Lamont-Doherty Earth Observatory
Marine Office
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R/V Maurice Ewing

Data Reduction Summary

EW9912 – Townsville ,Australia - Suva, Fiji - Lyttelton, NZ

December 3, 1999 - December 19, 1999

Port Dates

Date	Julian	Time	Port
12/03	337	0700	Leave Townsville
12/11	345	0800 - 1100	Suva, Fiji
12/29	362	2000	Arrive Lyttelton NZ

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Project Summary

The experiment was a reconnaissance seismic reflection survey of the Lau Basin using the R/V Ewing's 6 km long, 480 channel streamer. The experiment was relatively short, a total of 11 acquisition days, but collected data along and across all major seafloor spreading segments within the basin. The primary aim of the seismic survey was to investigate how crustal accretion styles and parameters in a back arc setting differ from those found along mid-ocean ridges. Understanding, precisely, the correspondence between the two modes of crustal genesis bears directly on the reading of ophiolites suites as fossilized records of ridge processes, since many ophiolites are presumed to have originated in back arc environments. Spreading rates within the basin cover the range from intermdiate to fast, and the composition of rocks ranges from N-MORB to more arc-like. These variations will be correlated to observed trends in crustal stucture such as depth to magma chamber.

A secondary aim of the survey was to test models of the tectonic history of the basin by collecting longer profiles across suspected pseudofaults associated with ridge propagation and the establishment of seafloor spreading within the basin. Near real-time processing of the seismic data was performed on board the Ewing in order to optimally locate survey and identify targets of greatest interest.

Cruise Members

Lamont-Doherty Science List

Name	Position	Email Address
Mark Landow	Captain	captain@ewing.ldeo.columbia.edu
Steve Pica	Chief Engineer	engine@ewing.ldeo.columbia.edu
Joe Stennett	Science Officer	stennett@ldeo.columbia.edu
Jeff Turmelle	Data Reduction	jefft@ldeo.columbia.edu
Karl Hagel	Electronics Tech	hagel@ldeo.columbia.edu

Science Party List

Chief Scientist	Alistair Harding		
Party Members	John Collins	Graham Kent	Jeff Babcock
	Paul Henkart	Margaret Boettcher	Eric Hallenborg
	Diann Neenan		

Cruise Notes

Seismic Notes

There were a total of 59,256 shots from 346:01:50:20 - 357:02:59:53.727.

Date	Shot Numbers	
348:10:13	12627 - 12753	Acquisition system hung. No shots recorded
348:10:59	12627 -	restarted
355:06:09	44135	Acquisition hung for 7 minutes.
355:06:16	44137	restarted

