Lamont-Doherty Earth Observatory
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Data Reduction Summary

Western Geophysical Cruises
EW9805, EW9806, EW9807

May 23 – September 23, 1998

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Data Reduction Summary

Summary of Data Processing for Western Geophysical Cruises EW9805 – EW9807

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Cruise Notes

All times specified within this report are GMT.

- **There was a break of approximately one hour between 168:2330 – 169:01due to a disk change.**
- **Differential navigation wasn't integrated into the system until the third day of the cruise, and is also missing on days 152 and 185**
- **The gravity meter table gyros failed at approximately noon on day 252 and the problem was corrected late on 253. Gravity data was back on line starting at day 253, 2000 hours.**
- **Due to a combination of rough seas and shallow ocean bottom, the hydrosweep logging was returning incorrect data (*The readings coming back from the Hydrosweep were twice the actual depth*) from 248:2030, through 250:1808. Repeated attempts to fix the problem failed through day 249. However, it was believed to be running correctly up until it was reported to be still incorrect on day 250 at 1800. At this time, the problem was finally corrected and the sea state had returned to normal.**

Cruise Data

See *Data Instruments* for more precise definitions of these fields.

Data Type	File	Description	Log Interval	Days Collected
UTC time	tr2	Datum UTC time clock	60 seconds	144 – 264
Furuno	fu	Furuno speed and heading	3 second	144 – 264
Y Code GPS	gp1	Tasman Ycode receiver	10 second	144 – 264
Trimble GPS	gp2	Selective availability GPS	10 second	144 – 264
Magnavox GPS	gp3	Selective availability GPS	10 second	144 – 264
Differential GPS	gp4	Trimble Differential GPS	10 second	147 – *264*
Hydrosweep	hb	Krupp Atlas Hydrosweep	variable	144 – *264*
Gravity	vc	Bell gravimeter data	1 second	144 – *264*
Sea Temp	ct		60 second	144 – 264
Meteorology	wx	Weather Station	60 second	144 – 264

Logging

All logged data (*except GPS data*) is synchronized to the CPU time of the logging computer, which in turn is synchronized to the UTC time.

GPS time is extracted from the GPS fix data.

Data Instruments

The following times are specified in GMT time.

Datum UTC Time Clock

The Datum 9390-1000 Startime GPS clock is logged at 60 second intervals. CPU time is synchronized every 60 seconds to this clock.

Date	Comment
144:0000	Start EW9805
168:2330 - 169:0100	Logging Interrupted
181:2359	End EW9805
183:1100	Start EW9806
223:2359	End EW9806
225:1054	Start EW9807
264:2359	End EW9807

Furuno Speed and Heading

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

Date	Comment
144:1440	Start EW9805
168:2330 - 169:0100	Logging Interrupted
181:2359	Logging ends for EW9806
183:1100	Start EW9806
223:2359	End EW9806
225:1054	Start EW9807
264:2359	End EW9807

GPS Receivers

- gp1 = Tasman Ycode
- gp2 = Trimble SA
- gp3 = Magnavox 4200
- gp4 = Trimble Differential

are logged at 10 second intervals. Navigation is processed and reduced to 1 minute intervals, which is later applied to hydrosweep bathymetry and gravity. All data has been processed using gp4: differential navigation. When differential navigation is not available, Ycode is used.

Date	Comment
144:0000	Start GP1 EW9805
147:0000	*Start GP4 EW9805*
152	*GP4 differential not recorded*
168:2330-169:0100	Logging Interrupted
181:2359	End EW9805
183:1100	Start EW9806 GP1
185	*GP4 differential not recorded*
223:2359	End EW9806
225:1054	Start EW9807 GP1,GP4
264:2359	End EW9807

Krupp Atlas Hydrosweep

During certain circumstances, the Krupp hydrosweep will lose its calibration and start reporting invalid depths. This occurred twice during bad weather on days 248 and 250. On day 250, we do not know exactly what time it lost calibration, but it was repaired at 1808Z. This is why no data is available until 1808Z on day 250.

Date	Comment
144:0147	Processed HS begins
155:0410 - 158:2042	Processed HS interrupted
167:2111 - 170:1741	Processed HS interrupted
181:1300	End EW9805
184:1300	Start EW9806 HS Processing
222:2359	End EW9806
225:1727	Start EW9807
242:1902 –243:1152	*Port stop*
248:2030 – 250:1808	*Depth out of calibration*
264:2359	End EW9807

Bell Gravimeter

The Bell BGM-3 Gravimeter table gyros went out during some bad weather on day 252. The table was restored to working order and gravity data was restored starting on day 254.

