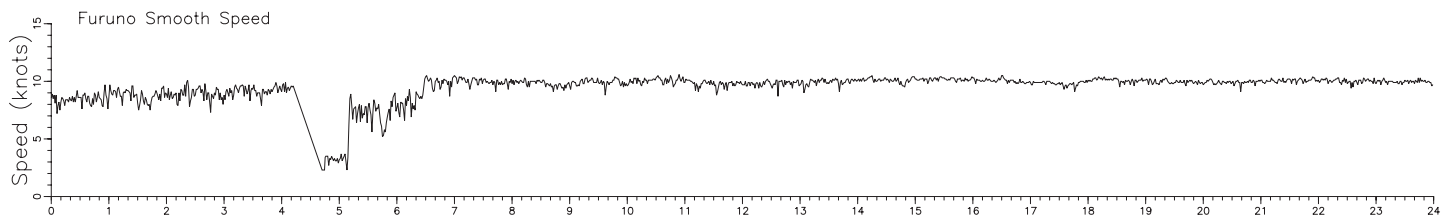
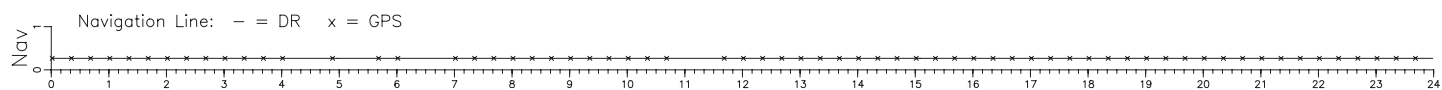
Navigation file: n.017 Speed/Course file: fu.s017 Magnetics file: mg.n017 Gravity file: vt.n017 Bathymetry file: hb.n017



Day 017 / 1-17-96

EW9513 Auckland, New Zealand – Lyttelton, New Zealand

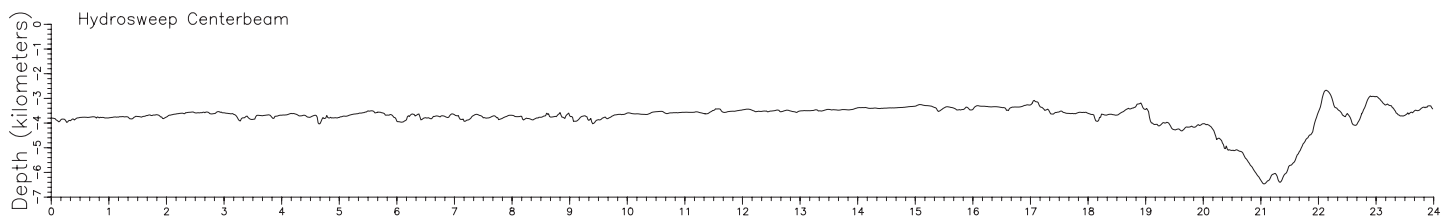
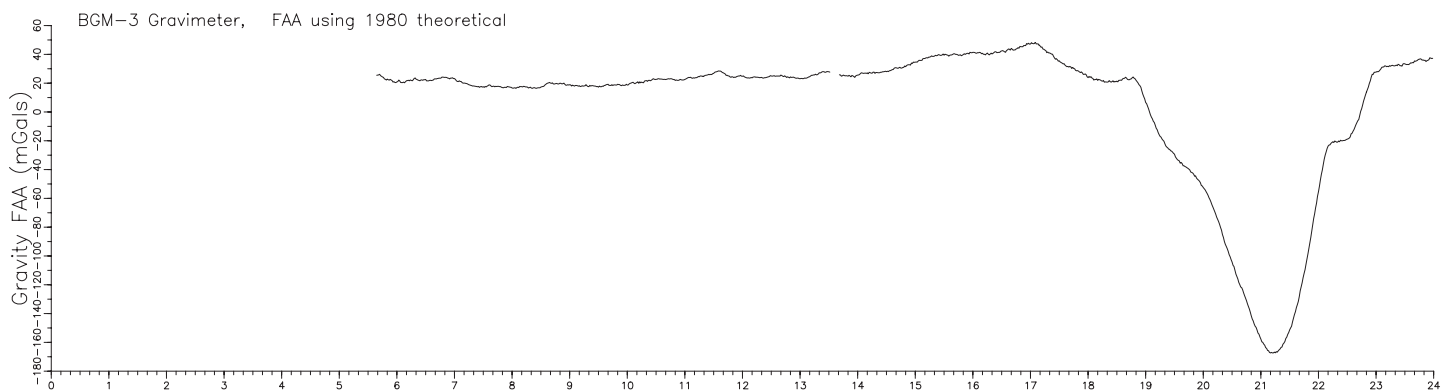
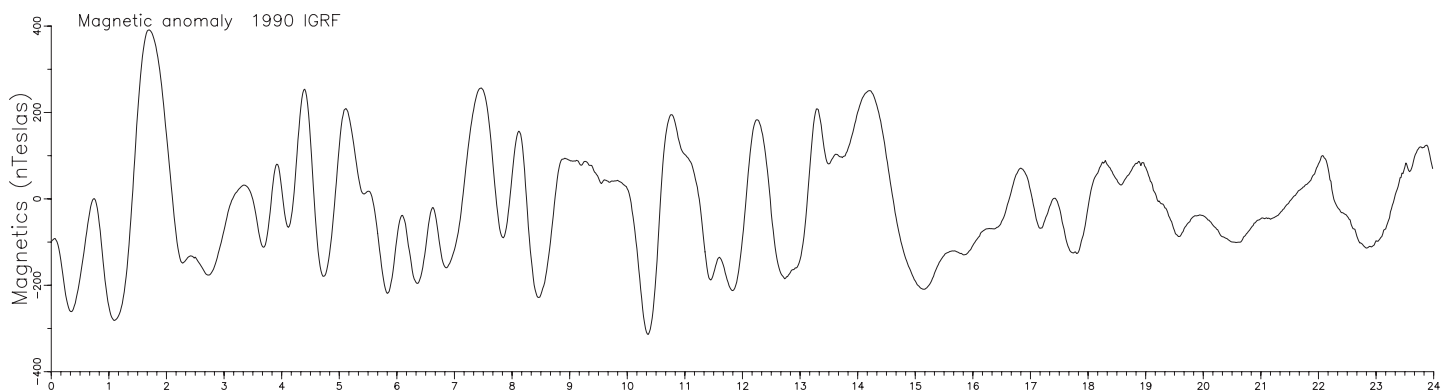
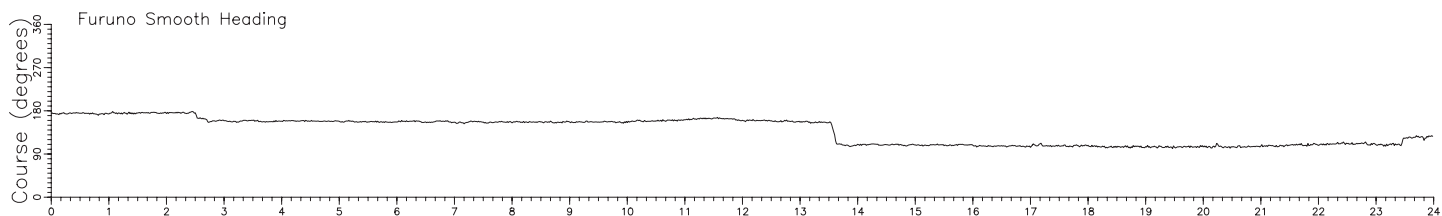
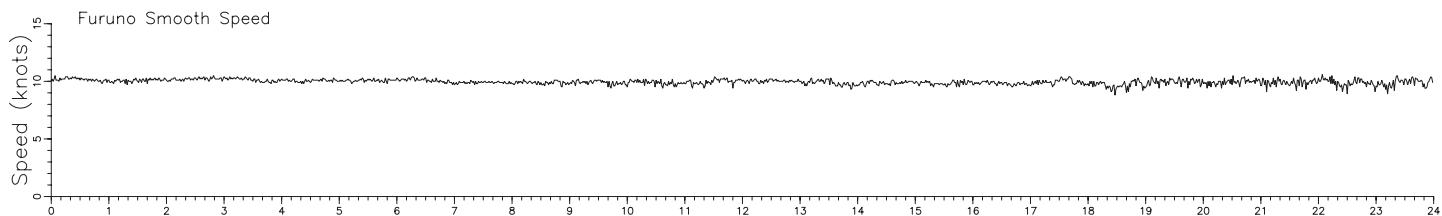
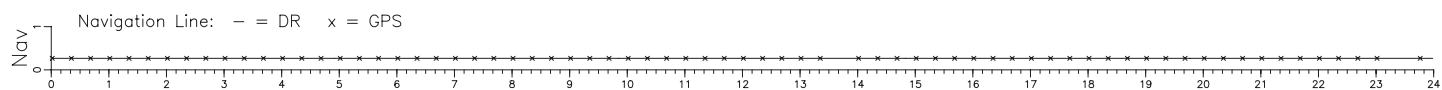
Navigation file: n.018 Speed/Course file: fu.s018 Magnetics file: mg.n018 Gravity file: vt.n018 Bathymetry file: hb.n018



Day 018 / 1-18-96

EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.019 Speed/Course file: fu.s019 Magnetics file: mg.n019 Gravity file: vt.n019 Bathymetry file: hb.n019



