BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

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RIG SEISMIC RESEARCH CRUISES 10 & 11, SOUTHERN MARGIN OF AUSTRALIA: EXPLANATORY NOTES TO ACCOMPANY RELEASE OF NON-SEISMIC DATA

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INTRODUCTION

The purpose of this report is to summarise the processing techniques applied to the non-seismic geophysical data on *Rig Seismic* Research Cruises 10 and 11 (Surveys 65 and 66; southern margin of Australia).

GEOPHYSICAL SYSTEMS & PERFORMANCE

The following non-seismic geophysical systems were employed during Surveys 65 & 66:

Navigation

Prime System: Magnavox MX1107RS dual-channel short-count TRANSIT satellite navigator; ship speed from Magnavox 610D dual-axis sonar doppler and heading from Arma-Brown SGB 1000 gyro-compass.
Secondary System: Magnavox MX1142 single-channel short-count TRANSIT satellite navigator; ship speed from Raytheon DSN-450 dual-axis sonar doppler and heading from a Robertson gyro-compass.
Tertiary System: Magnavox T-Set Global Positioning System (GPS).

Performance Comments: Both TRANSIT satellite navigators generally performed reliably. The MX1107RS was interfaced to the Data Acquisition System (DAS) and latitude, longitude, course, speed (every 10 seconds) and all satellite fix details were transferred and recorded. The DAS interface for the MX1142 was configured to its printer port and the information on the screen was 'printed' to the DAS at the maximum rate (60 s); satellite fix information was also passed by the same route.

The GPS system was operational for about 12-14 hours per day, of which about 8 hours provided usable data. No GPS was available from 1550 GMT on day 303 until the end of Survey 65 as a result of an accident that seriously damaged the receiver.

The Magnavox and Raytheon speed logs both performed somewhat better than on previous surveys. However, in moderate to high sea states, the performance of both deteriorated rapidly. The Ben paddle log (recorded by the DAS, but not used by the satellite navigators) gave the most reliable data in poor sea conditions. Unfortunately, this log became inoperative early on Survey 66.

Both gyro-compasses performed satisfactorily for the entire survey.

Bathymetric Systems

Raytheon Deep-sea Bathymetric System, with a maximum power output of 2 kW at 12 kHz. This system, purchased in the early 1970's, was of very sophisticated design for its day, providing in addition to digital depths and various alarm flags, an automatic tracking facility that should theoretically provide usable bathymetric data even in marginal

recording conditions.

Performance Comments: Data quality was generally higher than on previous *Rig Seismic* cruises; however, performance of the system is still poor in moderate or high sea states. The extensive processing required to retrieve acceptable bathymetric data is described fully later in this report.

Magnetics

Two Geometrics G801/803 proton precession magnetometers were installed in the instrument room. Due to a malfunction in one of the gradiometer sensors, only single-channel data were recorded.

Performance Comments: The magnetometer performed without serious problems for both surveys. Noise levels were less than 3 nT except in high sea states.

Gravity

A Bodenseewerk KSS-31 marine gravity meter was installed in the main instrument room.

Performance Comments: Gravity data were recorded for the entire survey with no problems. Gravity ties were performed at Fremantle prior to Survey 65, at Port Lincoln between the cruises, and at Adelaide at the end of Survey 66. Gravity tie information is provided in Table 1.

DATA ACQUISITION SYSTEM (DAS)

The shipboard DAS is based on a Hewlett-Packard (HP) 1000 E-Series 16-bit minicomputer which during Surveys 65 & 66 was fitted with 512 kW of memory. The DAS programs run under the HP Real Time Executive (RTE-6/VM) disc-based operating system, which allows a multiprogramming environment and a large number of interactive users. Data are acquired either directly from the appropriate device through an RS-232C interface (gravity, Magnavox MX1107RS, Magnavox MX1142), or through a BMR-designed 16-bit digital multiplexer (magnetics, bathymetry) and attached gyro-log interface (for both sonar dopplers and gyro-compasses). After preliminary processing, plotting on strip-chart recorders, and listing on a variety of printers, the data were recorded on 9-track, 1600 bpi, phase-encoded magnetic tape in HP's 32-bit floating-point format.

Data were acquired and saved at a 10-second rate, regardless of ship speed and independently of the seismic acquisition system. The data were written to tape in 1.0 minute (6 record) blocks with 80 channels of data being recorded. The channels that were recorded are listed in Table 2.

Table 1: Gravity tie information for Surveys 65 and 66.

Place	Date	Time (GMT)	KSS-31 value	Corrected value
Fremantle	14 Oct 1986	0345	-1002.191	979415.88
Port Lincoln	12 Nov 1986	0300	-674.289	979740.531
Adelaide	07 Dec 1986	0300	-697.839	979714.914

Gravity meter drift - Fremantle to Port Lincoln = 3.25 mgal

Gravity meter drift - Port Lincoln to Adelaide = 2.067 mgal

Table 2: DAS channels recorded.

The following is a list of the channel allocations for the non-seismic data for the Southern Margin 1 and 2 cruises.

1 - Clock (Survey and Day Number)
2 - Acquisition time (GMT) from computer clock
3 - Master clock time at acquisition
4 - Latitude, best estimate (Radians)
5 - Longitude, best estimate (Radians)
6 - Speed, best estimate (knots)
7 - Heading, best estimate (degrees)
8 - Magnetometer no. 1
9 - Magnetometer no. 2
10 - Depth no. 1; 3.5 kHz
11 - Depth no. 2; 12 kHz
12 - F/A Magnavox sonar-doppler (3920.4 counts/nm)
13 - P/S Magnavox sonar-doppler (3920.4 counts/nm)
14 - F/A Raytheon sonar-doppler (193.5 counts/nm)
15 - P/S Raytheon sonar-doppler (193.5 counts/nm)
16 - Paddle log (approx 7000 counts/nm)
17 - not used
18 - Instrument room gyro (degrees)
19 - Bridge gyro (degrees)
20 - not used
21 - not used
22 - not used
23 - not used
24 - not used
25 - Hifix Fine A (centilanes)
26 - Hifix Fine B (centilanes)
27 - Hifix Fine C (centilanes)
28 - Hifix Coarse A (centilanes)
29 - Hifix Coarse B (centilanes)
30 - Hifix Coarse C (centilanes)
31 - 40 - not used
41 - T-SET ; number of satellites and satellite numbers in constellation
42 - T-SET time (GMT seconds)
43 - T-SET Dilution of Precision
44 - T-SET latitude (radians)
45 - T-SET longitude (radians)
46 - T-SET height above geoid (metres)
47 - T-SET speed (knots X 10)
48 - T-SET course (degrees X 10)
49 - T-SET frequency bias
50 - T-SET GMT (.HHMMSS)
51 - Latitude, calc. from Magnavox Sonar-Doppler & A-B gyro
52 - Longitude, calc. from Magnavox Sonar-Doppler & A-B gyro
53 - Speed calc. from Magnavox sonar doppler & A-B gyro
54 - Course calc. from Magnavox sonar doppler & A. B. gyro
55 - Latitude, calc. from Raytheon Sonar-Doppler & bridge gyro
56 - Longitude, calc. from Raytheon Sonar-Doppler & bridge gyro
57 - Speed calc. from Raytheon sonar doppler & bridge gyro
58 - Course calc. from Raytheon sonar doppler & bridge gyro