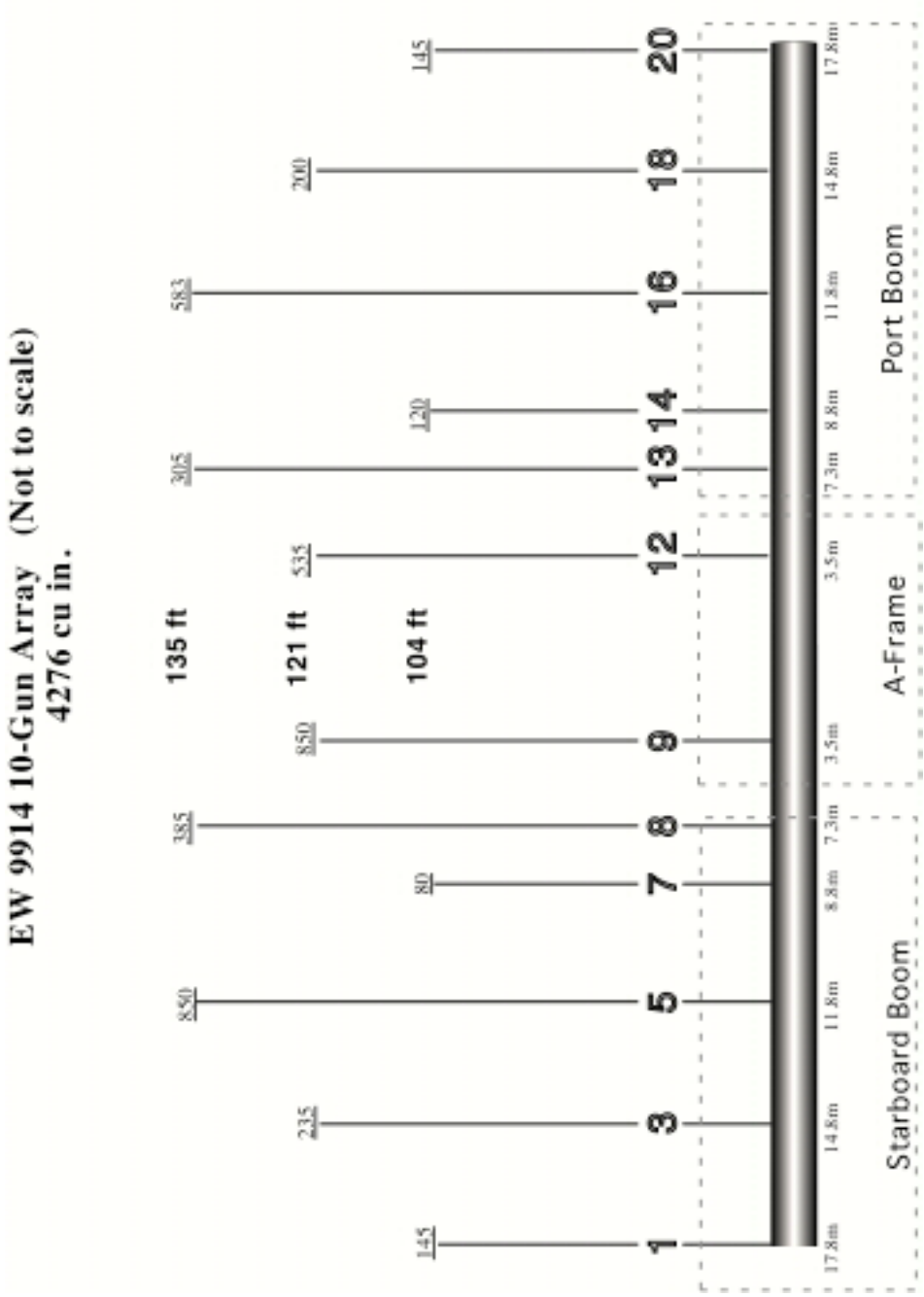
Logging Notes

Magnetic logging started getting noisy around day 351 and became progressively worse through the remainder of the cruise.

Instruments logged:

- All CPU clocks synchronized to Kinemetrics TrueTime GPS UTC time receiver
- Tasman P(Y) Code GPS
- Trimble NT400
- Ashtec G8 Tailbuoy GPS
- Geometrics G-886 Magnetometer
- BGM-3 Gravity
- RM Young Weather
- Furuno Speed and Course
- Krupp Atlas Hydrosweep
- Sea Temperature

Gun Array


EW 9914 10-Gun Array (Not to scale)
4276 cu in.
135 ft
121 ft
104 ft
145
235
850
385
80
850
535
120
583
200
145
1
3
5
7
8
9
12
13
14
16
18
20
17.8m
14.8m
11.8m
8.8m
7.3m
3.5m
3.5m
7.3m
8.8m
11.8m
14.8m
17.8m
Starboard Boom
A-Frame
Port Boom