Day 019 / 1-19-96

EW9513 Auckland, New Zealand – Lyttelton, New Zealand

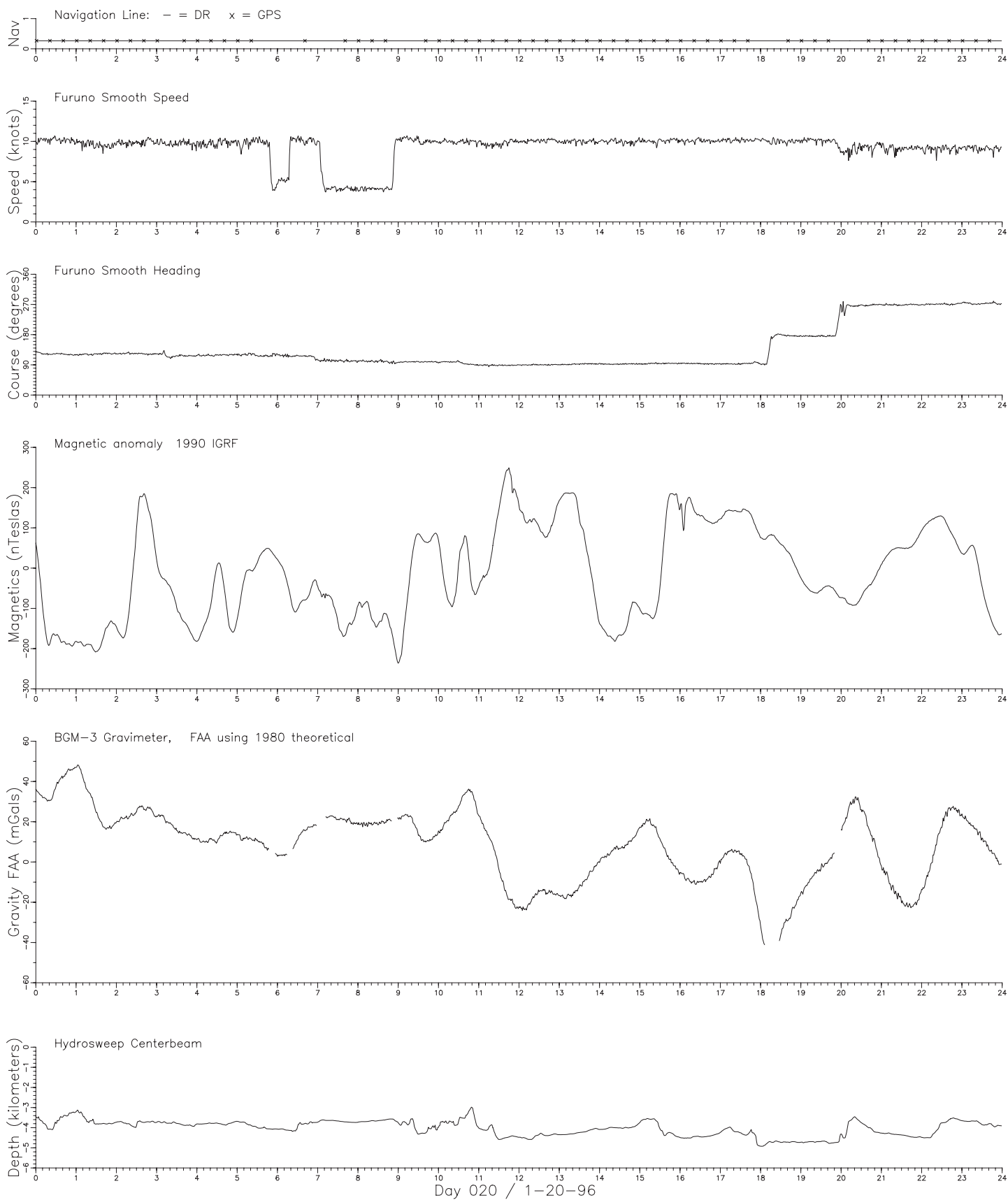
Navigation file: n.020

Speed/Course file: fu.s020

Magnetics file: mg.n020

Gravity file: vt.n020

Bathymetry file: hb.n020



EW9513 Auckland, New Zealand – Lyttelton, New Zealand

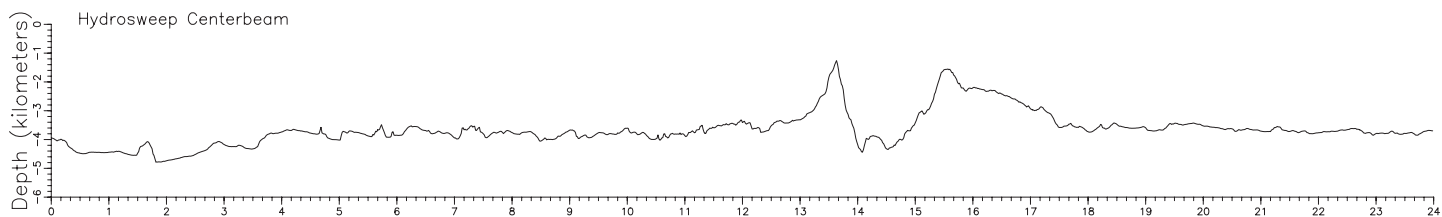
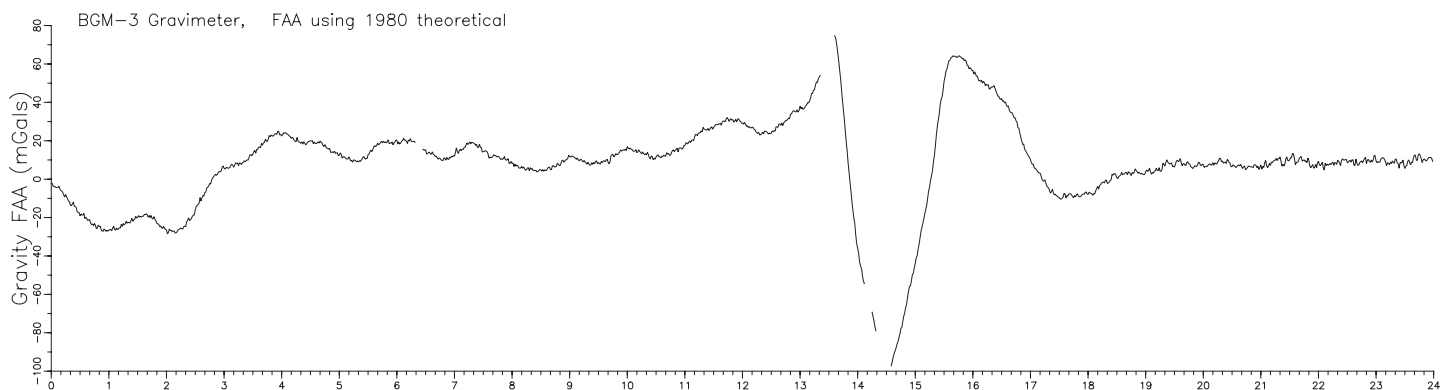
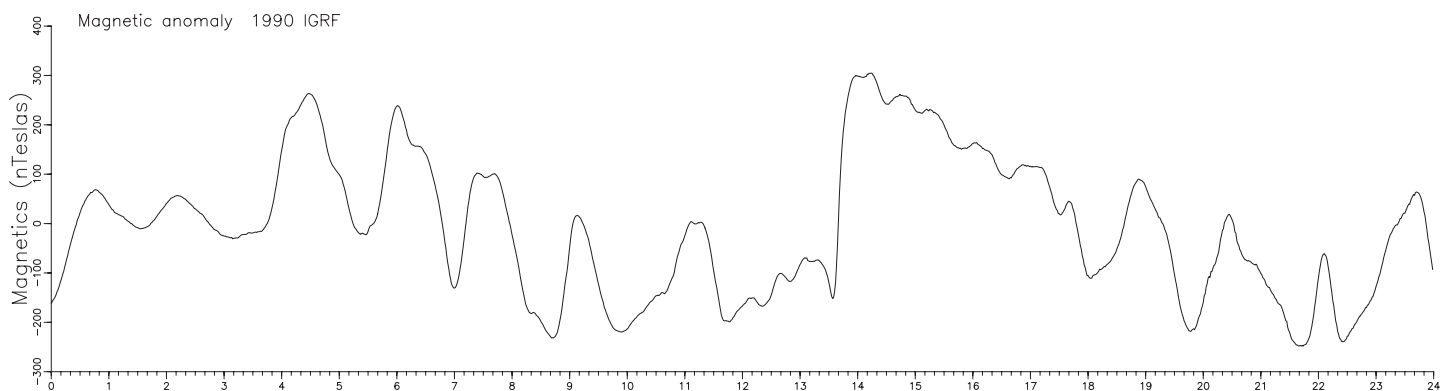
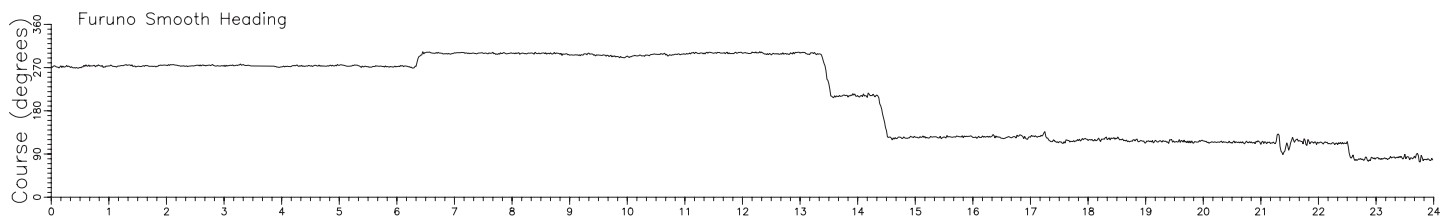
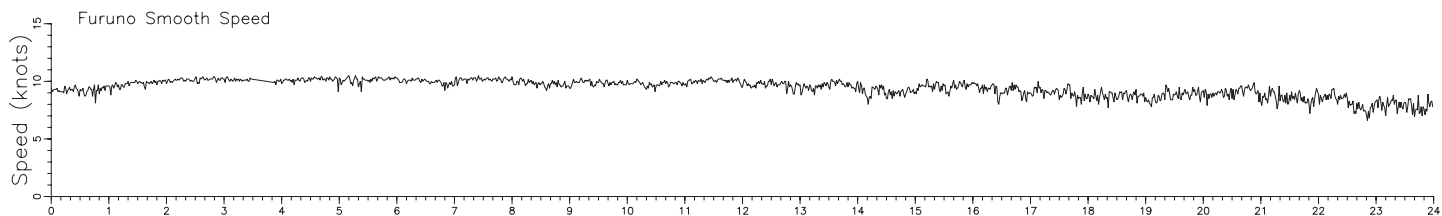
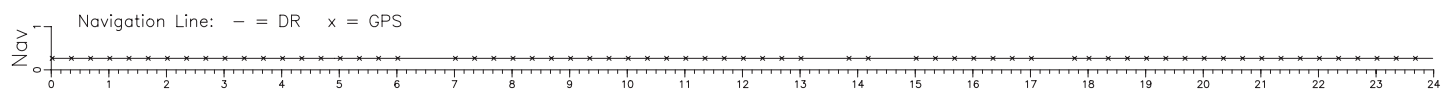
Navigation file: n.021