59 - Latitude, calc. from paddle log & A-B gyro
60 - Longitude, calc. from paddle log & A-B gyro
61 - Speed calc. from paddle log
62 - Course calc. from A-B gyro
63 - Latitude, radio-nav
64 - Longitude, radio-nav
65 - Speed from radio-nav
66 - Course from radio-nav
67 - GMT from Magnavox MX1107 sat nav (secs)
68 - Dead Reckoned Time from MX1107 (secs)
69 - Latitude (radians) MX1107
70 - Longitude (radians) MX1107
71 - Speed (knots) MX1107
72 - Heading (degrees) MX1107
73 - GMT from Magnavox MX1142 sat nav
74 - Dead Reckoned Time from MX1142
75 - Latitude (radians) MX1142
76 - Longitude (radians) MX1142
77 - Speed (knots) MX1142
78 - Heading (degrees) MX1142
79 - Gravity (mGal x 100)
80 - ACX (m/s/s x 10000)
81 - ACY (m/s/s x 10000)
82 - Sea state (N/A)
83 - AGRF magnetic anomaly no. 1
84 - AGRF magnetic anomaly no. 2
85 - Magnetics difference (gradiometer)
86-128 - not used

DATA PROCESSING

The data were processed on an in-house Hewlett-Packard 1000 F-Series minicomputer utilising similar hardware and the same operating system as the DAS. The processing was applied in two phases, as follows:

Phase 1: transcription of field tapes; correction of time errors; production of raw data plots; bulk editing (principally deletion of bad data segments); retrieval of water depth data; filtering of gravity, magnetic, and speed log data; computation of incremental latitudes and longitudes; production of final check plots; final editing.

Phase 2: tying of the dead-reckoned (DR) track to the satellite fixes using a cubic spline fitting technique to model ocean currents; assessment and deletion of poor quality satellite fixes; computation of final positions for each DR system; computation of final ship position from an appropriate mix of the available DR systems and the GPS system; computation of final Eotvos-corrected gravity, including a correction for gravity meter drift; final data editing (particularly gravity data during turns).

A brief summary of the processing steps follows, with some detail of the techniques applied.

PHASE 1

FCOPY: All field tapes were transcribed to processing tapes with several field tapes being combined into a single processing tape. Processing tapes were separated at obvious breaks (such as recording system crashes), or after about seven days recording. During the transcription, data were re-blocked to 2-minute blocks (12 records/block) and the number of channels was reduced to 80. Time jumps (positive or negative) were reported for processing in the next phase.

FIXTM: Time jumps reported in *FCOPY* were corrected, either automatically, or with a file of manual time corrections. data channels were re-ordered and reduced to 64 in number to simplify further processing.

VARPL: All raw data channels requiring processing were plotted as strip records on a drum plotter. These plots were used to determine where editing was required and as a first guide for the setting of filter parameters.

FTAPE: This program was used for a variety of tasks as follows -

(1) Removal of hardware/software flags in the bathymetric data. The Raytheon echo-sounder system provides, in addition to digital bathymetry, 'flags' indicating that the echo-sounder has lost track or that the digitiser gate is searching for an echo. These flags were removed, as appropriate, and such values were replaced by the number 1.0E10 (10 raised to the power 10), to indicate absent data.

(2) 'Bulk' deletions were done of any large blocks of irretrievable

data in particular channels.

(3) Automatic interpolations were done across data gaps of up to 120 seconds for selected data channels.

GMUL2: All raw gravity data were divided by 100 to reduce them to milligals. All three speed logs (each of which outputs a fixed number of 'clicks' per nautical mile) were reduced to give speeds in knots.

EDATA: This is a utility program used for the manual editing of problem areas that are not amenable to filtering or automatic editing.

SALVG: Briefly stated, the problem of bathymetry recovery is to fill in all the gaps left after the Raytheon hardware/software flags were removed and to discriminate against the bad bathymetric values that still remain.

To accomplish this, a file was first created of manually digitised water depths at selected points; this file was then read in conjunction with the processing data file. SALVG then performs a straight line interpolation between adjacent tie points and compares the interpolated depth with the 10-second digital depth. If the difference is less than a user-specified threshold, then the digital depth is accepted and is used to replace the previous first tie point. If the difference is greater than the threshold, then the 10-second digital depth is replaced by the interpolated depth. In this way, the program tracks along the acceptable water depths, providing the threshold is small enough to reject bad data and large enough to accept the good data. In the case of the digital data being totally unacceptable, as during poor sea conditions, the threshold was set to a very small number (0.01 m) and the process became one of simple linear interpolation between adjacent tie points. In practice, the interval between manually digitised tie points varied from several hours in the case of good digital 10-second data, to several minutes in the case of poor 10-second data or a very rugged seabed.

The success of this process, which is routinely applied to all *Rig Seismic* bathymetric data, can be seen in the 'before' and 'after' plots of Figure 1.

FDATA: The magnetic, gravity, and Magnavox and Raytheon speed log data were filtered using a sophisticated form of the median filter, a highly successful spike deletion tool. Filter parameters for each channel are summarised in Table 3.

MUFF: This program uses a SINC function filter to smooth selected data channels. All velocity channels were smoothed to provide acceptable speeds, while the gravity and magnetic data were filtered as an anti-aliasing measure prior to resampling to 60 s. The filter coefficients and the approximate responses of the filters to a sine wave are given in Table 4.

Figure 1: Bathymetry traces before (upper) and after processing by program SALVG. Vertical scale is 100 m/inch; horizontal scale is 30 minutes/inch. The input data are of fairly poor quality.