Transect Log

LINE #		JD	GMT	LAT	LON	TAPE	SHOT	FILE
1	START	346	0156	18 18.005	177 43.826	1	1	1
	END	346	2108	18 17.881	176 10.358	31	4352	4351
2	START	346	2252	18 11.859	176 10.889	33	4642	4641
	END	347	0354	18 03.486	176 31.079	40	5657	5656
3	START	347	0404	18 03.152	176 30.987	40	5775	5774
	END	347	0547	17 56.161	176 28. 363	43	6092	6091
4	START	347	0604	17 56.146	176 27 .103	43	6195	6194
	END	347	0746	18 00.119	176 19.503	46	6599	6598
5	START	347	0800	18 01.093	176 19.308	46	6652	6651
	END	347	1159	18 19.323	176 22.759	53	7856	7855
6	START	347	1237	18 19.776	176 19.996	54	7737	7736
	END	347	1535	18 05.158	176 18.541	59	8412	8411
7	START	347	1600	18 04.796	176 16.647	60	8557	8556
	END	347	2355	18 39.322	176 28.164	72	10334	10333
8A	START	348	0104	18 36.273	176 28.700	74	10587	10586
	END	348	0339	18 42.167	176 17.726	78	11167	11166
9	START	348	0400	18 43.605	176 18.114	78	11167	11166
	END	348	0527	18 48.640	176 23.113	81	11602	11601
10	START	348	0536	18 48.749	176 23.884	81	11602	11601
	END	348	0932	18 40.599	176 39.107	87	12468	12461
11	START	348	0953	18 39.351	176 39.016	87	12730	12729
	END	348	1153	18 32.627	176 33.062	90	12799	12799
8B	START	348	1200	18 32.509	176 32.581	90	12822	12822
	END	348	1447	18 32.513	176 18.774	94	13469	13469
8C	START	348	1511	18 31.498	176 19.004	95	13558	13558
	END	348	1608	18 31.50X	176 23.496	96	13641	13641
7B	START	348	1608	18 31.50X	176 23.496	96	13641	13641
	END	348	2249	19 00.5XX	176 33.77X	107	15236	15236
12A	START	349	0005	18 58.218	176 36.457	109	15526	15526
	END	349	0203	18 58.181	176 26.904	112	15961	15961
13	START	349	0221	18 58.996	176 25.886	113	16106	16106
	END	349	0500	19 10.862	176 21.796	117	16681	16681
14	START	349	0519	19 09.802	176 22.153	117	16681	16681
	END	349	0846	19 12.002	176 39.657	123	17618	17618
15	START	349	0857	19 11.519	176 40.320	123	17660	17660
	END	349	1205	18 57.100	176 42.270	128	18372	18372
12B	START	349	1219	18 56.504	176 41.488	129	18426	18426
	END	349	1436	18 56.491	176 30.436	132	18943	18943
7C	START	349	1545	18 56.073	176 34.022	134	19214	19214
	END	349	2026	19 18.192	176 31.865	142	20311	20311
16	START	349	2026	19 18.192	176 31.865	142	20311	20311
	END	350	0133	19 29.997	176 09.704	150	21471	21471
17	START	350	0138	19 29.997	176 09.704	150	21471	21471
	END	350	0700	19 31.125	175 42.605	159	22776	22776
18	START	350	0723	19 29.978	175 42.154	159	22776	22776
	END	350	1128	19 18.236	175 56.186	165	23729	23729

LINE #		JD	GMT	LAT	LON	TAPE	SHOT	FILE
19	START	350	1150	19 18.817	175 57.577	166	23815	23815
	END	350	1708	19 43.38X	176 00.576	174	24951	24951
20A	START	350	1830	19 40.981	176 03.357	176	25314	25314
	END	350	2036	19 43.293	175 52.936	180	25821	25821
21	START	350	2055	19 44.361	175 52.02X	180	25896	25896
	END	350	2230	19 51.368	175 54.126	183	26300	26300
22	START	350	2232	19 51.758	175 54.958	183	26300	26300
	END	351	0212	19 47.218	176 10.129	188	26981	26981
23	START	351	0224	19 46.549	176 10.533	188	26981	26981
	END	351	0318	19 43.000	176 09.413	190	27271	27271
20B	START	351	0359	19 40.166	176 08.327	191	27416	27416
	END	351	0559	19 41.868	175 59.394	194	27851	27851
19B	START	351	0711	19 39.137	175 58.979	196	28141	28141
	END	351	1444	20 12.429	176 09.434	207	29862	29862
24	START	351	1444	20 12.429	176 09.434	207	29862	29862
	END	351	1649	20 18.807	176 15.661	210	30188	30188
25	START	351	1701	20 19.565	176 15.453	212		
	END	351	2000	20 24.004	176 00.851	216	31060	31060
26	START	351	2022	20 22.478	176 00.166	217	31124	31124
	END	351	2787	20 09.53X	176 03.83X	222	31791	31791
27	START	352	0040	20 09.822	176 05.507	223	31936	31936
	END	352	0434	20 29.620	176 11.677	230	32951	32951
28	START	352	0434	20 29.620	176 11.677	230	32952	32952
	END	352	0556	20 33.923	176 15.971	232	33241	33241
29	START	352	0556	20 33.923	176 15.971	232	33242	33242
	END	352	0836	20 37.212	176 04.170	236	33865	33865
30	START	352	0859	20 35.896	176 03.272	236	33955	33955
	END	352	1045	20 28.883	176 07.248	239	34348	34348
31	START	352	1108	20 29.065	176 08.590	240	34432	34432
	END	352	1458	20 44.897	176 12.865	245	35242	35242
32	START	352	1458	20 44.897	176 12.865	245	35243	35243
	END	352	1605	20 46.7XX	176 17.969	245	35498	35498
33	START	352	1704	20 48.713	176 15.791	249	35706	35706
	END	352	1922	20 51.207	176 05.962	252	36172	36172
34	START	352	1930	20 50.977	176 05.426	253	36286	36286
	END	352	2100	20 44.3XX	176 07.822	255	36576	36576
35A	START	352	2147	20 42.79X	176 10.075	256	36744	36744
	END	353	0206	21 01.889	176 15.807	262	37591	37591
36A	START	353	0315	21 00.486	176 13.314	265	38026	38026
	END	353	0436	20 58.723	176 19.696	267	38316	38316
37	START	353	0514	20 59.803	176 21.901	268	38461	38461
	END	353	0628	21 05.287	176 23.827	270	38750	38750
38	START	353	0628	21 05.287	176 23.827	270	38751	38751
	END	353	0921	21 09.245	176 10.748	274	39390	39390
39	START	353	0933	21 09.975	176 10.385	274	39433	39433
	END	353	1121	21 17.747	176 12.930	277	39833	39833
40	START	353	1134	21 18.244	176 13.766	277	39883	39883
	END	353	1445	21 14.165	176 27.993	282	40568	40568
41	START	353	1459	21 14.784	176 28.810	282	40625	40625
	END	353	1602	21 19.471	176 30.077	284	40863	40863
42	START	353	1614	21 20.209	176 29.385	284	40915	40915