Speed/Course file: fu.s021

Magnetics file: mg.n021

Gravity file: vt.n021

Bathymetry file: hb.n021



Day 021 / 1-21-96

EW9513 Auckland, New Zealand – Lyttelton, New Zealand

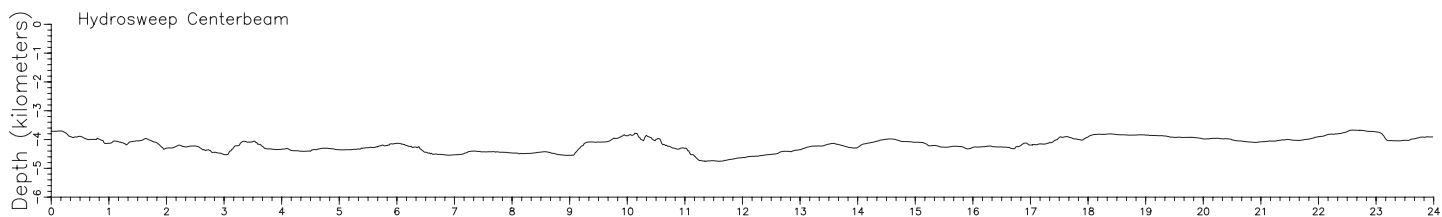
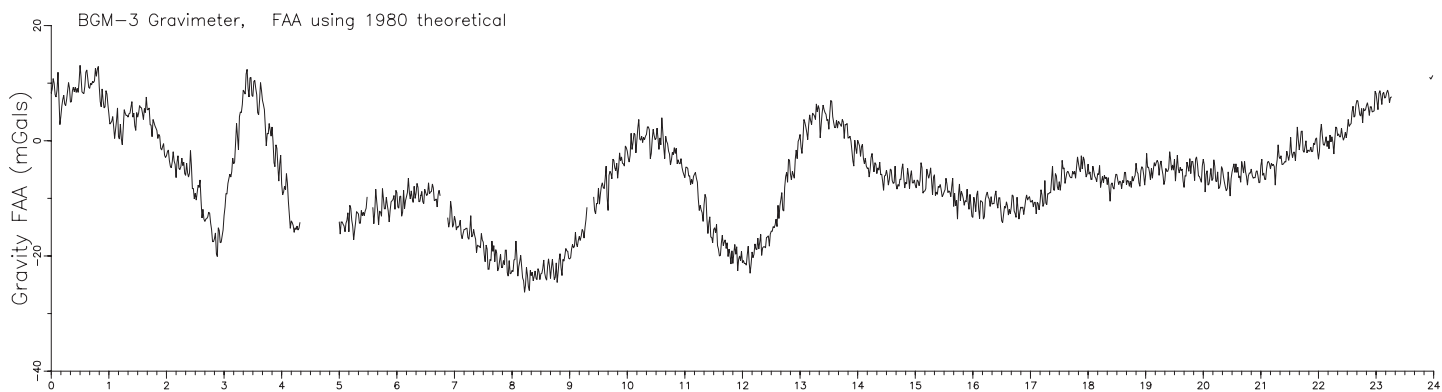
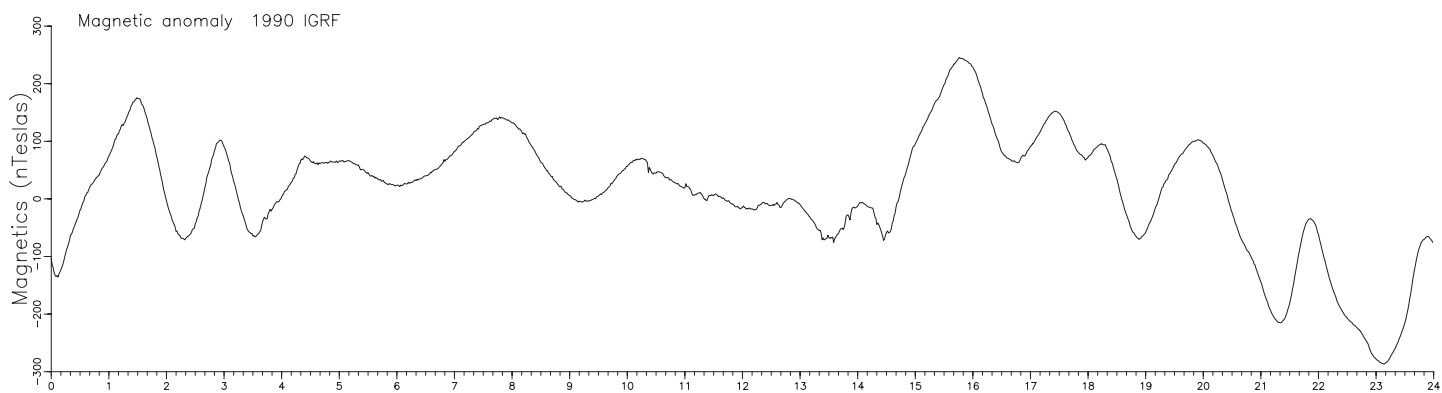
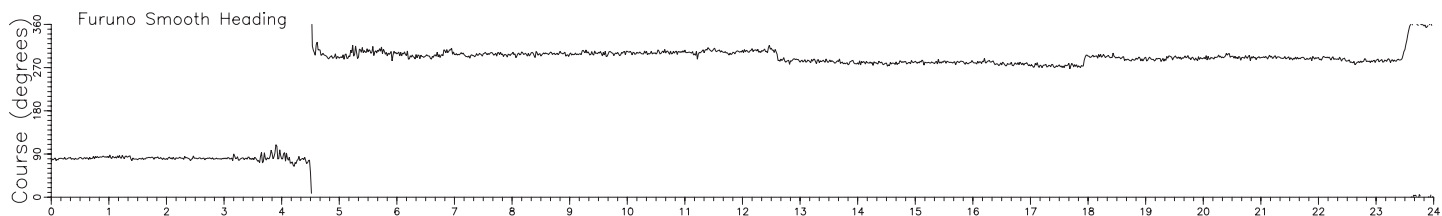
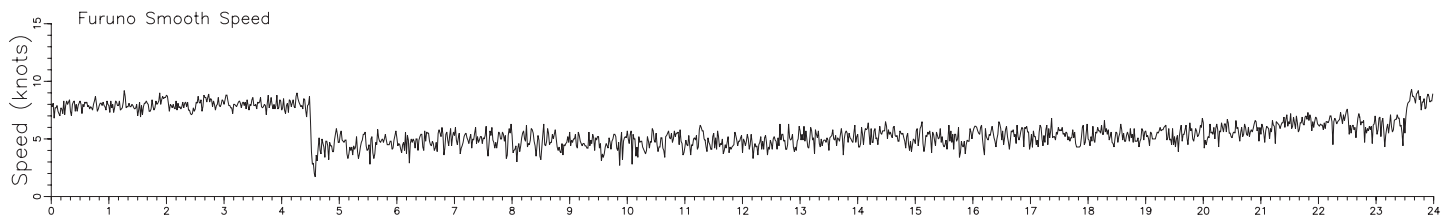
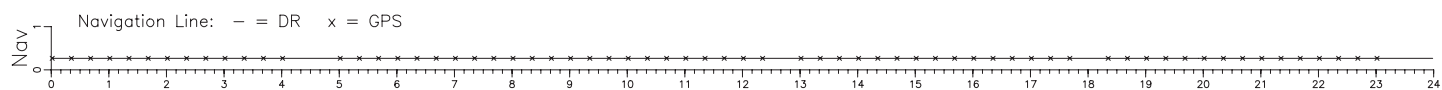
Navigation file: n.022

Speed/Course file: fu.s022

Magnetics file: mg.n022

Gravity file: vt.n022

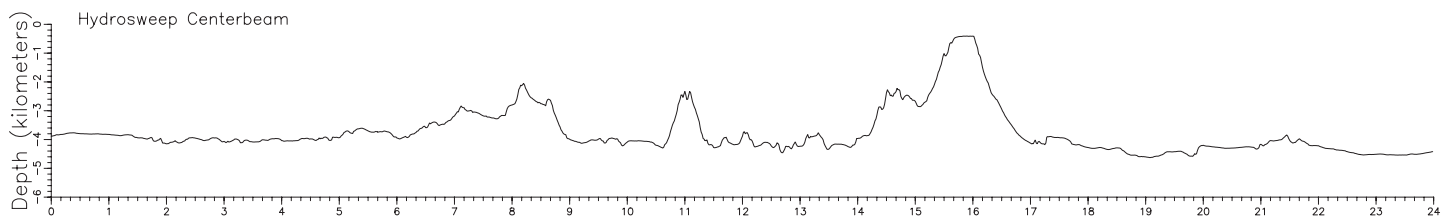
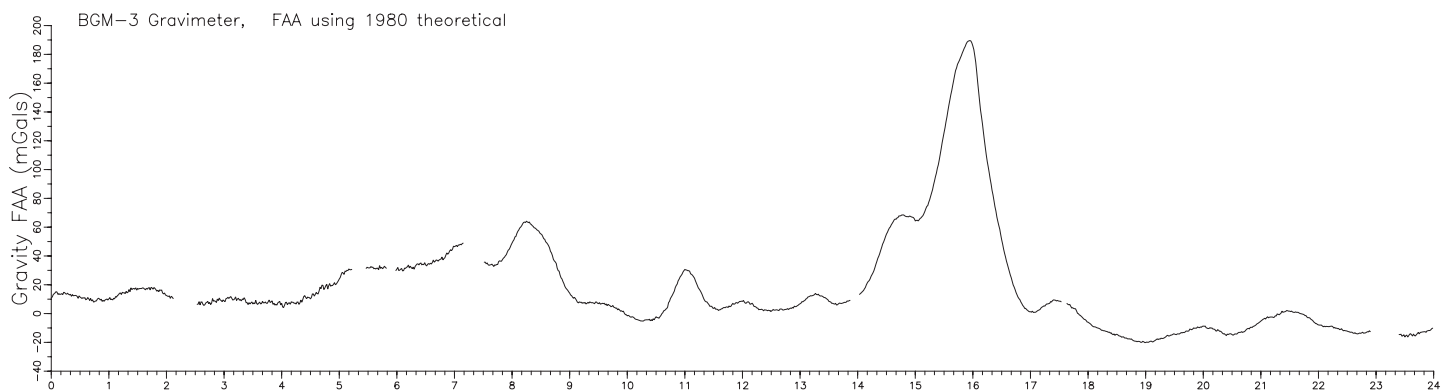
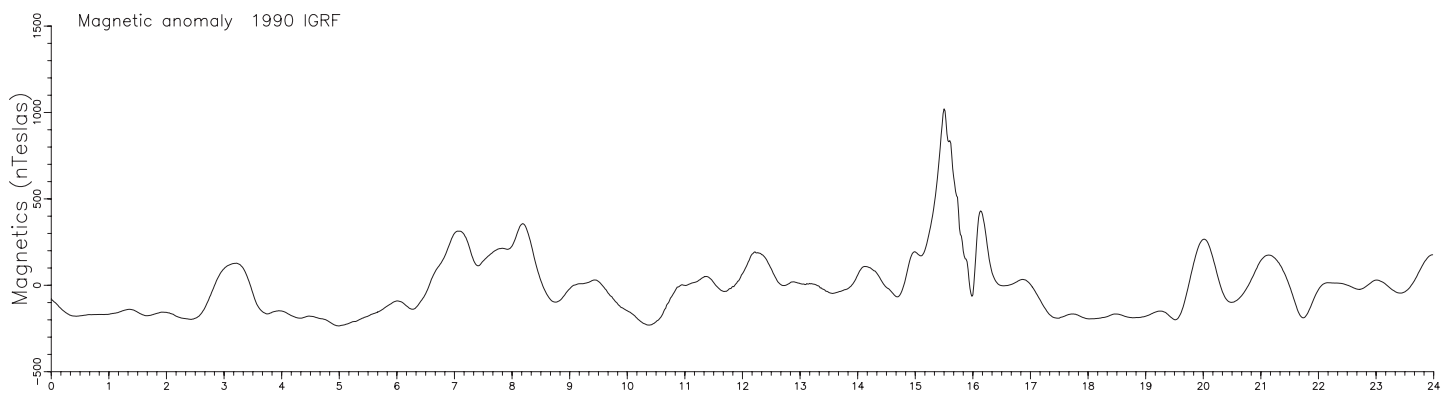
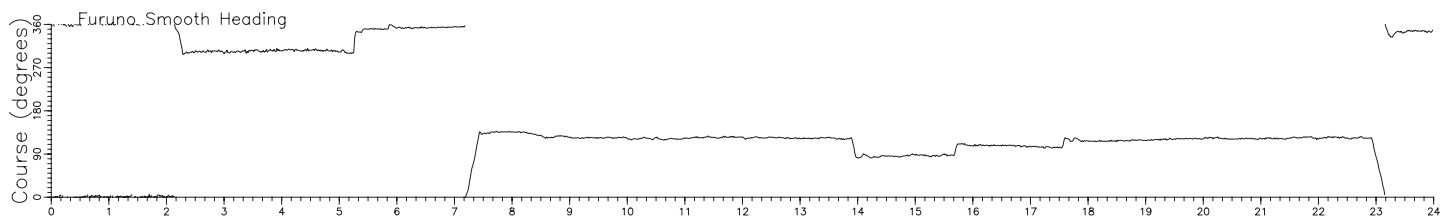
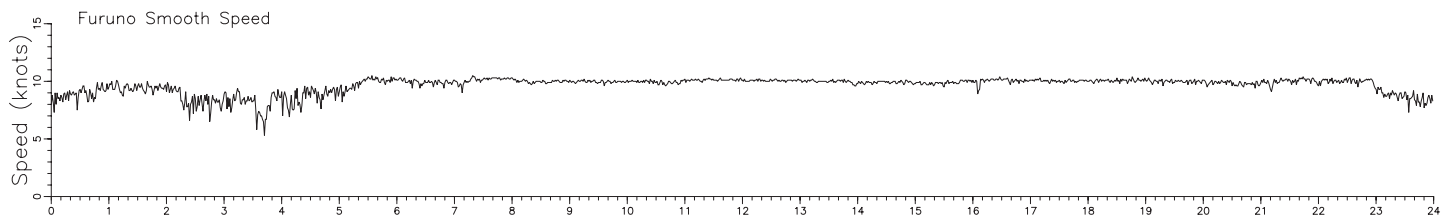
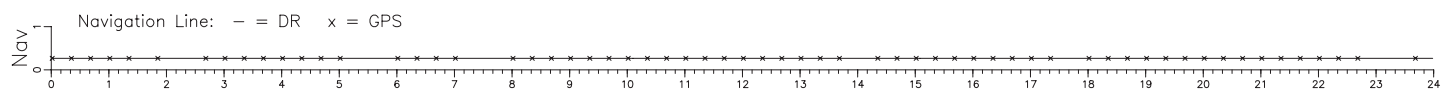
Bathymetry file: hb.n022