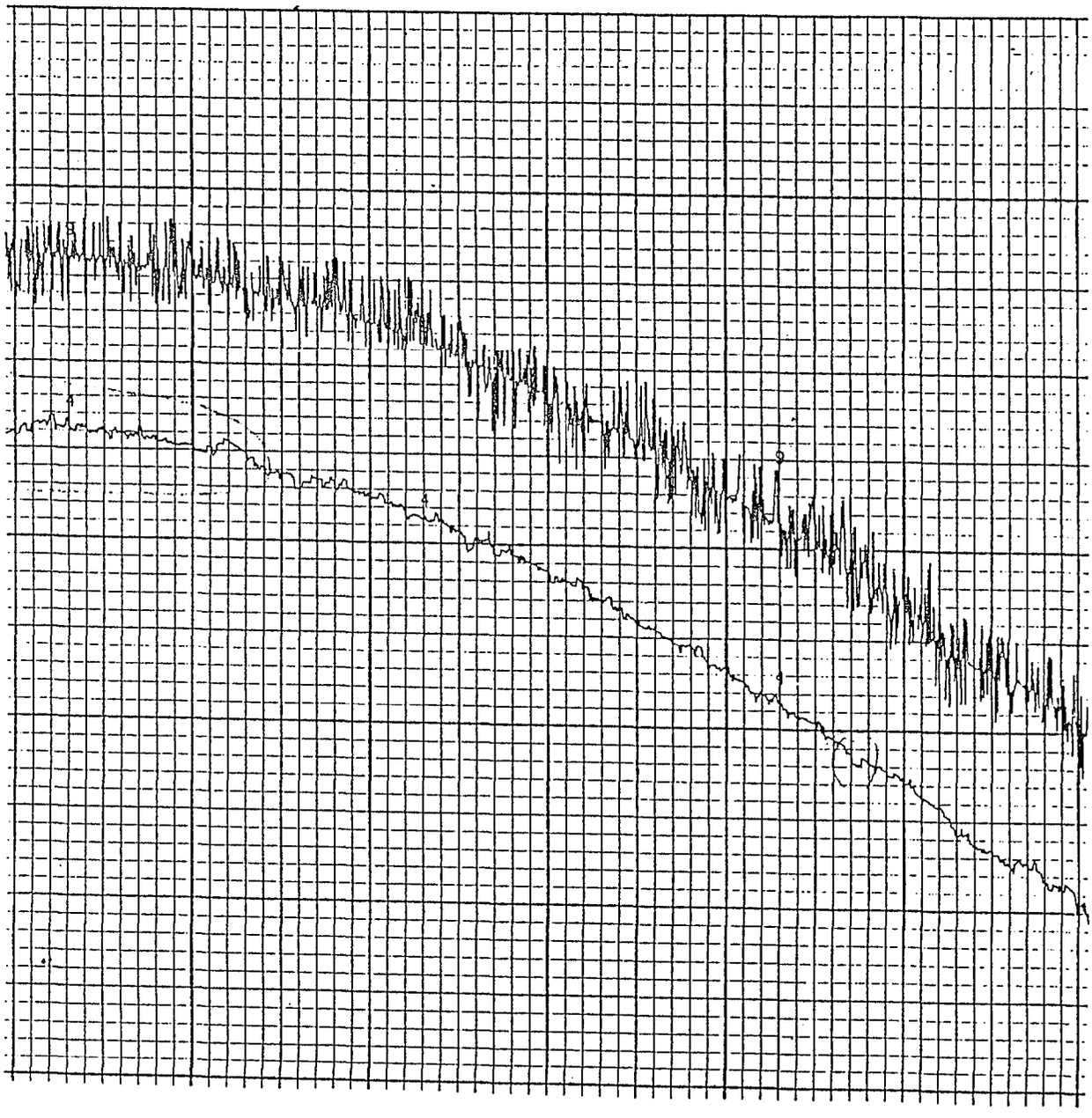

Table 3: Median filter parameters.

Data Channel	Filter length (samples)	Threshold (data units)
10 - magnetics	13	7
13 - gravity	13	5
16 - Magnavox fore-aft	13	1
17 - Magnavox port-stbd	13	1
18 - Raytheon fore-aft	7	2
19 - Raytheon port-stbd	7	2

Table 4: Smoothing filter coefficients and approximate response of filter to sine wave input.

Filter 1: Applied to - Magnavox sonar-doppler (fore-aft & port-stbd) and Magnavox T-Set GPS latitude and longitude.
Period of filter - 120 sec.
Cutoff at 1st zero crossing

NUMBER ØF PØINTS IN FILTER 11

FILTER CØEFFICIENTS AS FØLLØWS

.009 .036 .079 .126 .162 .176 .162 .126 .079 .036
.009

FRACTIØN	PERIØD	RESPØNSE	db
.500	60.0	.02611	-31.7
.518	62.1	.04140	-27.7
.536	64.3	.05889	-24.6
.555	66.6	.07843	-22.1
.574	68.9	.09984	-20.0
.595	71.4	.12291	-18.2
.616	73.9	.14744	-16.6
.637	76.5	.17320	-15.2
.660	79.2	.19996	-14.0
.683	82.0	.22750	-12.9
.707	84.9	.25560	-11.8
.732	87.8	.28408	-10.9
.758	90.9	.31273	-10.1
.785	94.2	.34138	-9.3
.812	97.5	.36989	-8.6
.841	100.9	.39810	-8.0
.871	104.5	.42590	-7.4
.901	108.2	.45317	-6.9
.933	112.0	.47984	-6.4
.966	115.9	.50581	-5.9
1.000	120.0	.53103	-5.5
1.035	124.2	.55544	-5.1
1.072	128.6	.57902	-4.7
1.110	133.1	.60173	-4.4
1.149	137.8	.62355	-4.1
1.189	142.7	.64448	-3.8
1.231	147.7	.66451	-3.6
1.275	152.9	.68364	-3.3
1.320	158.3	.70189	-3.1
1.366	163.9	.71927	-2.9
1.414	169.7	.73580	-2.7
1.464	175.7	.75149	-2.5
1.516	181.9	.76638	-2.3
1.569	188.3	.78049	-2.2
1.625	194.9	.79384	-2.0
1.682	201.8	.80646	-1.9
1.741	208.9	.81838	-1.7
1.803	216.3	.82963	-1.6
1.866	223.9	.84025	-1.5
1.932	231.8	.85025	-1.4
2.000	240.0	.85967	-1.3