Date	Comment
144:1430	Start EW9805
168:2330 - 169:0100	Logging Interrupted
181:2359	End EW9805
183:100	Start EW9806
223:2359	End EW9806
225:1113	Start EW9807
252:1200 - 253:2100	Gravity data interrupted due to gyro problems
264:2359	End EW9807

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
144:0000	Start EW9805
168:2330-169:0100	Logging Interrupted
181:2359	End EW9805
183:1100	Start EW9806
223:2359	End EW9806
225:1054	Start EW9807
264:2359	End EW9807

Omega DP-10 Sea Temperature

Date	Comment
144:0000	Start EW9805
168:2330-169:0100	Logging Interrupted
181:2359	End EW9805
183:1100	Start EW9806
223:2359	End EW9806
225:1054	Start EW9807
264:2359	End EW9807

Line Information

Line Name		Julian Date	FSP	SOL Time	LSP	EOL Time	
WG98CAN-093		147	1001	16:03:00	1097	16:28:00	
WG98CAN-093	A	148	4367	5:24:00	0	5:36:00	
WG98CAN-093	B	148/149	4367	20:47:00	2631	5:00:00	
WG98CAN-093	C	149	2905	10:36:00	1394	16:59:00	
WG98CAN-075		151	2508	1:35:00	2190	3:07:00	
WG98CAN-075	A	151	2366	8:55:00	767	16:40:00	
WG98CAN-075	B	152	1774	3:13:00	1456	4:46:00	
WG98CAN-075	B	152	934	7:21:00	20	11:49:00	*RGAP*
WG98CAN-085		152	112	16:01:00	397	17:19:00	
WG98CAN-085	A	153/154	1800	19:12:00	3002	0:29:00	
WG98CAN-085	B	154	2843	5:31:00	3119	6:46:00	
WG98CAN-087		154	2503	10:27:00	2278	11:26:00	
WG98CAN-087	A	154/155	2502	16:39:00	20	4:09:00	
WG98CAN-085	C	155	100	6:52:00	240	7:30:00	
WG98CAN-093	D	158/159	4367	21:36:00	20	16:44:00	
WG98CAN-085	D	159/160	101	22:41:00	1879	6:34:00	
WG98CAN-091		160	2499	12:01:00	21	23:18:00	
WG98CAN-089		161	101	2:06:00	1803	9:45:00	
WG98CAN-089	A	161	1626	14:52:00	2849	20:28:00	
WG98CAN-083		161/162	2501	23:28:00	20	10:35:00	
WG98CAN-081		162	100	aborted	line		
WG98CAN-081	A	162/163	100	17:32:00	2983	6:24:00	
WG98CAN-079		163	2499	9:33:00	21	20:34:00	
WG98CAN-077		163/164	100	23:06:00	805	2:14:00	
WG98CAN-077	A	164	620	7:01:00	2851	16:59:00	
WG98CAN-095		164/165	1704	22:30:00	606	3:28:00	
WG98CAN-095	A	165	765	8:26:00	20	11:47:00	
WG98CAN-113		165	1968	15:43:00	1079	19:42:00	
WG98CAN-113	A	166	1247	:25	1189	:42	
WG98CAN-113	B	166	1247	4:49:00	20	10:24:00	
WG98CAN-111		166	100	12:52:00	1375	18:40:00	
WG98CAN-111	A	166/167	1215	23:16:00	2586	5:26:00	
WG98CAN-097		167	2236	14:05:00	684	21:11:00	
WG98CAN-073		170	100	4:25:00	2854	16:51:00	
WG98CAN-071		107/171	2496	19:31:00	20	6:35:00	
WG98CAN-069		171	100	9:06:00	2405	19:21:00	
WG98CAN-069	A	172	2246	:07	2718	2:17:00	
WG98CAN-067		172	2518	4:26:00	20	15:39:00	
WG98CAN-065		172/173	100	18:04:00	2714	5:44:00	
WG98CAN-063		173	2493	7:55:00	20	18:58:00	
WG98CAN-061		173/174	100	21:31:00	2582	8:35:00	
WG98CAN-059		174	2502	11:01:00	20	22:10:00	