Day 022 / 1-22-96

EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.023 Speed/Course file: fu.s023 Magnetics file: mg.n023 Gravity file: vt.n023 Bathymetry file: hb.n023



Day 023 / 1-23-96

EW9513 Auckland, New Zealand – Lyttelton, New Zealand

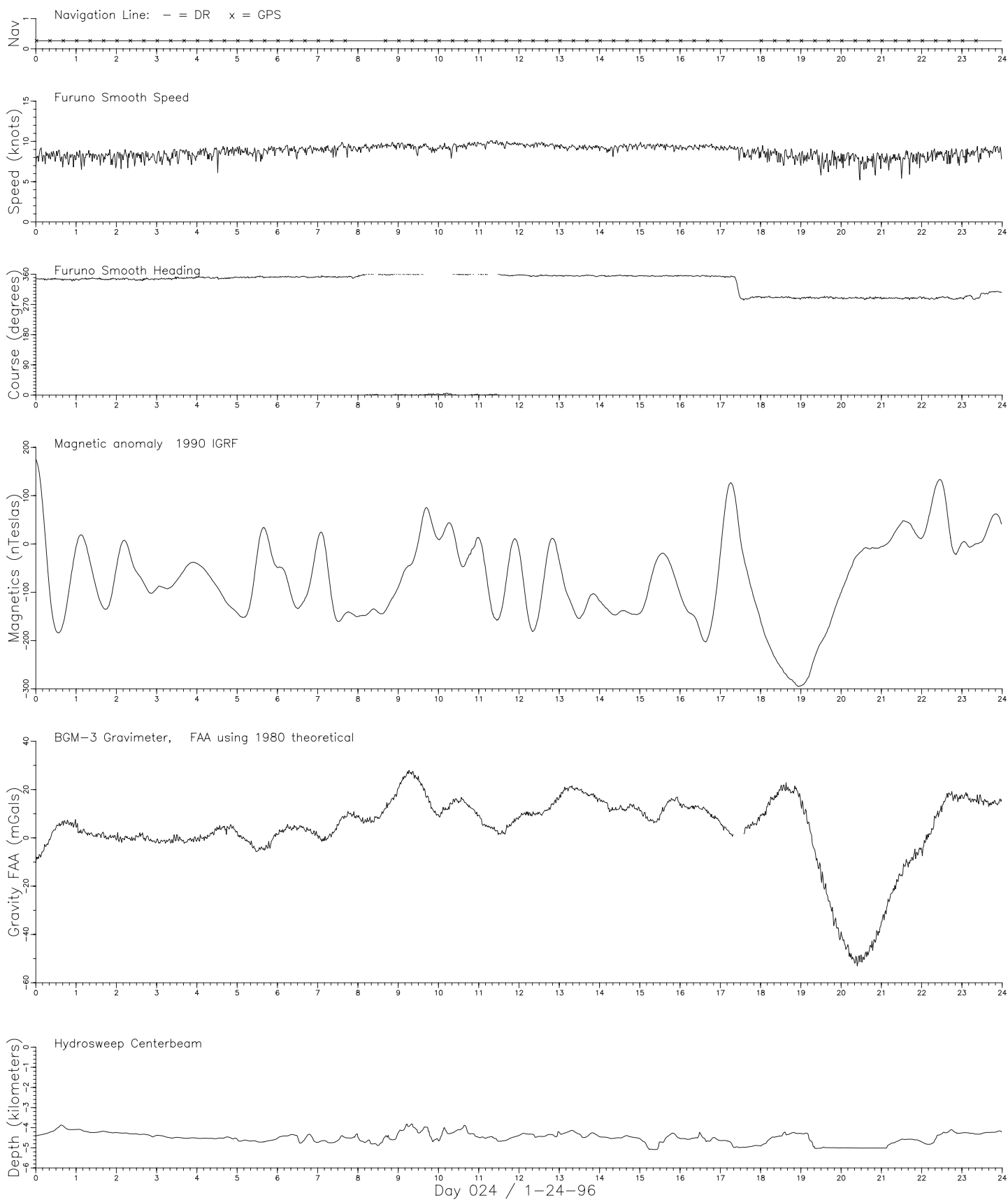
Navigation file: n.024

Speed/Course file: fu.s024

Magnetics file: mg.n024

Gravity file: vt.n024

Bathymetry file: hb.n024



EW9513 Auckland, New Zealand – Lyttelton, New Zealand

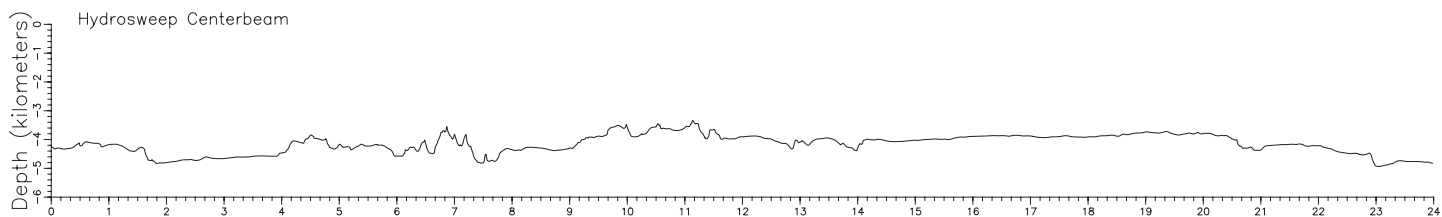
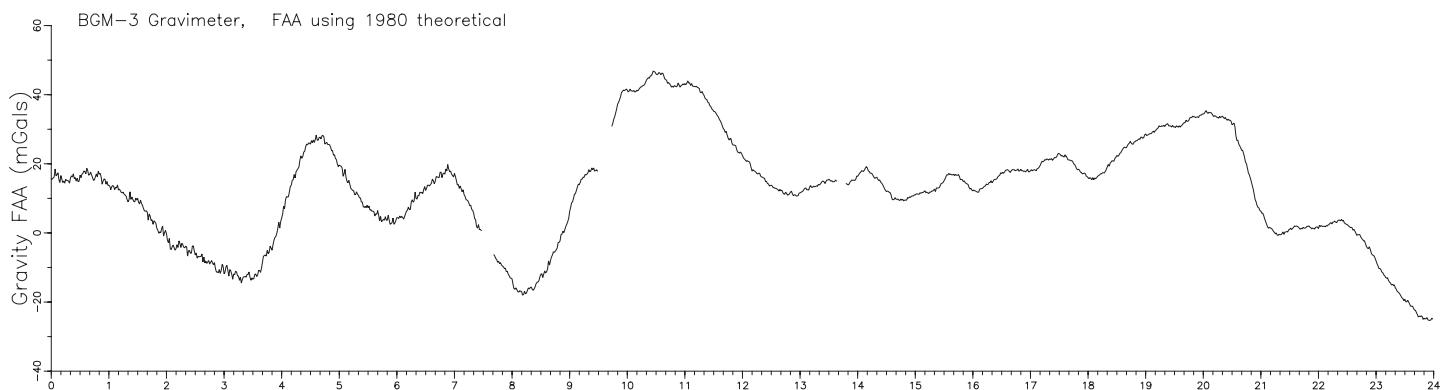
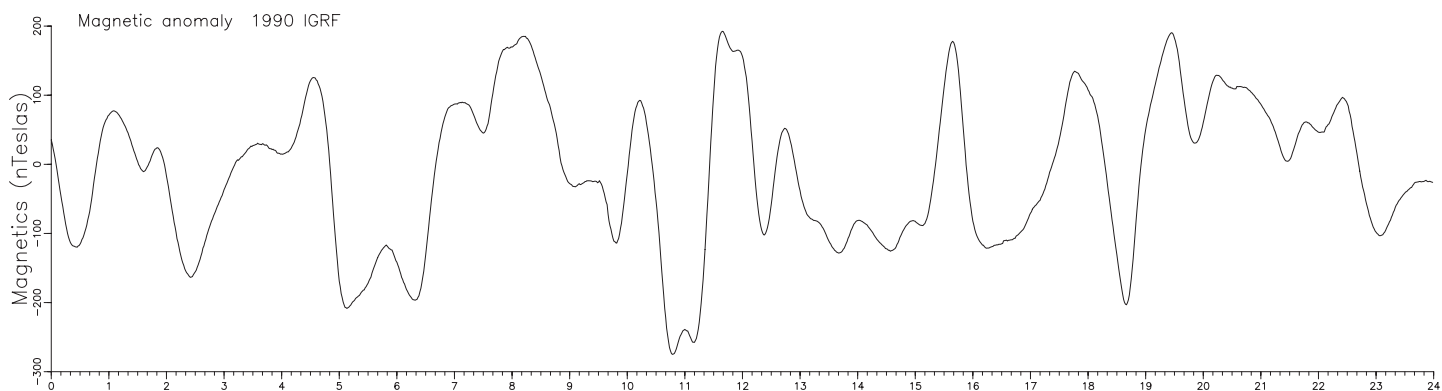
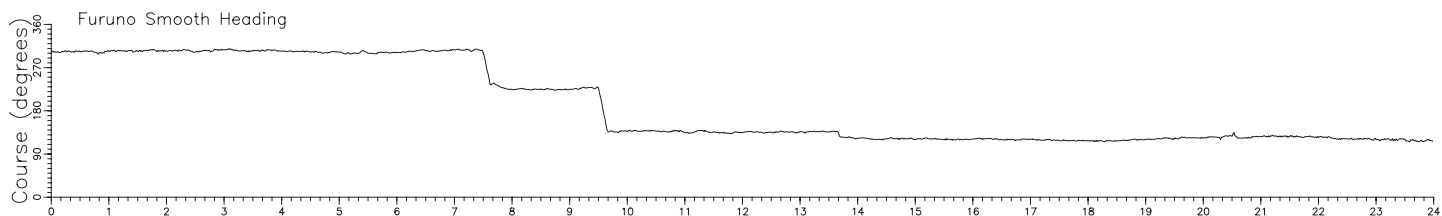
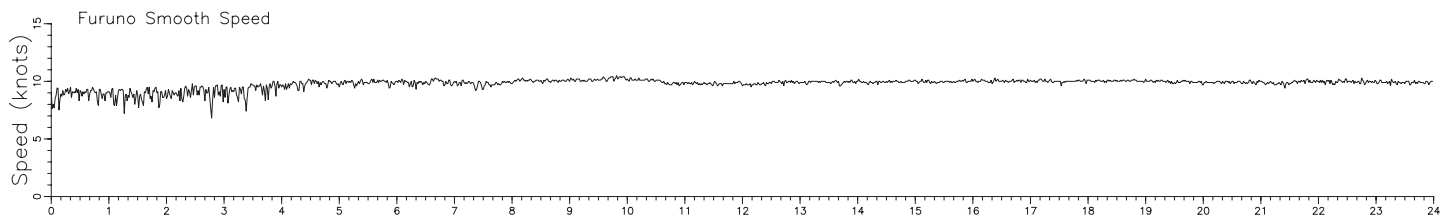
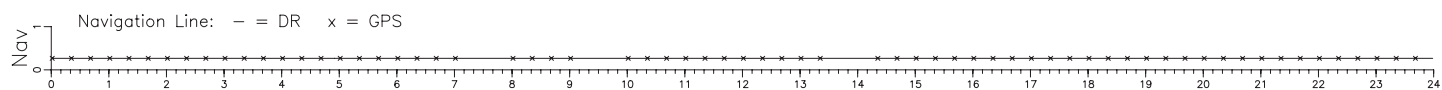
Navigation file: n.025