Filter 2: Applied to - Raytheon sonar-doppler (fore-aft & port-stbd)
Period of filter - 300 sec.
Cutoff at 1st zero crossing

NUMBER ØF PØINTS IN FILTER 29

FILTER CØEFFICIENTS AS FØLLØWS

.001	.002	.005	.009	.015	.021	.028	.035	.043	.050
.057	.063	.067	.069	.070	.069	.067	.063	.057	.050
.043	.035	.028	.021	.015	.009	.005	.002	.001	

FRACTIØN	PERIØD	RESPØNSE	db
.500	150.0	.02608	-31.7
.518	155.3	.04140	-27.7
.536	160.8	.05892	-24.6
.555	166.4	.07848	-22.1
.574	172.3	.09991	-20.0
.595	178.4	.12300	-18.2
.616	184.7	.14754	-16.6
.637	191.2	.17330	-15.2
.660	197.9	.20007	-14.0
.683	204.9	.22760	-12.9
.707	212.1	.25571	-11.8
.732	219.6	.28418	-10.9
.758	227.4	.31282	-10.1
.785	235.4	.34147	-9.3
.812	243.7	.36997	-8.6
.841	252.3	.39818	-8.0
.871	261.2	.42596	-7.4
.901	270.4	.45323	-6.9
.933	279.9	.47988	-6.4
.966	289.8	.50585	-5.9
1.000	300.0	.53106	-5.5
1.035	310.6	.55547	-5.1
1.072	321.5	.57904	-4.7
1.110	332.9	.60174	-4.4
1.149	344.6	.62356	-4.1
1.189	356.8	.64448	-3.8
1.231	369.3	.66451	-3.5
1.275	382.4	.68364	-3.3
1.320	395.9	.70189	-3.1
1.366	409.8	.71927	-2.9
1.414	424.3	.73579	-2.7
1.464	439.2	.75148	-2.5
1.516	454.7	.76637	-2.3
1.569	470.8	.78047	-2.2
1.625	487.4	.79382	-2.0
1.682	504.5	.80644	-1.9
1.741	522.3	.81837	-1.7
1.803	540.8	.82962	-1.6
1.866	559.8	.84023	-1.5
1.932	579.6	.85023	-1.4
2.000	600.0	.85965	-1.3

Filter 3: Applied to magnetics, gravity.
Period of filter - 180 sec.
Cutoff at 3rd zero crossing

NUMBER ØF PØINTS IN FILTER 53

FILTER CØEFFICIENTS AS FØLLØWS

.000	.001	.002	.003	.004	.004	.004	.003	-.000	-.004
-.008	-.012	-.015	-.018	-.018	-.015	-.009	.000	.012	.027
.043	.060	.076	.091	.102	.109	.111	.109	.102	.091
.076	.060	.043	.027	.012	.000	-.009	-.015	-.018	-.018
-.015	-.012	-.008	-.004	-.000	.003	.004	.004	.004	.003
.002	.001	.000							

FRACTIØN	PERIØD	RESPØNSE	db
.500	90.0	.00108	-59.3
.516	93.2	.00442	-47.1
.536	96.5	.00672	-43.5
.555	99.9	.00672	-43.5
.574	103.4	.00380	-48.4
.595	107.0	-.00178	-55.0
.616	110.8	-.00884	-41.1
.637	114.7	-.01548	-36.2
.660	118.8	-.01934	-34.3
.683	122.9	-.01804	-34.9
.707	127.3	-.00946	-40.5
.732	131.8	.00793	-42.0
.758	136.4	.03500	-29.1
.785	141.2	.07183	-22.9
.812	146.2	.11784	-18.6
.841	151.4	.17184	-15.3
.871	156.7	.23226	-12.7
.901	162.2	.29728	-10.5
.933	167.9	.36499	-8.8
.966	173.9	.43355	-7.3
1.000	180.0	.50127	-6.0
1.035	186.3	.56672	-4.9
1.072	192.9	.62872	-4.0
1.110	199.7	.68641	-3.3
1.149	206.8	.73918	-2.6
1.189	214.1	.78669	-2.1
1.231	221.6	.82882	-1.6
1.275	229.4	.86564	-1.3
1.320	237.5	.89735	-.9
1.366	245.9	.92426	-.7
1.414	254.6	.94676	-.5
1.464	263.5	.96527	-.3
1.516	272.8	.98024	-.2
1.569	282.5	.99210	-.1
1.625	292.4	1.00129	.0
1.682	302.7	1.00821	.1
1.741	313.4	1.01322	.1
1.803	324.5	1.01665	.1
1.866	335.9	1.01881	.2
1.932	347.7	1.01994	.2
2.000	360.0	1.02028	.2

DELTA: Incremental (delta) latitude/longitudes were produced every 10 seconds by combining the ship speed with the headings from the Arma-Brown and Robertson gyro-compasses. This produced three separate dead-reckoning (DR) systems (Magnavox + Arma-Brown; Magnavox + Robertson; Raytheon + Arma-Brown).

INTEG: The filtered incremental latitude/longitudes were re-integrated over running 60-second intervals. These 60-second incremental distances were then used in the Phase 2 processing to compute the DR vector over each satellite fix interval.

VARPL/EDATA: As the final stage of the Phase 1 processing, all processed channels were plotted again as 'strip' plots with program VARPL. Program EDATA was then used to correct any minor residual data problems.

PHASE 2

Phase 2 processing encompasses the following tasks -

1. Re-formatting and production of assessment listings of satellite fixes;
2. Resampling Phase 1 data;
3. Assessment of satellite fixes and deletion of those considered dubious or unacceptable;
4. Constrainment of DR track to remaining satellite fixes and computation of 1-minute positions for each DR system;
5. Selection of a suitable mix of navigation systems to produce final positions;
6. Application of Eotvos and drift corrections to gravity data and conversion to absolute values;
7. Final plots and editing as necessary.

In rather more detail, the programs applied were as follows -

RESAF: Re-format the ASCII parameter file of satellite fixes and adjust each fix to the nearest whole minute of survey time using the ship speed and heading applying at that time in the Phase 1 data file.

FIXES: Produce a listing of the satellite fixes for assessment purposes (Table 5).

RESAM: Concatenate the Phase 1 data files, as appropriate, and resample to produce 1-minute data.