LINE #		JD	GMT	LAT	LON	TAPE	SHOT	FILE
	END	353	1826	21 23.335	176 18.521	288	41506	41506
43	START	353	1847	21 22.261	176 17.689	289	41506	41506
	END	354	0019	20 57.484	176 09.704	297	42666	42666
36B	START	354	0030	20 56.922	176 10.330	297	42666	42666
	END	354	0140	20 55.501	176 16.074	300	43111	43111
36C	START	354	0253	20 54.070	176 16.117	301	43246	43246
	END	354	0305	20 55.644	176 13.014	302	43391	43391
35B	START	354	0305	20 55.644	176 13.014	302	43391	43391
	END	354	1004	21 26.240	176 22.737	313	44987	44986
44	START	354	1004	21 26.240	176 22.737	313	44988	44987
	END	354	1349	21 42.740	176 26.893	318	45829	45828
45A	START	354	1449	21 39.781	176 28.256	320	46056	46055
	END	354	1646	21 42.122	176 18.858	323	46508	46507
46	START	354	1659	21 42.122	176 18.000	323	46564	46563
	END	354	1814	21 36.594	176 16.061	325	46854	46853
47	START	354	1834	21 35.785	176 17.030	326	46918	46917
	END	354	2147	21 31.490	176 36.131	331	47597	47596
48	START	354	2205	21 32.073	176 32.166	331	47664	47663
	END	354	2339	21 38.184	176 33.674	333	47992	47991
45B	START	354	2351	21 38.448	176 32.741	334	48032	48031
	END	355	0211	21 40.891	176 21 .901	337	48562	48561
44B	START	355	0319	21 38.895	176 24.770	339	48708	48707
	END	355	0852	22 02.397	176 34.943	348	50070	50068
49A	START	355	1016	21 59.758	176 36.174	350	50396	50394
	END	355	1146	22 02.615	176 29.647	352	50727	50725
50	START	355	1200	22 02.178	176 28.687	353	50782	50780
	END	355	1338	21 54.982	176 25.461	355	51166	51164
51	START	355	1349	21 54.235	176 25.851	356	51209	51207
	END	355	1623	21 49.784	176 37.797	360	51800	
52	START	355	1654	21 51.454	176 38.984	361	51898	
	END	355	1819	21 56.918	176 40.879	363	52188	
49B	START	355	1836	21 57.706	176 40.879	363	52248	
	END	355	2033	22 01.445	176 32.389	366	52684	
44C	START	355	2147	21 58.789	176 33.391	368	52913	
	END	356	0155	22 14.314	176 37.945	374	53783	
53	START	356	0236	22 14.982	176 39.767	375	53928	
	END	356	0313	22 13.126	176 42.056	376	54073	
54	START	356	0349	22 11.165	176 44.409	377	54218	
	END	356	0427	22 08.201	176 44.495	378	54363	
55	START	356	0503	22 05.782	176 43.456	379	54508	
	END	356	0807	22 08.954	176 29.999	383	55144	
56	START	356	0822	22 09.737	176 29.449	383	55195	
	END	356	0915	22 13.384	176 30.255	385	55378	
57	START	356	0932	22 13.854	176 31.240	385	55438	
	END	356	1142	22 11.494	176 41.423	388	55918	
58	START	356	1206	22 10.130	176 41.181	389	56014	
	END	356	1306	22 08.255	176 36.513	391	56248	
59	START	356	1322	22 08.978	176 35.657	391	56303	
	END	356	2158	22 42.729	176 45.083	403	58040	
60	START	356	2252	22 39.259	176 46.573	405	58278	
	END	357	0030	22 30.291	176 46.735	408	58713	