Speed/Course file: fu.s025

Magnetics file: mg.n025

Gravity file: vt.n025

Bathymetry file: hb.n025



Day 025 / 1-25-96

EW9513 Auckland, New Zealand – Lyttelton, New Zealand

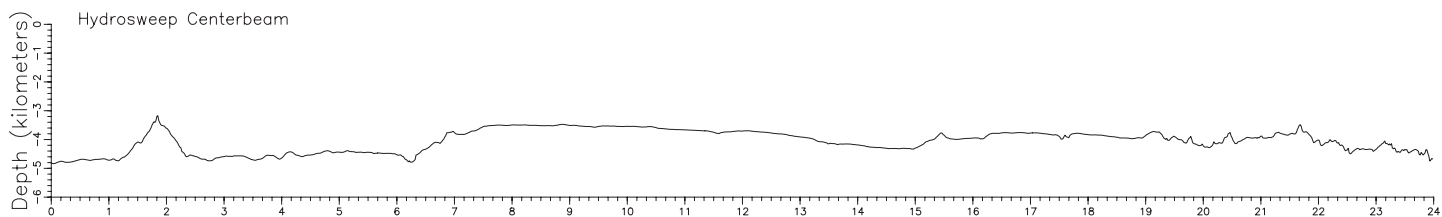
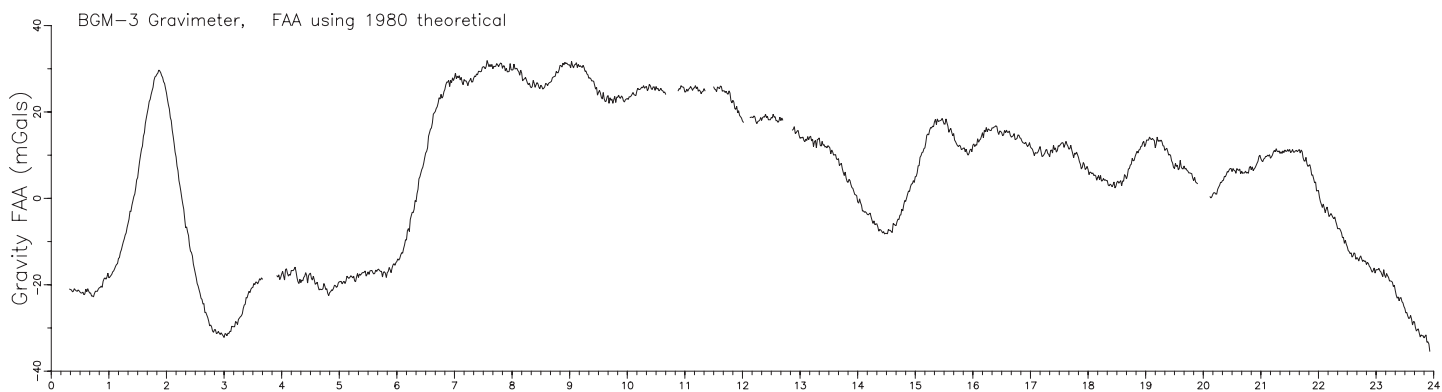
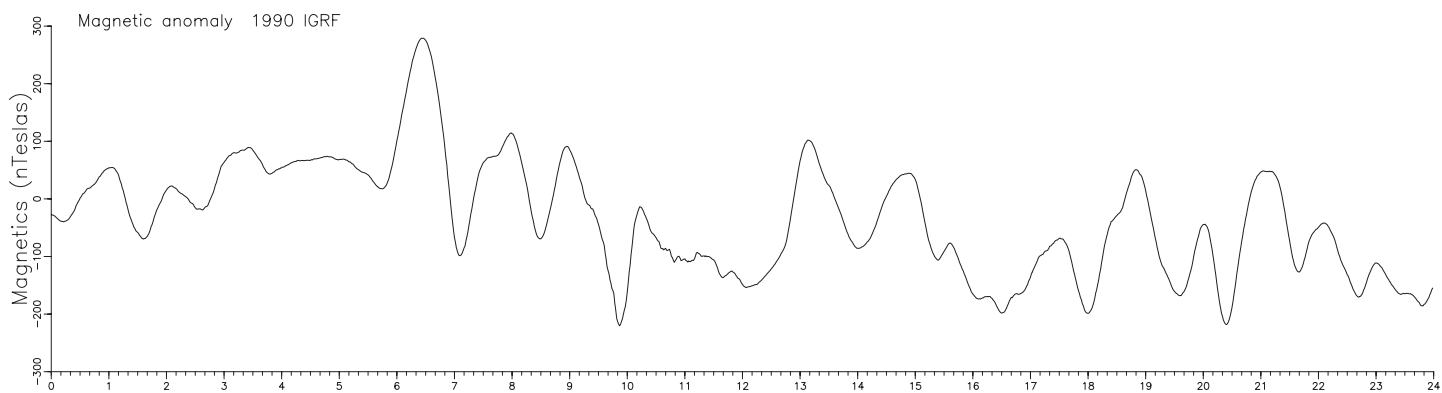
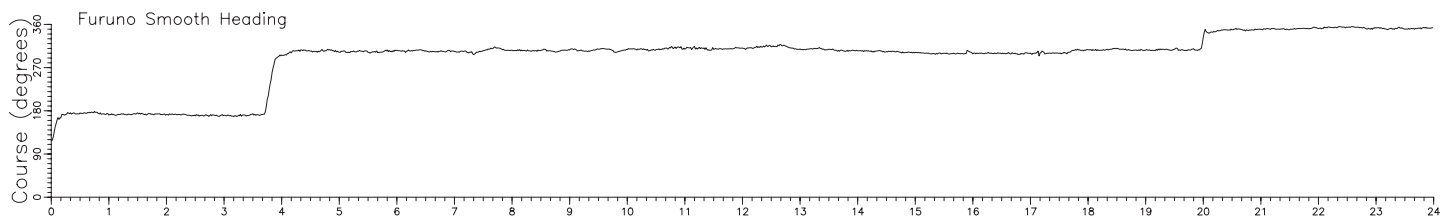
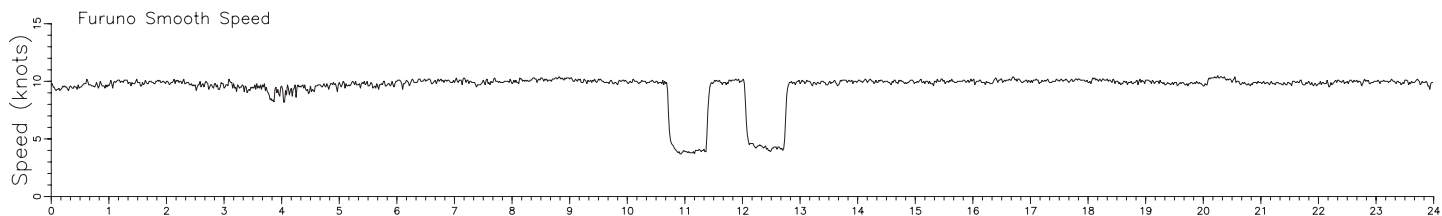
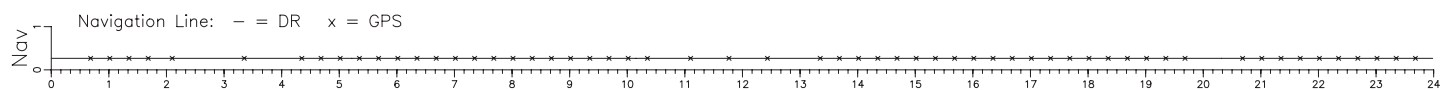
Navigation file: n.026