SAT12: Two passes of this program are required for each round of satellite fix assessment. During each pass, a number of options are called, as follows:

Pass 1

a. SATEL - reads in the file of satellite fixes and stores them in memory. Any fix intervals with dubious speeds (too low or too high) or any intervals that are very short (<15 minutes) or very long (>120 minutes) are flagged in the output listing.

b. DRNAV - uses the incremental latitude/longitudes stored on the Phase 1 file and the satellite fix information to compute the DR path (or DR vector) for each satellite fix interval. This is saved as an ASCII parameter file.

c. CALNV - reads the DR file created by DRNAV and computes the ratio of the average DR velocity to the velocity computed from successive satellite fixes. This is done for each DR system used, and the results are listed.

d. CALPL - produces a line printer plot of the velocity ratios for each satellite fix interval.

Pass 2

a. CFACT - uses the DR file and a user-created file of calibration factor intervals to compute velocity calibration factors for each DR system.

b. APROX - uses the calibration factors computed in CFACT and the DR file to produce an approximately calibrated DR file.

c. ASSES - uses the approximately calibrated DR file created by APROX to produce a line printer plot of the current and summed error vectors at and between satellite fixes. The plot is produced at a 10-minute sample interval.

The basis of the processing is that option 'ASSES' takes the summed latitude and longitude error vectors at each fix (*ie* a running sum of the DR position to satellite fix position vectors at the time of each fix) and uses a piece-wise cubic polynomial curve-fitting function (the Akima spline) to compute error vectors at all times between satellite fixes. It is assumed that the ensuing smooth variation of the error vector is due to ocean currents, winds, etc. Poor quality fixes will produce unrealistic or large and variable ocean currents. At each round of assessment (and usually at least three rounds are required for each file), the satellite fixes are checked wherever the summed error and current vectors suggest a problem, and those fixes of poor quality are deleted for the next program run. The effect of this process can be seen in the example in Figures 2 and 3.

SAT3: uses the final file of satellite fixes and the DR data to produce final positions for each DR system. This program again uses the Akima spline to compute the assumed currents acting at all times between satellite fixes and applies those currents to the DR data to compute positions.

FINAV: performs the following functions -

a. Computes final 1-minute positions based on a 'mix' of DR systems and the Global Positioning System according to a file specified by the user.

b. The gravity data (which was in mgals relative to an arbitrary datum) was converted to absolute values corrected for meter drift and with Eotvos corrections applied.

VARPL/EDATA/FIXTM/EDATA/MUFF: As a final check, the Phase 2 positions, water depths, magnetic, and gravity data were plotted and editing applied as necessary. Program FIXTM was then used to re-block the data to 8 channels x 60 records per block (*ie* 1-hour blocks). The final channel allocations are shown in Table 6. As a final editing stage, the residual gravity spikes at turns are removed (EDATA) and the gravity channel is smoothed by a filter of 15-minute period to remove any remaining sea noise (MUFF).

Figures 2 & 3 (following pages). Satellite fix assessment plots for a part of Survey 66. 10-minute time (DD.HHMM) along bottom of plot; satellite fixes indicated by vertical row of dashes (eg at 335.1530); traces on the plot are as follows:-
N & E - north and east currents for DR system 1;
1 & 2 - north and east summed error vectors for DR system 1;
Y & X - north and east currents for DR system 2;
3 & 4 - north and east summed error vectors for DR system 2.
Note in particular the large fluctuations in both the north and east currents and summed error vectors in Figure 2 around the satellite fix at 335.1700. Removal of this fix produces smoothly varying currents and summed error vectors in Figure 3.