LINE #		JD	GMT	LAT	LON	TAPE	SHOT	FILE
61	START	357	0050	22 29.349	176 45.630	408	58713	
	END	357	0300	22 32.337	176 36.333	411	59148	

Data Instruments

Truetime UTC Time Clock

The Kinemetrics Truetime UTC clock is logged at 60 second intervals. CPU time is synchronized every 60 seconds to this clock.

Date	Comment
336: 00:00	Start Logging
362:20:00	End Logging

Magnetometer

Geometrics G-886 Marine Magnetomer logged at 12 second intervals.

Date	Comment
341:22:57	Started
343:02:13 - 346:04:09	No logging
346:04:09	Logging resumes
351:15:40	Magnetometer gets progressively noisier from this day forward
357:01:56	End of logging

Furuno Speed and Heading

The Furuno CI-30 2 axes doppler speed log and Sperry MK-27 gyro are logged at 3 second intervals. Furuno was logged during the entire cruise

Date	Comment
336: 00:00	Start Logging
362:20:00	End Logging

GPS Receivers

gp1 = Tasman Y/Pcode
gp2 = Trimble Selective Availability **tb1** = Ashtec G8 Selective Availability

were logged at 10 second intervals. Navigation is processed and reduced to 1 minute intervals, which is later applied to hydrosweep bathymetry, magnetics, gravity, and shot data. All data has been processed using gp1: Pcode navigation.

Date	Comment
336: 00:00	Start Logging
362:20:00	End Logging

Bell Gravimeter

The gravity meter is logged at one second intervals. There were no gaps in the gravimeter record

for this cruise.

Date	Comment
336: 00:00	Start Logging
340:03:06 - 340:03:26	Gravity interrupted
341:00:16 - 341:00:26	interrupted
362:20:00	End Logging

Hydrosweep Centerbeam and Swath Data

Krupp Atlas Hydrosweep Centerbeam. Each Hydrosweep ping is logged, and center beam data is extracted and logged separately. Hydrosweep was logged during the entire cruise.

HS swath data can be read and processed using MB-System software which can be found at the website of Dale Chayes: http://www.ldeo.columbia.edu/~dale.

Date	Comment
336:22:23	Start HS Logging
340:03:06 - 340:03:25	interrupted
344:18:48 - 344:21:28	interrupted
362:20:00	End Logging

Omega DP-10 Sea Temperature

Sea temperature is logged at 60 second intervals; there were no gaps in the data for the cruise.

Date	Comment
336: 00:00	Start Logging
362:20:00	End Logging

Weather Station

R.M. Young Precision Meteorological Instruments 26700 Series is used to log a variety of meteorological events at 60 second intervals.

Date	Comment
336:00:00	Start Weather Logging
362:20:00	End Logging

Data Processing

GPS Data Reduction/Processing

Navigation data is post-processed in order to accurately determine the position due to GPS accuracy errors. We perform slightly different processing depending on the type of receiver.

GPS Processing Steps

1. Check data for mutant records and non-sequential times.
2. If we have speed and/or DOP information, remove records that have excessive speed or too high of a DOP1
3. Convert from NMEA or proprietary format to a standard format
   98+240:00:28:50.091 N 42 14.1536 W 063 25.5897 P-trimble
4. If we are processing known differential data, remove non-differential fixes from the file.
5. Interpolate and reduce data. Fixes are reduced to 30 second fixes and any minor gaps (< 3 minutes) are linearly interpolated.
6. Smooth data using a 9 point running average algorithm and further reduce data to 60 second fixes.
7. Perform dead reckoning using the smoothed Furuno speed and heading to fill in major gaps (> 3 minutes) and to insure the accuracy of the GPS data. By performing dead reckoning, we can determine the drift of the GPS vs. the speed and heading. Any huge distances will alert us to a problem.