Speed/Course file: fu.s026

Magnetics file: mg.n026

Gravity file: vt.n026

Bathymetry file: hb.n026



Day 026 / 1-26-96

EW9513 Auckland, New Zealand – Lyttelton, New Zealand

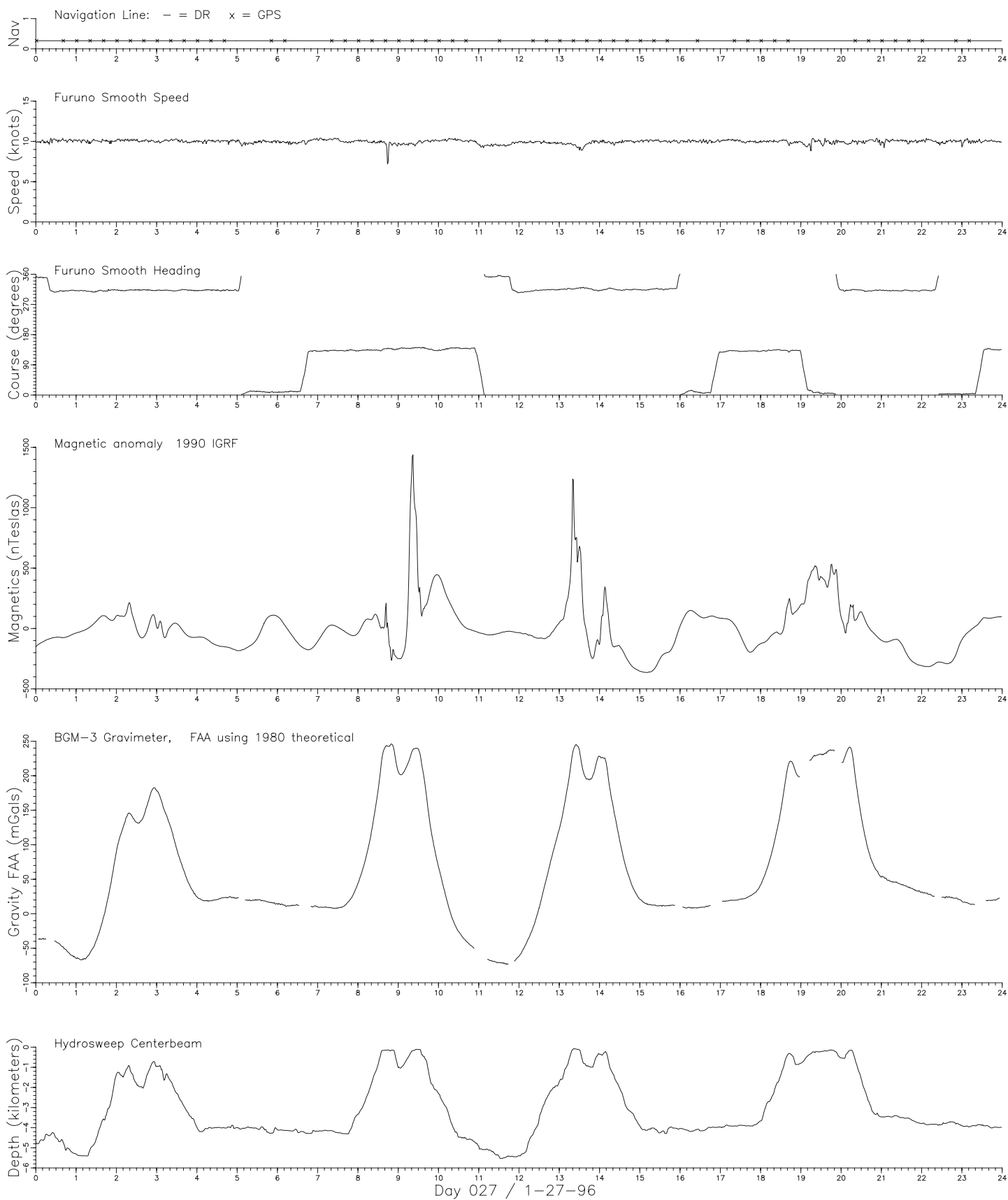
Navigation file: n.027

Speed/Course file: fu.s027

Magnetics file: mg.n027

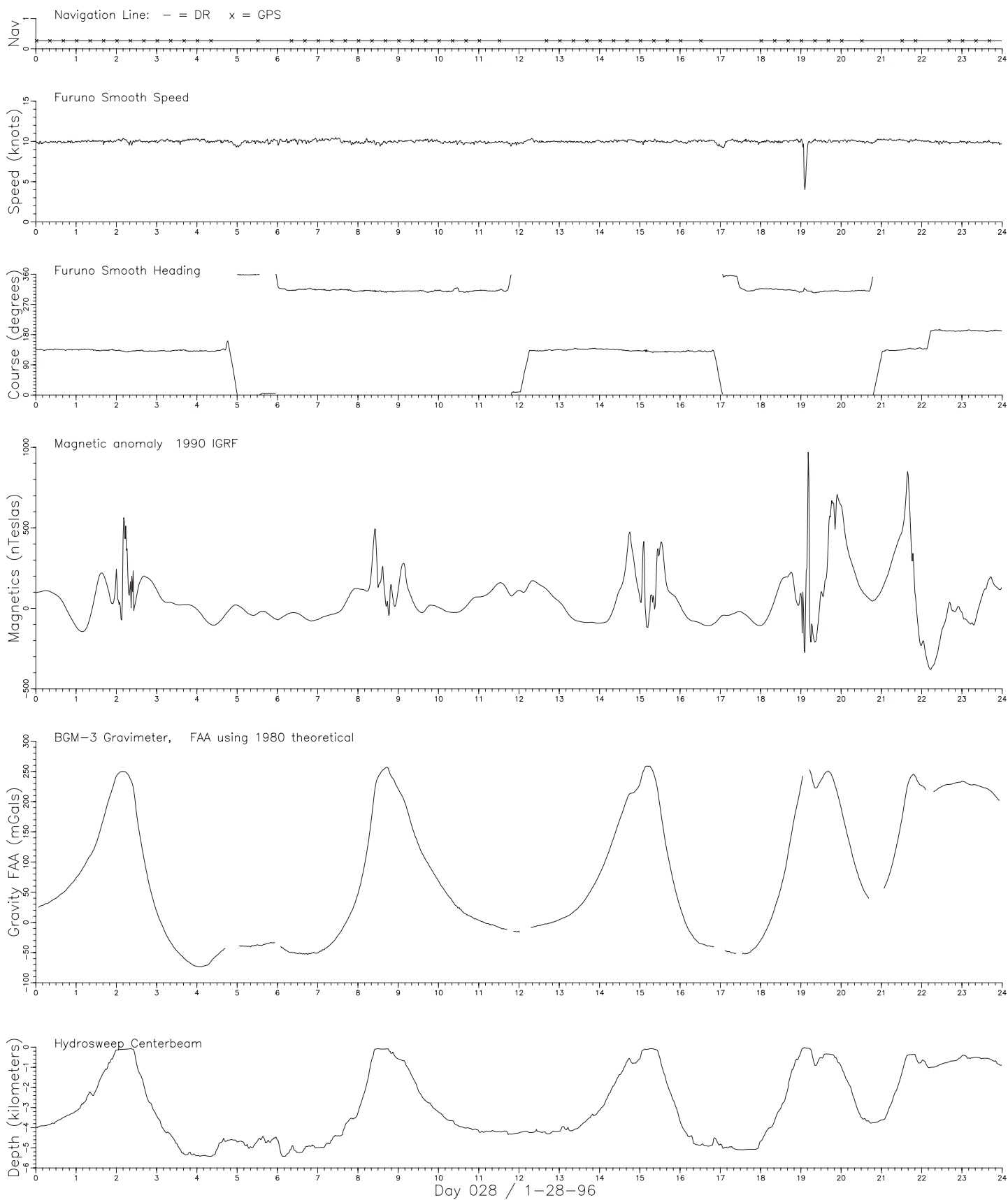
Gravity file: vt.n027

Bathymetry file: hb.n027



EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.028 Speed/Course file: fu.s028 Magnetics file: mg.n028 Gravity file: vt.n028 Bathymetry file: hb.n028