Line Name		Julian Date	FSP	SOL Time	LSP	EOL Time
WG98CAN-057		175	100	:38	2579	11:43:00
WG98CAN-055		175/176	2498	14:09:00	20	1:16:00
WG98CAN-053		176	100	3:47:00	708	6:32:00
WG98CAN-053	A	176	519	11:11:00	2578	20:21:00
WG98CAN-049		176/177	4113	23:59:00	20	18:37:00
WG98CAN-051		178	100	:58	823	4:14:00
WG98CAN-051	A	178	620	8:44:00	2582	17:44:00
WG98CAN-047		178/179	2244	20:41:00	20	7:01:00
WG98CAN-045		179	100	9:22:00	135	9:32:00
WG98CAN-045	A	180/181	2498	12:48:00	20	:19
WG98CAN-043		181	100	2:55:00	2318	12:59:00
WG98CAN-041		184	100	15:51:00	287	16:41:00
WG98CAN-041	A	184	100	21:07:00	2579	8:16:00
WG98CAN-039		185	2237	10:43:00	19	20:42:00
WG98CAN-037		185	101	23:12:00	264	:01
WG98CAN-037		186	265	:01	2579	10:40:00
WG98CAN-035		186	2235	15:18:00	2177	15:34:00
WG98CAN-035	A	186	2235	19:39:00	1271	:01
WG98CAN-035	A	187	1270	:01	197	4:55:00
WG98CAN-035	B	187	401	13:39:00	20	15:22:00
WG98CAN-033		187	100	17:52:00	1469	:01
WG98CAN-033		188	1470	:01	2584	4:56:00
WG98CAN-031		188	2233	7:46:00	19	17:44:00
WG98CAN-029		188	100	20:14:00	931	:01
WG98CAN-029		189	932	:01	2584	7:22:00
WG98CAN-027		189	2234	10:02:00	383	18:32:00
WG98CAN-027	A	189	543	23:15:00	378	:01
WG98CAN-027	A	190	377	:01	19	1:44:00
WG98CAN-025		190	100	4:13:00	3114	18:01:00
WG98CAN-023		190	2502	21:54:00	2083	:01
WG98CAN-023		191	2082	:01	19	10:26:00
WG98CAN-021		191	100	13:05:00	2566	:01
WG98CAN-021		192	2567	:01	2584	:05
WG98CAN-019		192	2498	3:05:00	484	12:12:00
WG98CAN-019	A	192	682	16:49:00	19	19:55:00
WG98CAN-017		192	100	22:37:00	378	23:17:00
WG98CAN-017	A	193	203	4:53:00	2583	15:20:00
WG98CAN-015		193	2500	17:50:00	1928	20:19:00
WG98CAN-015	A	194	2211	3:59:00	19	14:20:00
WG98CAN-013		194	100	16:58:00	1696	:01
WG98CAN-013		195	1697	:01	1933	1:03:00
WG98CAN-013	A	195	1744	5:31:00	2584	9:21:00
WG98CAN-011		195	2505	12:00:00	20	23:07:00
WG98CAN-004		196	9237	2:44:00	5657	:01
WG98CAN-004		197	5656	:01	3525	9:49:00

Line Name		Julian Date	FSP	SOL Time	LSP	EOL Time
WG98CAN-097	A	197	860	12:43:00	20	16:29:00
WG98CAN-099		197	100	18:52:00	1253	:01
WG98CAN-099		198	1254	:01	3115	8:16:00
WG98CAN-101		198	2233	12:44:00	20	22:40:00
WG98CAN-103		199	100	1:08:00	2710	12:36:00
WG98CAN-105		199	2243	15:40:00	1399	19:29:00
WG98CAN-105	A	200	1648	7:11:00	20	15:56:00
WG98CAN-107		200	100	18:30:00	1298	:01
WG98CAN-107		201	1299	:01	1857	2:33:00
WG98CAN-107	A	201	1678	7:15:00	2754	12:00:00
WG98CAN-109		201	2239	15:18:00	452	:01
WG98CAN-109		202	451	:01	20	2:07:00
WG98CAN-119		202	100	5:52:00	913	9:46:00
WG98CAN-119A		202	676	14:53:00	2585	23:04:00
WG98CAN-121		203	1969	2:21:00	20	10:51:00
WG98CAN-123		203	100	13:21:00	2327	:01
WG98CAN-123		204	2328	:01	2865	2:20:00
WG98CAN-125		204	1968	7:07:00	20	15:30:00
WG98CAN-123	A	204	627	19:01:00	1162	21:17:00
WG98CAN-119	B	205	917	0:03:00	465	2:11:00
WG98CAN-127		205	100	6:41:00	2587	18:11:00
WG98CAN-117		205	1961	22:25:00	1631	:01
WG98CAN-117		206	1630	:01	20	7:34:00
WG98CAN-131		206	100	12:01:00	2483	:01
WG98CAN-131		207	2484	:01	2578	0:25:00
WG98CAN-133		207	1966	4:09:00	20	12:22:00
WG98CAN-129		207	100	15:09:00	1948	:01
WG98CAN-129		208	1949	:01	2044	0:27:00
WG98CAN-137		208	1968	3:45:00	20	12:41:00
WG98CAN-135		208	100	19:07:00	1022	:01
WG98CAN-135		209	1023	:01	3648	11:53:00
WG98CAN-125	A	209	1969	16:40:00	457	:01
WG98CAN-125	A	210	456	:01	20	1:51:00
WG98CAN-139		210	100	6:33:00	1460	12:47:00
WG98CAN-139	A	210	1269	18:00:00	2543	:01
WG98CAN-139	A	211	2544	:01	2578	0:09:00
WG98CAN-141		211	1967	3:38:00	20	12:59:00
WG98CAN-143		211	100	15:25:00	1812	23:53:00
WG98CAN-143	A	212	1635	19:27:00	2577	23:49:00
WG98CAN-145		213	1974	3:12:00	422	9:59:00
WG98CAN-145	A	213	595	14:51:00	19	17:35:00
WG98CAN-147		214	100	0:50:00	2577	12:19:00
WG98CAN-149		214	1973	15:40:00	65	:01
WG98CAN-149		215	64	:01	20	0:13:00
WG98CAN-151		215	100	2:33:00	2588	14:03:00