Furuno Processing

Furuno speed and heading is processed by smoothing the data using a vector summing algorithm. Data is reduced and output at 1 minute intervals by taking the smoothed values and calculating the mean value for the 30 seconds before and after the whole minute.

Hydrosweep Processing

Centerbeam Processing steps

1. Remove all survey and calibration records from the raw data and all *0* level depths.
2. Reduce data to one minute intervals on 00 seconds of the minute by computing the median

[1] Dilution of Precision, a term used to measure the accuracy of the fix based on the number of Satellites the GPS receiver is tracking, and the position of the satellites.

values from the raw values that lie between +-30 seconds of 00 seconds of the minute.

3. Merge the data with the processed navigation to end up with one minute hydrosweep centerbeam fixes with navigation.

Swath Processing

Hydrosweep swath data is processed using a package from Lamont-Doherty Earth Observatory called **MB-System**.

The processing includes hand-editing the beam data to insure an accurate hydrosweep survey. This process is too involved to document here; but the source code and documentation may be found at the website: *http://www.ldeo.columbia.edu/~dale*

Gravity Processing

> *bias = 852645.3; Dec 5, 1997*
> *scale = 5.0940744 July 9, 1992*
> *mGals = raw_gravity_count * scale + bias;*

Logging

- Raw gravity is logged to disk (roughly 1 sample/second) and broadcast to the network.
- A real-time gravity process reads the sampled data and applies a 6 minute gaussian filter to the raw sample to provide a running display of the current gravity. This value is used in the gravity ties to determine the local gravity. (Gravity Meter Value (BGM Reading))

Gravity Post Processing

1. Raw gravity is filtered using a 6 minute gaussian filter and mGals are output. The raw mGals are represented by
   > *mGals = gravitycount * scale + bias;*
4. A second filter is then applied; an 8 minute Gaussian filter using the GMT system:
   > *filter1D -G480 -R -E*
5. The filtered output is then reduced to 1 minute intervals by using the mean values of all data +/- 30 seconds from the 00 second mark of the minute to output:
   ```
   98+254:00:07:00.000 980422.37
   98+254:00:08:00.000 980422.38
   ```
6. The data is merged with the navigation. **See** *Processed File Formats.*
   At this point eotvos corrections are determined by merging the daily navigation and raw gravity files and calculating the Eotvos correction as:
   > *Eotvos correction = 7.5038 * vel_east * cos(lat) + .004154 * vel*vel*
7. The velocities used in the Eotvos calculation are smoothed to reduce the jitter in the corrected gravity and FAA values. The smoothing is done using a 9 point running average.

Gravity Ties

It is usual practice to have a gravity "tie" to a gravity reference base station during the port stay. A

portable gravity meter, e.g. the Lacoste Model G #70, is used to make 1) a pier-side reading; 2) a reading at the base station; 3) an additional pier-side reading. The pier-side gravity value, adjusted in value to correspond to the height of the BGM gravity meter, is compared to the real-time **BGM Gravity Reading** discussed previously.

The practice is not to adjust the BGM-3 so that its reading agrees with the pier-side gravity value, but to establish a "dc shift", which represents a constant correction to be applied to all gravity values on the next cruise.

For example, suppose the pier-side value equaled 980274.7 mGal and the BGM reading was 980279.9, the dc shift would be 5.2 mGal. In other words, the BGM is 5.2 mGal high. This value is subtracted from observed values of gravity following the cruise as a constant correction. The "drift" of the Bell gravity meter is determined from the two in-port gravity station ties. In the pre-cruise tie the BGM might have been found to be 5.3 mGal high and during the post-cruise tie it is 8.4 mGal high. The drift during the cruise is therefore equal to 3.2 mGal (8.4 - 5.2). The amount of drift per day is then calculated and gravity data is processed with the drift values corrected for the length of the cruise.

Thus, for daily reduction at sea the drift correction option cannot be used. However, the drift rate of the Bell gravimeter is very low, usually much less than 0.1 mGals/day; thus useful analysis of the FAA values while at sea is possible

A corrected gravity value is computed as:

> *corrected_grv = raw_grv + eotvos_corr - drift - dc_shift*

The theoretical gravity value is based upon different models for the earth's shape.