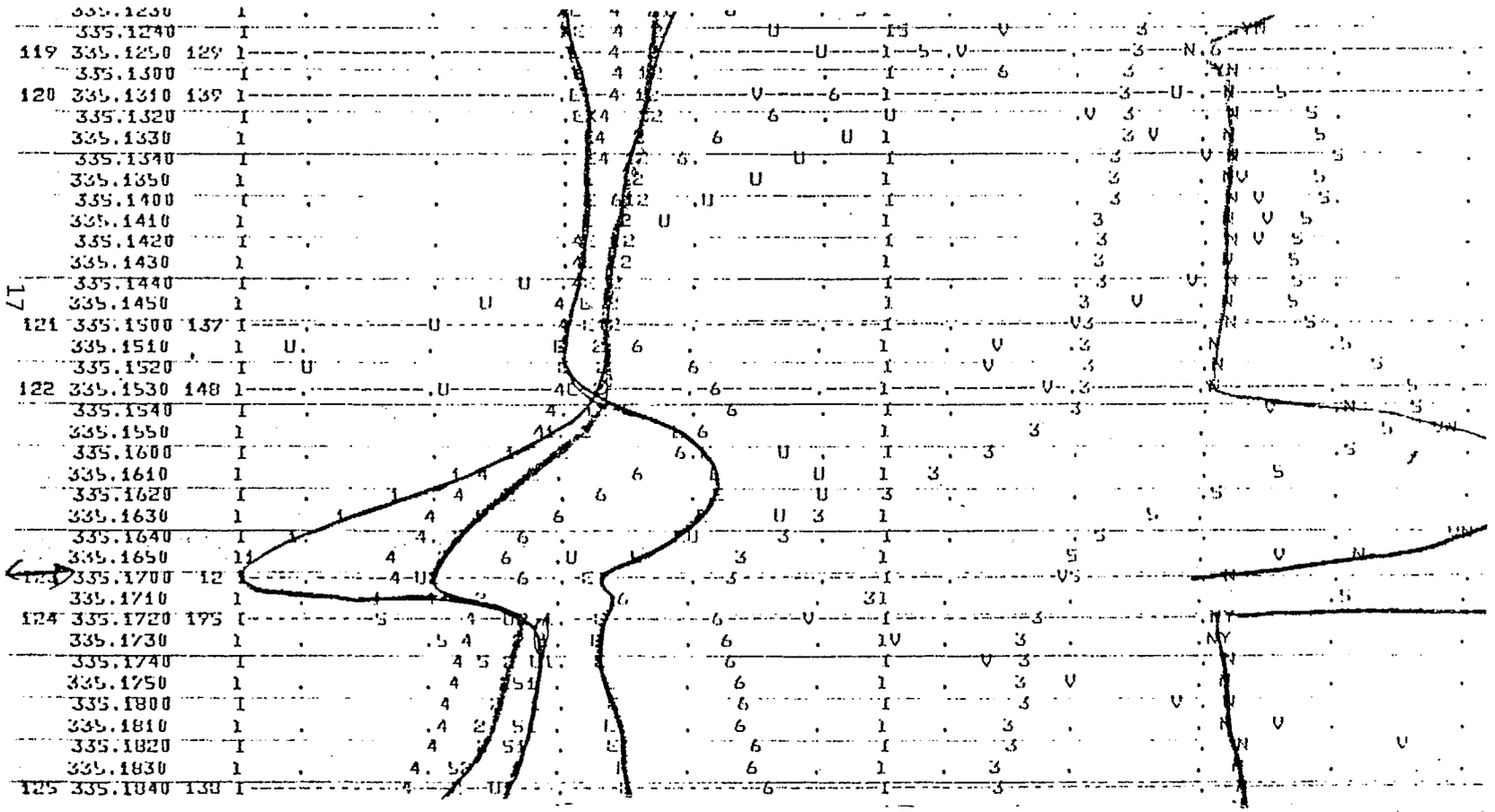

Figure 2

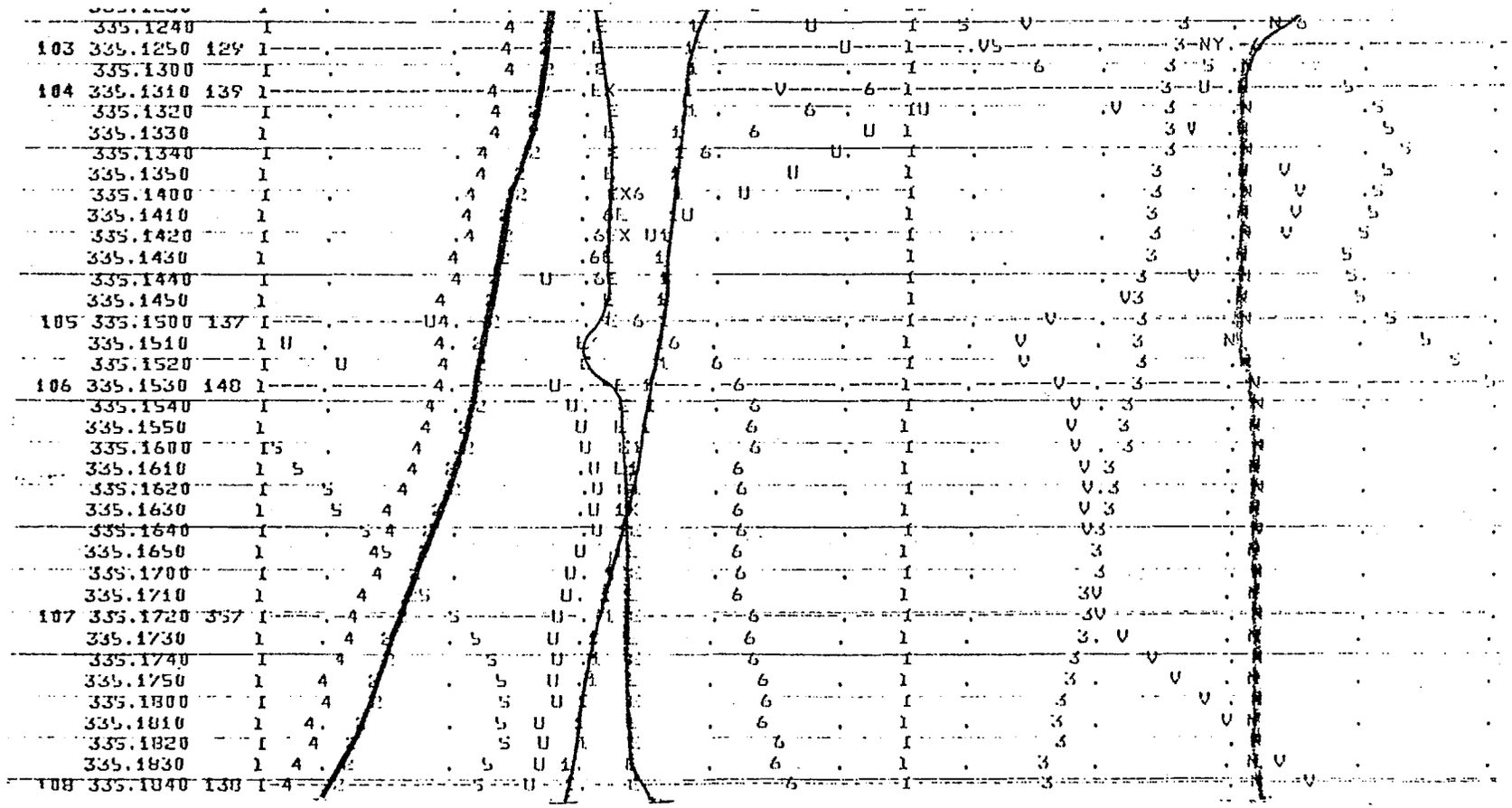

Figure 3

Table 5: (Next page) Sample listing of satellite fix parameters produced by program FIXES.

FIX - satellite fix number within file;
FIX TIME - computed time of fix in format SS.DDD.HHMMSS, where SS is the survey number (65 or 66), DDD is the Julian day number in 1986, and HHMMSS is the GMT time;
LAT, LONG - Latitude & longitude of fix in degrees & decimal minutes;
SYSTEM - Magnavox 1107 or 1142, or dummy fix (DFIX);
SAT - satellite number; OK - accepted (Y) or rejected (N) on-board;
ELEV - maximum elevation of satellite (degrees);
COUNT - number of doppler counts received;
ITER - number of iterations required to compute fix;
GEOM - geometry of pass; ERROR - amount of shipboard update (n. miles);
DIR - direction of shipboard update (degrees);
SLT, SLN - standard deviation of latitude & longitude (metres);
CODE - error code if fix not accepted by sat nav;
COURSE, SPEED - vessel's course and speed at time of fix.