EW9513 Auckland, New Zealand – Lyttelton, New Zealand

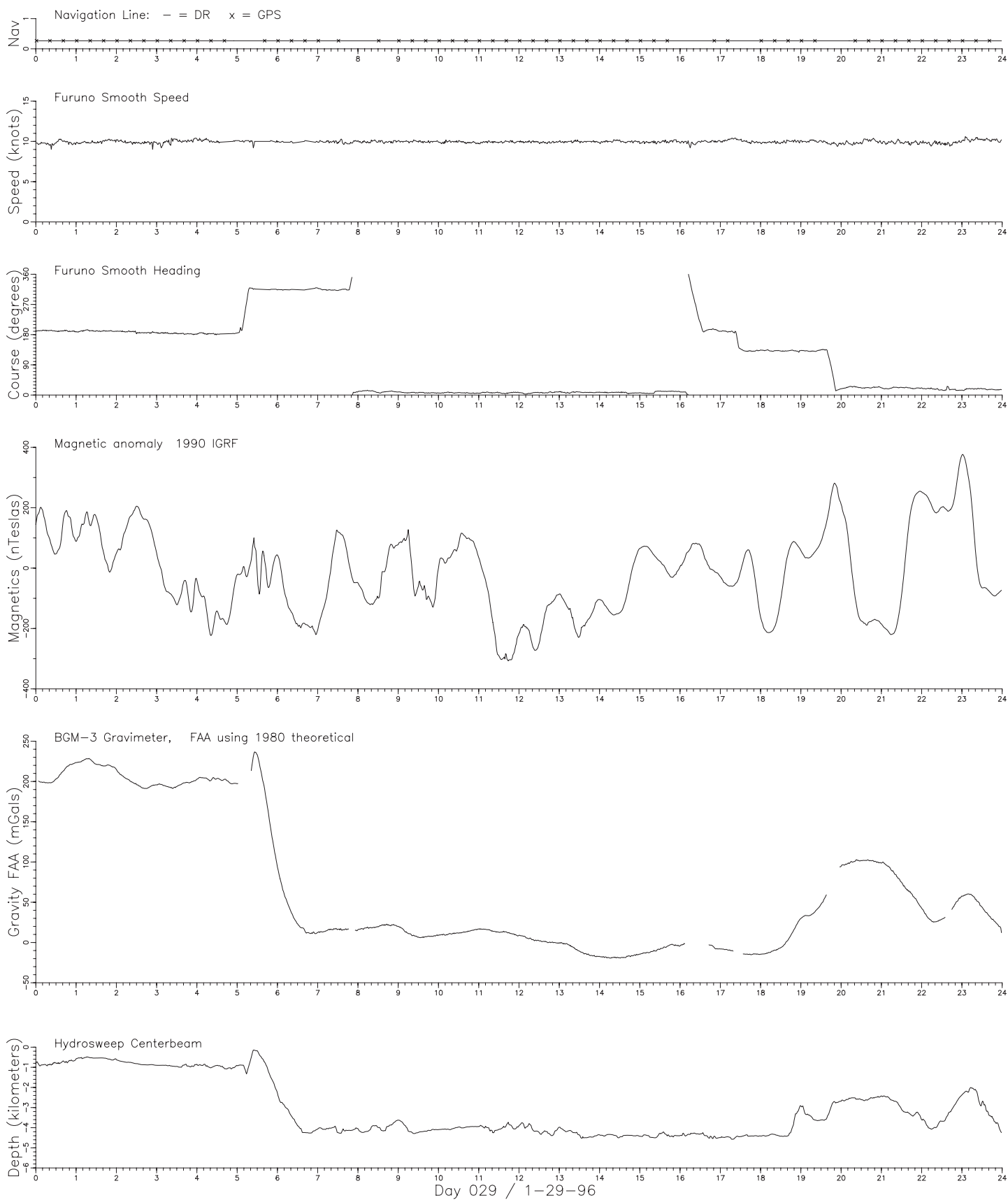
Navigation file: n.029

Speed/Course file: fu.s029

Magnetics file: mg.n029

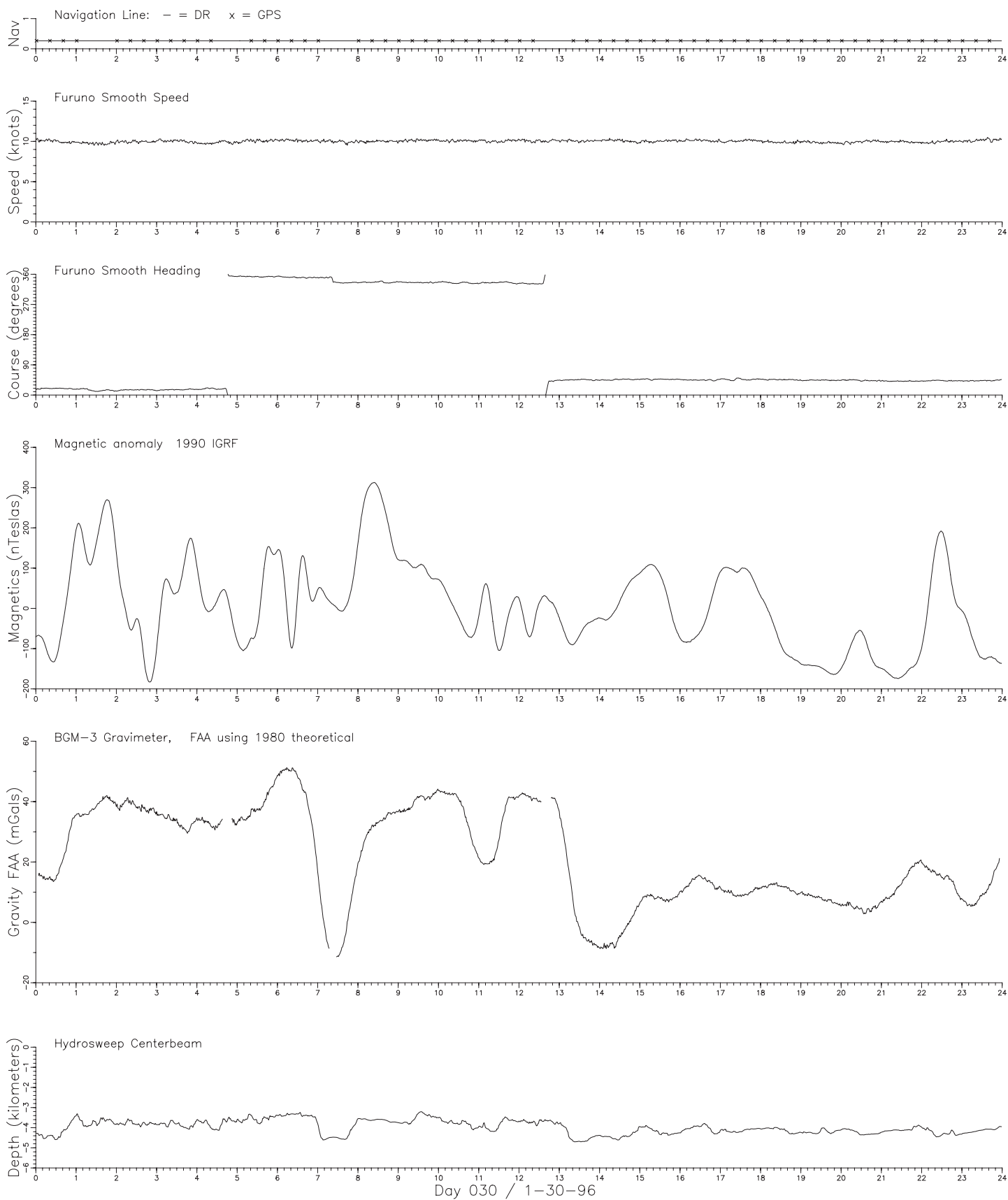
Gravity file: vt.n029

Bathymetry file: hb.n029



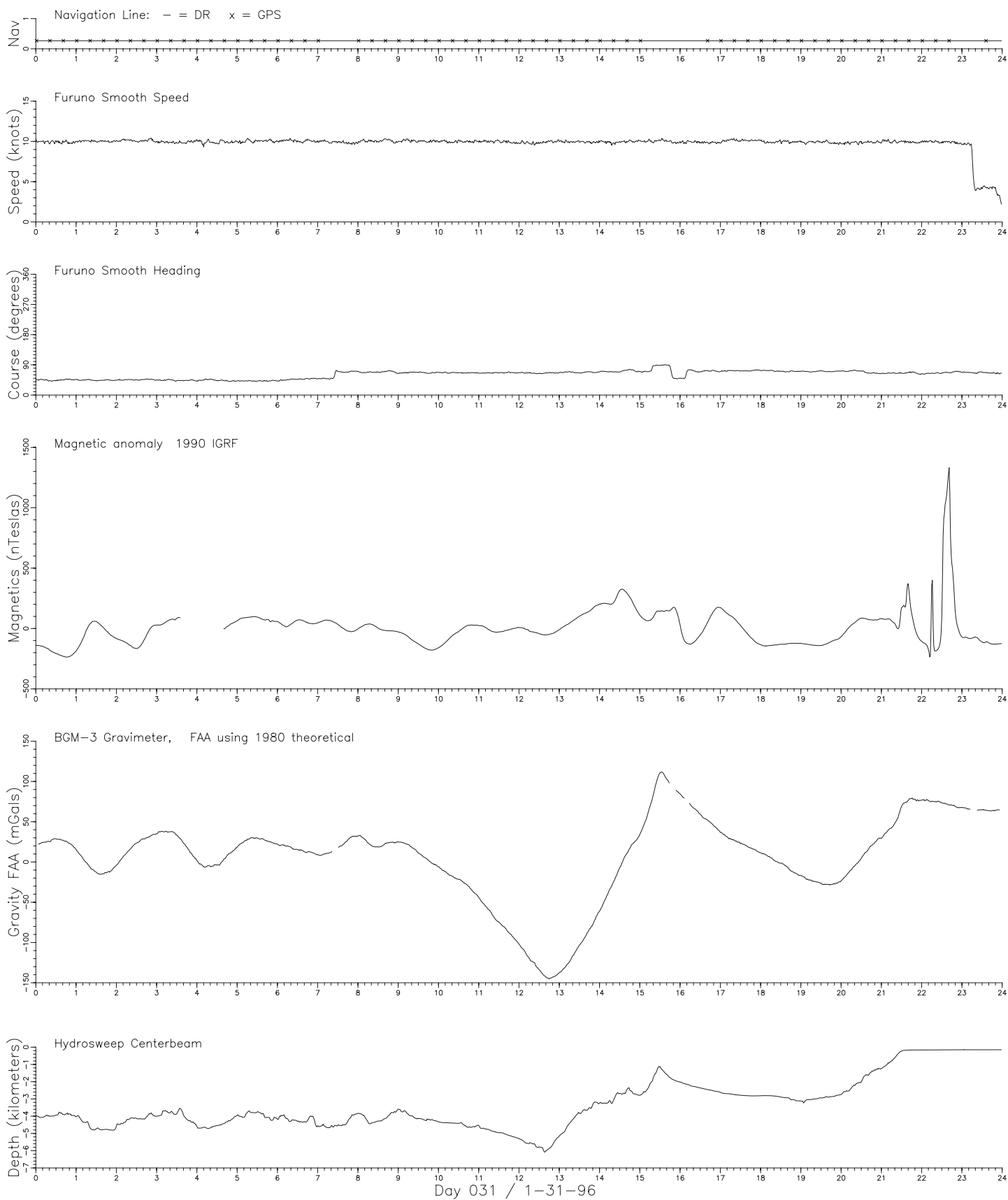
EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.030 Speed/Course file: fu.s030 Magnetics file: mg.n030 Gravity file: vt.n030 Bathymetry file: hb.n030



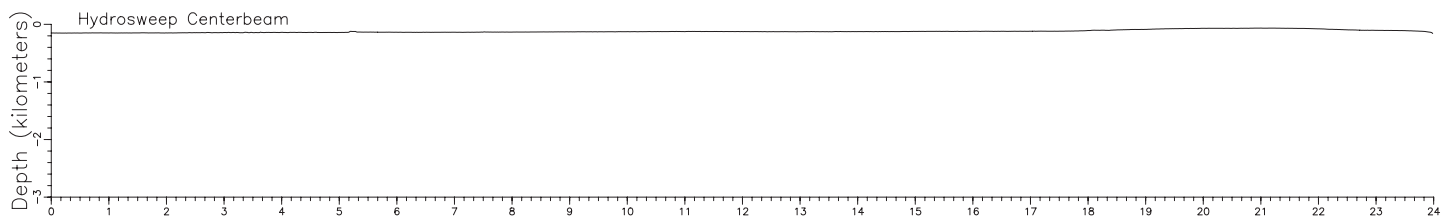
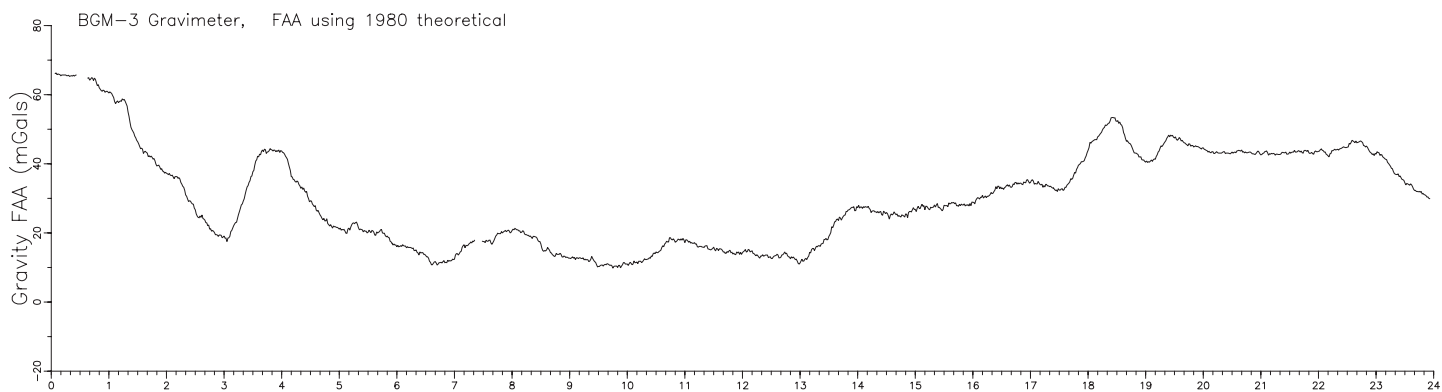
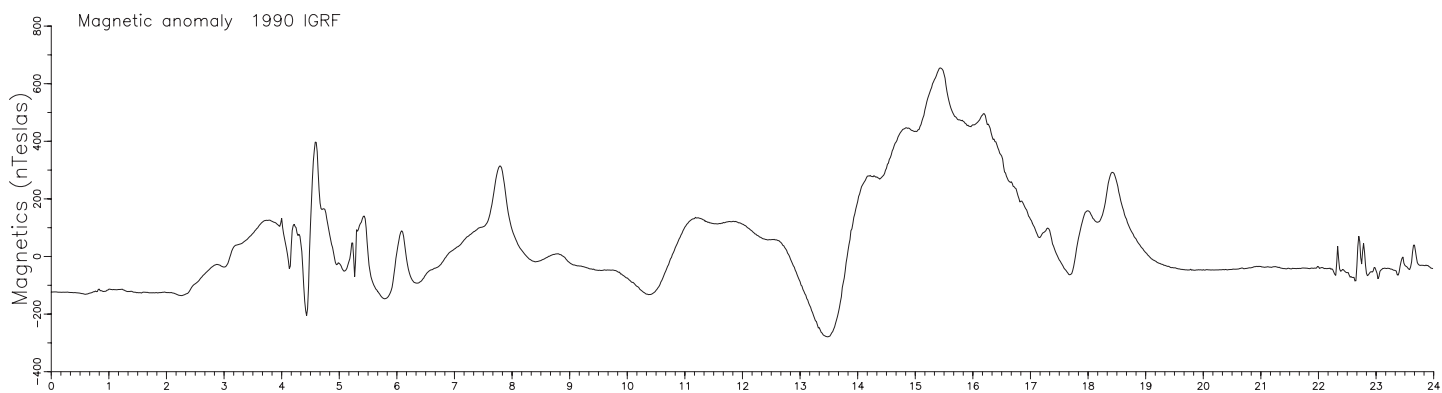
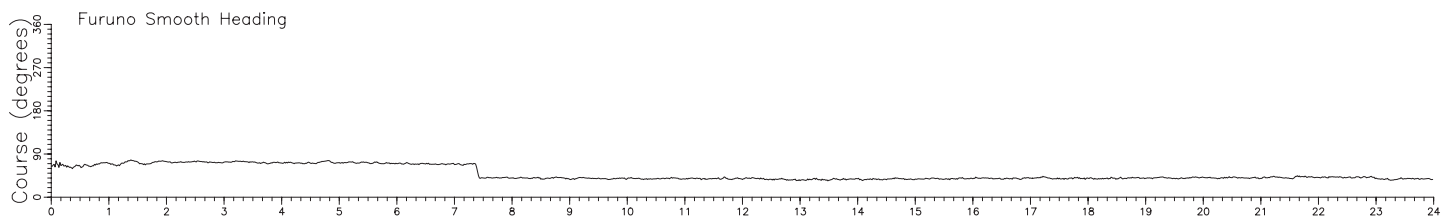
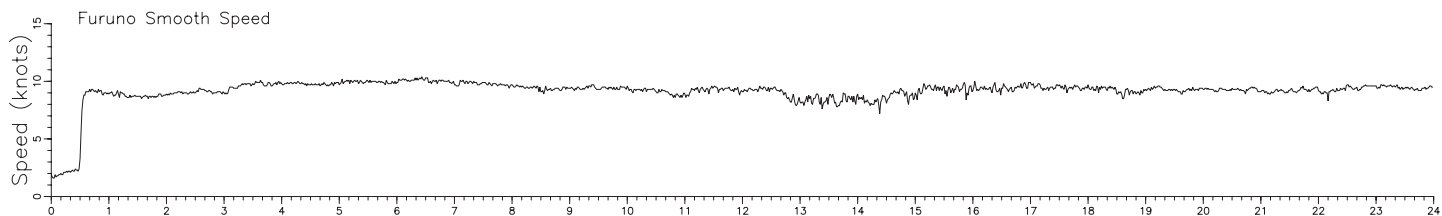
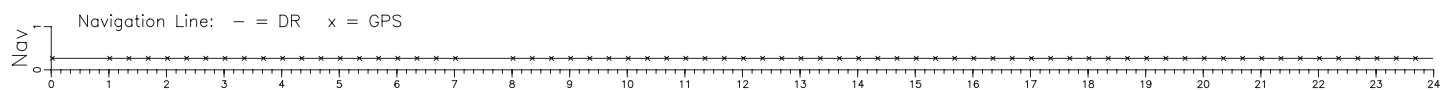
EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.031 Speed/Course file: fu.s031 Magnetics file: mg.n031 Gravity file: vt.n031 Bathymetry file: hb.n031