> *1930 = 1930 International Gravity Formula*
> *1967 = 1967 Geodetic Reference System Formula*
> *1980 = 1980 Gravity Formula*

The FAA is computed as: faa = corrected_grv - theoretical_grv

Gravity Ties

EW-9912 Townsville, Australia

Pier/Ship	Latitude	Longitude
	19 15.067 S	146 49.8395E

Berth 10, Townsville Port

End of pier (near bollard 10)

C Deck is 1 meter below Pier

Reference	Latitude	Longitude
	19 15.70S	146 46.80 E

Townsville City College Campus; Corner of Stanley and Walker. I took the reading near the bike rack outside the back door of C Block building as the original reading was carpeted over

	Id	Julian	Date	Mistie	Drift/Day	DC Shift
Pre Cruise	EW9911	295	10/22/99	2.28	0.02	1.55
Post Cruise	EW9912	336	12/2/99	3.87	0.04	2.28
Total Days			41.00	1.59		

Time	Entry	Value	
12/2/99 00:00	CDeck Level BELOW Pier	2.00	meters
	Pier 1 L&R Value	2286.01	L&R
	Reference L&R Value	2281.58	L&R
	Pier 2 L&R Value	2286.03	L&R
	Reference Gravity	978623.30	mGals
	Gravity Meter Value (BGM Reading)	978634.20	mGals
	Potsdam Corrected	0	1 if corrected

*Gravity meter is **5.5** meters below CDeck*

Difference in meters between Gravity Meter and Pier: 7.50 meters

Height Cor = Pier Height* FAA Constant

7.50	0.31			2.33	mGals/min

Difference in mGals between Pier and Gravity Meter

Pier (avg) - Reference * 1.06 L&R/mGal = Delta L&R

2286.02	2281.58	1.06		4.71	mGals

Gravity in mGals at Pierside

Reference + Delta mGals [+ Potsdam] = Pier Gravity

978623.30	4.71	0.00		978628.01	mgals

Gravity in mGals at Meter

Pier Gravity+ Height Correction = Gravity@meter

978628.01	2.33			978630.33	mGals

Current Mistie

BGM Reading- Calculated Gravity = Current Mistie

978634.20	978630.33			3.87	mGals

Pier/Ship	Latitude	Longitude
	43 36.4S	172 43.2 E

Reference	Latitude	Longitude
	43 31.77 S	172 37.18 E

Using Reference point from March 1992, and again in February 1996:

Marker ***1962*** on walkway across from RR tracks.

	Id	Julian	Date	Mistie	Drift/Day	DC Shift
Pre Cruise	EW9912	336	12/2/99	3.87	0.04	2.28
Post Cruise	EW9914	363	12/29/99	4.16	0.011	3.87
Total Days			27.00	0.29		

Time	Entry	Value	
	CDeck Level BELOW Pier	1.50	meters
	Pier 1 L&R Value	4095.00	L&R
	Reference L&R Value	4064.90	L&R
	Pier 2 L&R Value	4095.00	L&R
7/1/70 00:00	Reference Gravity	980508.06	mGals
	Gravity Meter Value (BGM Reading)	980546.30	mGals
	Potsdam Corrected	0	1 if corrected

Gravity meter is ***5.5*** *meters below CDeck*

Difference in meters between Gravity Meter and Pier: 7.00 meters

Height Cor = Pier Height* FAA Constant

Pier Height*	FAA Constant				
7.00	0.31			2.17	mGals/min

Difference in mGals between Pier and Gravity Meter

Pier (avg) -	Reference * 1.06 L&R/mGal			Delta L&R	
4095.00	4064.90	1.06		31.91	mGals

Gravity in mGals at Pierside

Reference + Delta mGals [+ Potsdam]				Pier Gravity	
980508.06	31.91	0.00		980539.97	mgals

Gravity in mGals at Meter

Pier Gravity+	Height Correction			Gravity@meter	
980539.97	2.17			980542.14	mGals

Current Mistie

BGM Reading-	Calculated Gravity			Current Mistie	
980546.30	980542.14			4.16	mGals

File Formats

Raw Compass Block cb1.d

CPU Time Stamp	Line	Shot	GPS 1 Position
99+350:00:01:29.572	LAU1	021144	S 19 26.4331 W 176 16.3491

GPS2 Position	Tailbuoy Position	Compass Positions/Compass# …
S 19 26.4393 W 176 16.3198	S 19 25.2864 W 176 19.7897	107.0 C01 97.8 C03

No processing is performed on compass block data since the compasses are directly related to the GPS position at the given time.