Table 5

FIX	FIX TIME	LAT	LONG	SYSTEM	SAT	OK	ELEV	COUNT	ITER	GEOM	ERROR	DIR	SLT	SLN	CODE	COURSE	SPEED
51	66.339.232000	36 25.705	136 28.114	1142	130	N	11	21	2		.30	190	0	0	6	319.5	10.1
52	66.340.004400	36 22.789	136 27.589	1107	300	Y	30	30	3	SE	.82	250	0	0		90.0	5.2
53	66.340.011300	36 23.031	136 29.922	1107	480	Y	15	27	4	SW	.05	305	0	0		182.2	3.2
54	66.340.023100	36 30.557	136 19.141	1107	300	Y	39	33	3	SW	.18	114	0	0		234.3	9.2
55	66.340.035900	36 37.625	136 25.808	1107	500	Y	23	30	3	SE	.49	138	0	0		262.3	9.4
56	66.340.051600	36 39.843	136 16.868	1107	110	Y	22	21	3	SE	.77	129	0	0		107.2	9.8
57	66.340.054700	36 41.546	136 23.166	1107	500	Y	58	38	2	SW	.03	44	0	0		107.2	10.5
58	66.340.070300	36 44.233	136 13.059	1107	110	Y	54	31	2	SW	.46	129	0	0		154.0	9.4
59	66.340.073700	36 49.771	136 16.026	1142	500	N	6	23	2		.90	142	0	0	1	158.2	10.0
60	66.340.074500	36 50.722	136 16.341	1107	130	Y	13	18	5	SE	.02	91	0	0		159.2	10.0
61	66.340.085100	36 53.661	136 11.584	1107	200	Y	22	23	4	SW	.26	141	0	0		254.5	5.5
62	66.340.093100	36 54.878	136 7.755	1107	130	N	85	34	*	SW	.44	93	0	0	2	252.7	5.5
63	66.340.105000	36 56.417	135 58.918	1107	480	Y	47	37	3	NE	.32	90	0	0		290.0	5.6
64	66.340.111800	36 55.173	135 56.073	1107	130	Y	12	25	3	SW	.09	84	0	0		291.7	6.1
65	66.340.120200	36 52.976	135 51.101	1107	300	Y	14	25	3	NE	.03	126	0	0		294.8	6.0
66	66.340.123900	36 51.192	135 46.930	1107	480	Y	29	33	3	NW	.19	225	0	0		292.7	5.9
67	66.340.135100	36 49.242	135 40.625	1107	300	N	80	35	3	NW	.29	178	0	0	1	148.8	8.0
68	66.340.152400	36 54.283	135 47.686	1107	500	Y	11	25	4	NE	.32	112	0	0		49.0	7.0
69	66.340.153700	36 53.423	135 49.215	1107	300	Y	10	20	6	NW	.11	143	0	0		49.7	7.1
70	66.340.162800	36 49.331	135 54.749	1107	110	N	8	22	4	NE	.41	347	0	0	1	46.5	7.1
71	66.340.171400	36 45.750	135 59.402	1107	500	N	80	38	3	NE	.84	332	0	0	1	49.3	6.7
72	66.340.180900	36 41.464	136 6.038	1107	200	Y	19	27	5	NE	1.37	2	0	0		52.5	6.1
73	66.340.190100	36 37.916	136 11.355	1107	500	Y	15	25	3	NW	.56	17	0	0		44.8	9.8
74	66.340.195500	36 30.331	136 18.765	1107	200	Y	67	34	3	NW	.50	13	0	0		31.0	10.9
75	66.340.204400	36 22.605	136 22.592	1107	130	Y	43	35	3	NE	.56	290	0	0		358.5	10.3
76	66.340.211400	36 17.659	136 22.961	1107	480	N	7	21	*	SE	.36	316	0	0	2	357.0	8.3
77	66.340.212600	36 16.004	136 23.430	DFIX	0		0	0	0		0.00	0	0	0		.8	9.8

Table 6: Final channel allocations.

Channel number	Contents
1	Time (SS.DDD)
2	Time (.HHMMSS)
3	Latitude (radians)
4	Longitude (radians) - relative to 100E
5	Water depth (metres)
6	Gravity (mgals)
7	Total magnetic field (nT)
8	blank

DATA AVAILABILITY

The Southern Margin non-seismic data are available in two forms:

a. Magnetic Tape - 9-track, 1600 bpi, phase-encoded, as either
- ASCII records, 80 characters per record, 10x1-minute records per block; or
- Hewlett-Packard 32-bit floating point, 8 channels, 60x1-minute records per block.

Enquiries concerning these data should be addressed to -

Chief Scientist,
Division of Marine Geosciences &
Petroleum Geology,
Bureau of Mineral Resources,
GPO Box 378
Canberra, ACT 2601, Australia

b. Track Maps - corresponding to the standard 1:1000000 sheet areas Eyre, Port Augusta, Du Couedic, and SJ52 are available from -

Copy Service,
Assistant Government Printer (Production)
PO Box 84,
Canberra, ACT 2600, Australia

c. Profile & Posted Value Maps - covering the area from 33-38 S, 126-137 E are also available from the Copy Service. Data channels plotted include bathymetry, total magnetic field, and free-air gravity.

Figure 4: Tracks of BMR Research Cruises 10 & 11 (Surveys 65 & 66) off southern Australia.