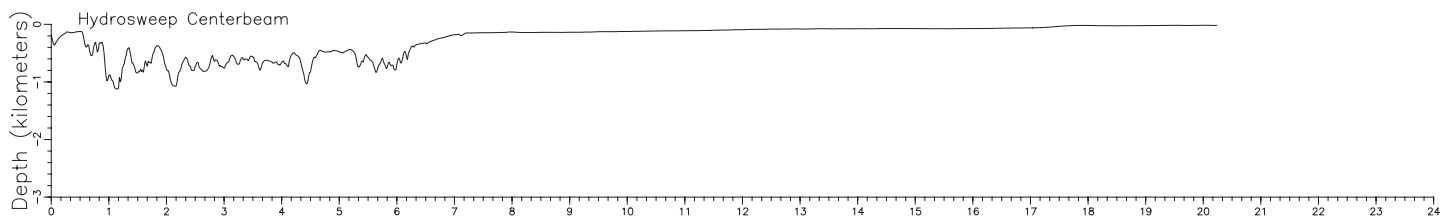
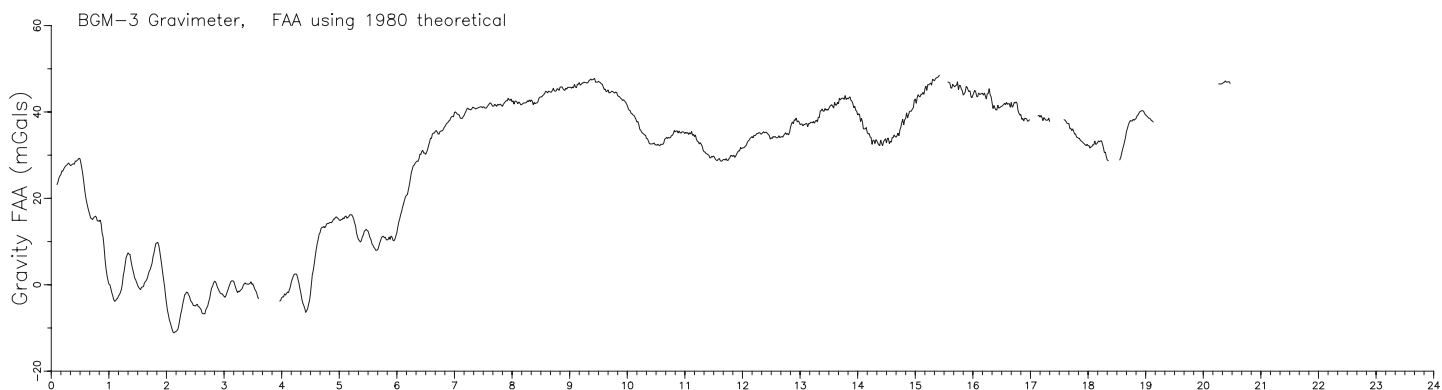
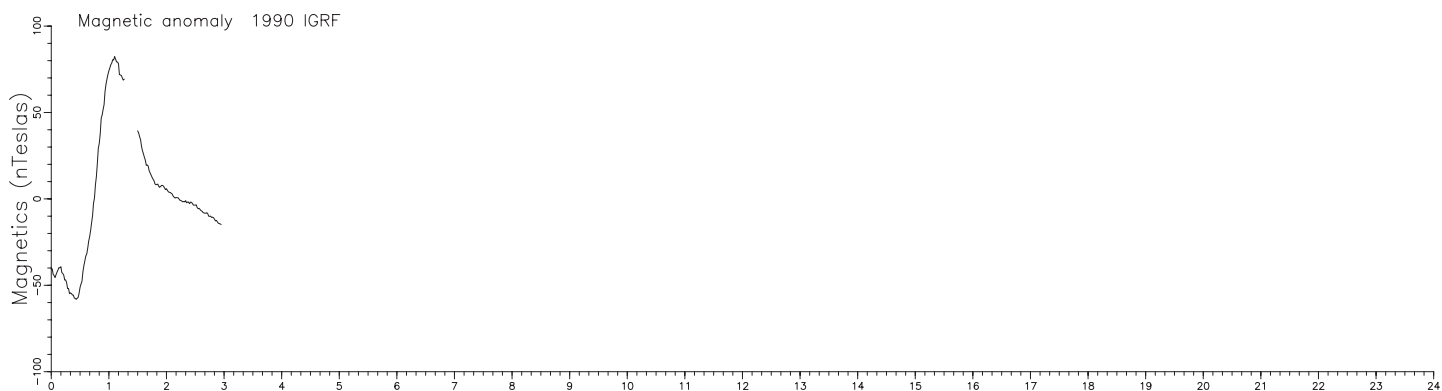
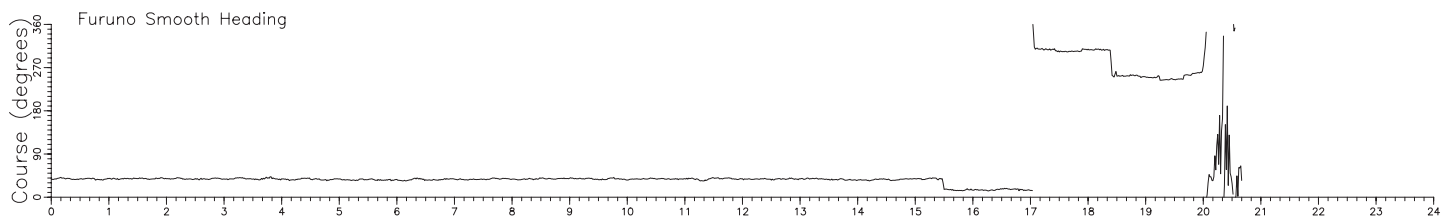
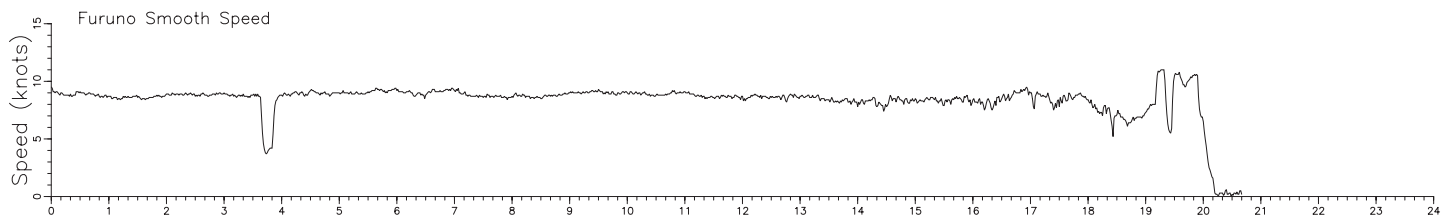
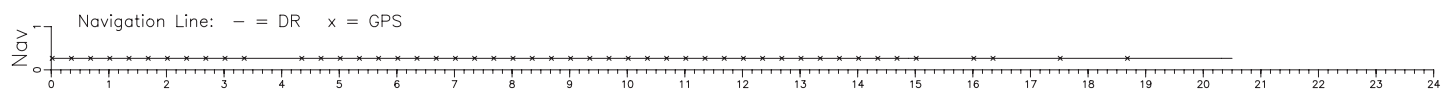
EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.032 Speed/Course file: fu.s032 Magnetics file: mg.n032 Gravity file: vt.n032 Bathymetry file: hb.n032



EW9513 Auckland, New Zealand – Lyttelton, New Zealand

Navigation file: n.033 Speed/Course file: fu.s033 Magnetics file: mg.n033 Gravity file: vt.n033 Bathymetry file: hb.n033



Day 033 / 2-02-96