Raw Furuno Log fu.r

CPU Time Stamp	Track	Speed	Heading	Gyro
98+166:00:01:53.091	-	4.4	140.5	148.3

Hydrosweep Centerbeam merged w/ Navigation hb.n

CPU Time Stamp	Latitude	Longitude	Depth
98+074:09:55:00.000	N 13 6.6206	W 59 39.3908	134.9

Hydrosweep is median filtered at 1 minute intervals, then merged with navigation at 1 minute intervals.

Merged Data m.

CPU Time Stamp	Latitude	Longitude	GPS	Set	Drift	Depth
98+074:14:08:00.000	N 13 54.3859	W 59 43.5175	gp1	0.0	0.0	732.9

Magnetic Total Intensity	Gravity Anomaly	FAA	GRV	EOTVOS	Drift	Shift
0.0	0.0	31.3	978370.7	-3.9	0.0	4.5

The gravity drift and shift are values that have been added to the raw gravity logged to make up for drift in the meter that has been lost in accordance with a gravity check at each port stop.

Navigation File n.

CPU Time Stamp	Latitude	Longitude	Used	Set	Drift
98+074:00:03:00.000	N 13 6.2214	W 59 37.9399	gp1	0.0	0.0

The raw navigation is interpolated to 30 second intervals. Then smoothed with a 9 point windowing average. The smoothed GPS points are them Fixed at 1 minute intervals. Dead

reckoning is then performed across the gaps to insure proper GPS positioning.

Time Shot File ts.n

CPU Time Stamp	Shot #	Latitude	Longitude	Line Name
98+077:00:15:00.000	00295	N 16 11.8600	W 59 48.0157	strike1

Gravity File merged with navigation vt.n

- *eotvos_corr = 7.5038 * vel_east * cos(lat) + .004154 * vel*vel*
- *faa = corrected_grv - theoretical_grv*

CPU Time Stamp	Latitude	Longitude	Model[2]	FAA	RAW
98+077:00:15:00.000	N 16 11.8600	W 59 48.0157	1980	-175.9	978253.6

Eotvos Smooth	Drift Total	DC Shift	Raw Velocity North East	Smooth Velocity North East
9.7	0.0	4.5	-4.350 1.282	-4.333 1.329

Raw Weather File Format wx.

CPU Time Stamp	wsi1	wss1	wsm1	wsx1	wdc1	wds1
94+022:00:00:00.244	9.3	5.4	13.2	21.1	27.1	26.1

wdm1	*wsi2*	*wss2*	*wsm2*	*wsx2*	*wdc2*	*wds2*	*wdm2*	tcur	tavg
6	*0*	*0*	*0*	*0*	*0*	*0*	*0*	26.7	26.7

tmin	tmax	rh	rhn	rhx	baro	
26.5	27.0	66	58	68	10	16.8

- wsi1 = wind speed, instantaneous, bird #1
- wss1 = wind speed, 60 second average, bird #1
- wsm1 = wind speed, 60 minute average, bird #1
- wsx2 = wind speed, current 60 minute maximum, bird #1
- wdc1 = wind direction, current, bird #1
- wds1 = wind direction, 60 second average, bird #1
- wdm1 = wind direction, 60 second st deviation, bird #1
- ~~*wsi2 = wind speed, instantaneous, bird #2*~~
- ~~*wss2 = wind speed, 60 second average, bird #2*~~
- ~~*wsm2 = wind speed, 60 minute average, bird #2*~~
- ~~*wsx2 = wind speed, current 60 minute maximum, bird #2*~~
- ~~*wdc2 = wind direction, current, bird #2*~~
- tcur = temperature, current
- tavg = temperature, current 60 minute average
- tmin = temperature, current 60 minute minimum
- tmax = temperature, current 60 minute maximum
- rh = relative humidity
- rhn = relative humidity, current 60 minute minimum

[2] The theoretical gravity value is based upon different models for the earth's shape: 1930 is the 1930 International Gravity Formula; 1967 is the 1967 Geodetic Reference System Formula; and 1980 is the 1980 Gravity Formula

- rhx = relative humidity, current 60 minute maximum
- baro = barometric pressure

Bird2 is deactivated, so all ~~*strikeout*~~ items are not valid.

Tape Contents

The tape contains the following items:

- EW9914.rtf
- EW9914.cdf, EW9914.cdf_nav
- reduction
  intermediate processed data
- processed
  Final processed data collected during the cruise and tied to navigation.
  Also includes trackplots, and some GMT plots and scripts of the cruise.
- raw
  All data logged during this cruise including the raw hydrosweep swath data.
- xbt