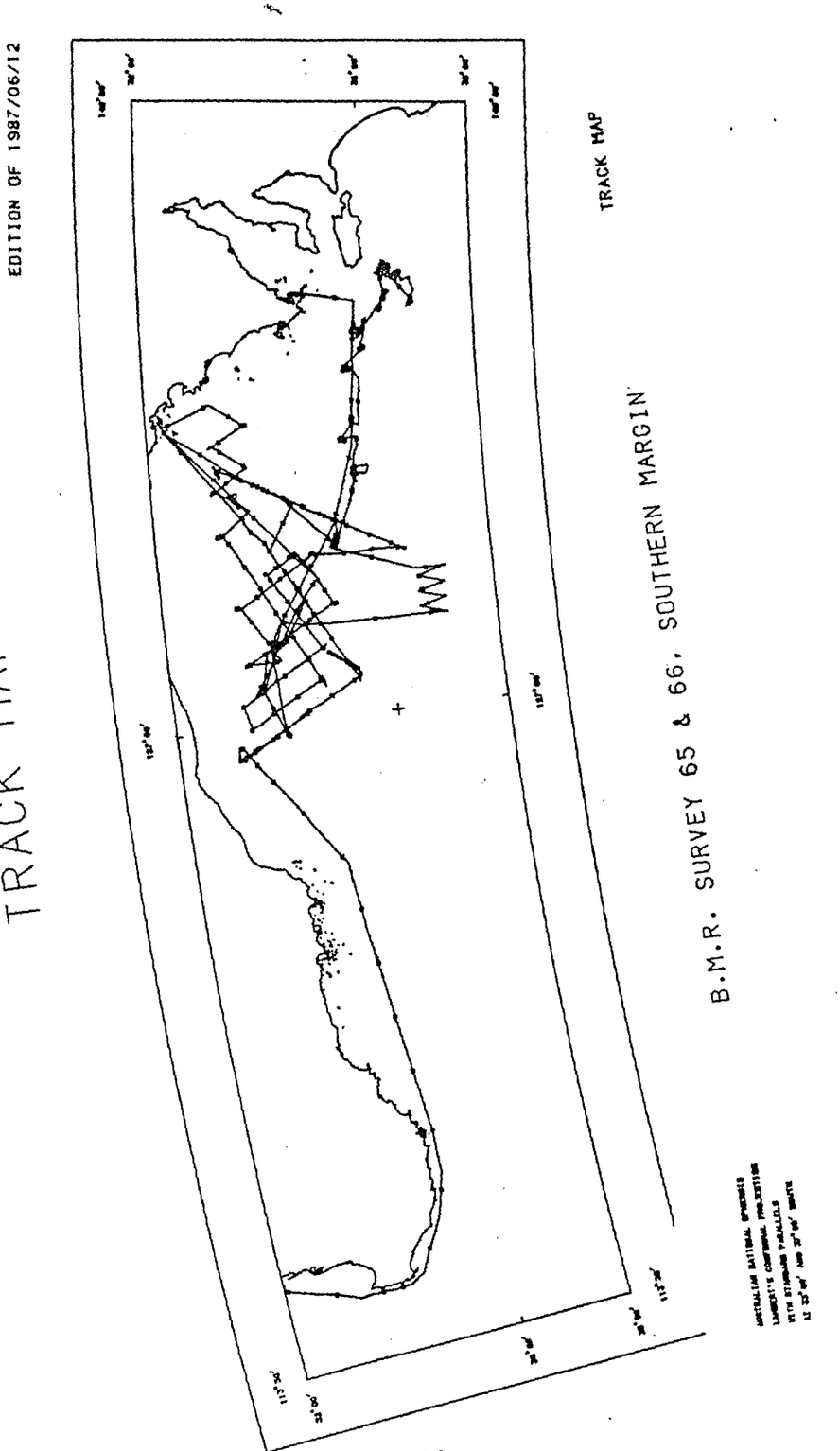

Figure 5: Tracks of BMR Research Cruise 10 (Survey 65) in the Great Australian Bight .

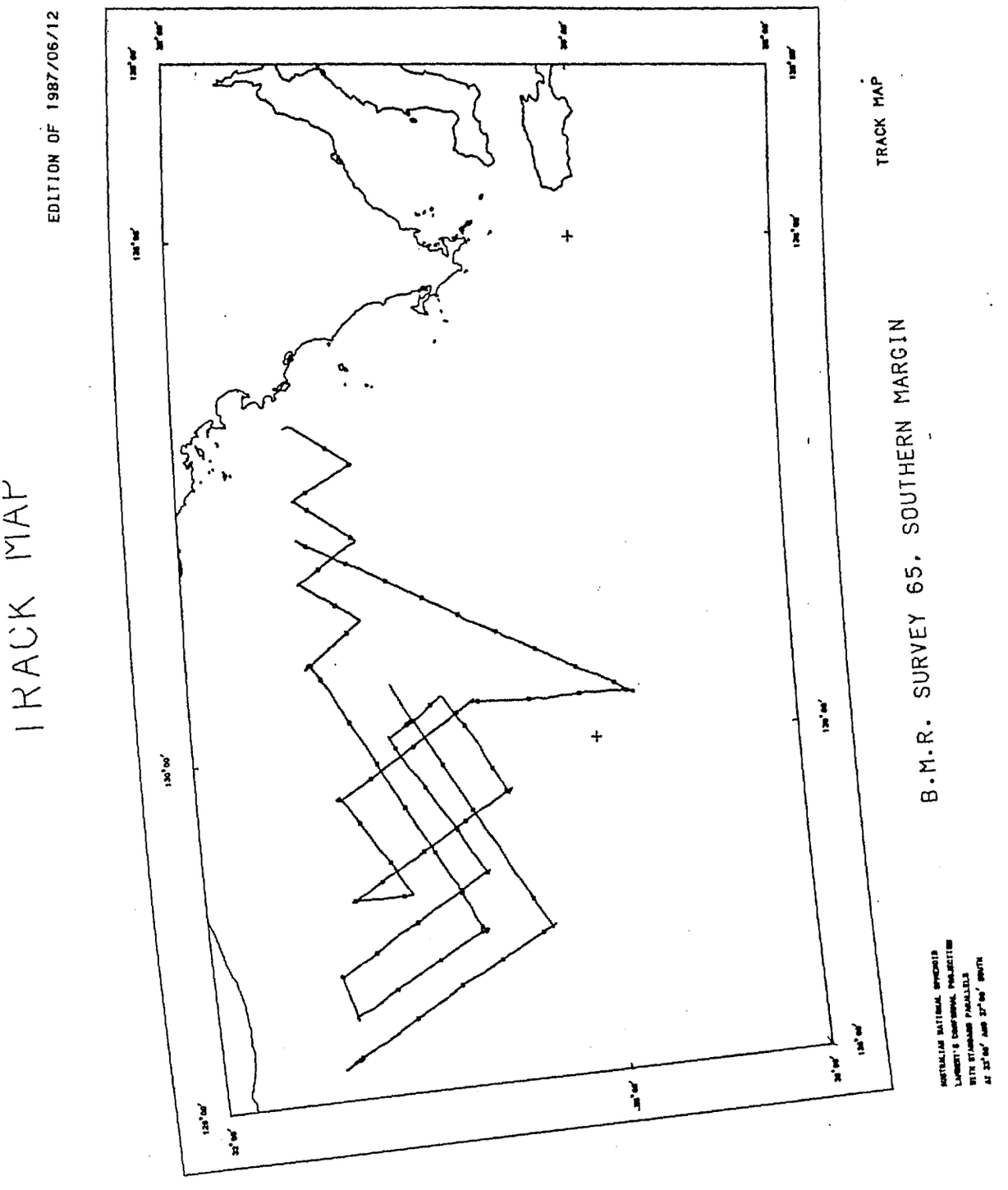

Figure 6: Tracks of BMR Research Cruise 11 (Survey 66) in the Great Australian Bight.