Line Name		Julian Date	FSP	SOL Time	LSP	EOL Time
WG98CAN-153		215	1971	17:35:00	992	22:18:00
WG98CAN-151	A	216	1179	0:22:00	1522	1:54:00
WG98CAN-153	A	216	1152	4:28:00	20	9:37:00
WG98CAN-155		216	100	16:22:00	1627	:01
WG98CAN-155		217	1628	:01	3659	9:33:00
WG98CAN-2006		217	100	19:17:00	1041	:01
WG98CAN-2006		218	1042	:01	3863	13:11:00
WG98CAN-004	A	219	100	3:25:00	670	5:53:00
WG98CAN-004	B	219	510	11:49:00	3136	:01
WG98CAN-004	B	220	3137	:01	3765	3:03:00
WG98CAN-115		220	3565	15:59:00	1744	:01
WG98CAN-115		221	1743	:01	20	7:27:00
WG98CAN-073	A	221	9040	19:05:00	10163	:01
WG98CAN-073	A	222	10164	:01	10260	0:25:00
WG98CAN-025	A	222	10180	11:48:00	8946	17:41:00
WG98CAN-013	B	223	9037	0:40:53	10261	6:52:00
WG98CAN-2025		223	100	11:07:00	2045	20:31:00
WG98CAN-2001		226	100	11:30:00	2764	:01
WG98CAN-2001		227	2765	:01	3096	1:38:00
WG98CAN-2003		227	3037	4:33:00	996	15:15:00
WG98CAN-2003	A	227	1186	19:53:00	243	:01
WG98CAN-2003	A	228	242	:01	20	0:58:00
WG98CAN-2005		228	100	3:42:00	3119	17:51:00
WG98CAN-2007		228	3031	20:17:00	2200	:01
WG98CAN-2007		229	2199	:01	20	10:19:00
WG98CAN-2009		229	100	3:05:00	2500	:01
WG98CAN-2009		230	2501	:01	3109	2:54:00
WG98CAN-2011		230	3035	5:39:00	20	21:05:00
WG98CAN-2013		230	100	22:48:00	135	:01
WG98CAN-2013		231	136	:01	3107	14:33:00
WG98CAN-2015	A	231	4098	23:03:00	3916	:01
WG98CAN-2015	A	232	3915	:01	20	18:29:00
WG98CAN-2017		233	100	6:11:00	3115	20:49:00
WG98CAN-2019		233	3040	23:24:00	2918	:01
WG98CAN-2019		234	2917	:01	20	13:05:00
WG98CAN-2021		234	100	16:14:00	1735	:01
WG98CAN-2021		235	1736	:01	3122	6:48:00
WG98CAN-2023	A	235	3026	14:11:00	786	:01
WG98CAN-2023	A	236	785	:01	20	3:14:00
WG98CAN-2027		236	100	7:35:00	1800	15:52:00
WG98CAN-2002		236	100	19:44:00	360	21:18:00
WG98CAN-2027	A	237	1641	6:34:00	3116	13:56:00
WG98CAN-2029		237	3032	18:09:00	1764	:01
WG98CAN-2029		238	1763	:01	20	6:15:00
WG98CAN-2031		238	100	12:50:00	2237	23:51:00

Line Name		Julian Date	FSP	SOL Time	LSP	EOL Time	
WG98CAN-2031	A	239	1982	5:13:00	2848	9:45:00	
WG98CAN-2002	A	239	100	17:45:00	1373	:01	
WG98CAN-2002	A	240	1374	:01	1850	2:18:00	
WG98CAN2011	A	240	0		0		
WG98CAN-2011	B	240	1671	14:12:00	1136	16:30:00	
WG98CAN-2002	B	240	1691	19:40:00	2665	:01	
WG98CAN-2002	B	241	2666	:01	2849	0:51:00	
WG98CAN-004	C	243	8998	13:31:00	10916	21:33:00	
WG98CAN-2006	A	244	16560	2:03:00	15082	8:04:00	
WG98CAN-2006	B	244	15481	14:34:00	15206	16:01:00	*REC. GAP*
WG98CAN-2006	B	244	14131	20:31:00	13531	22:51:00	*REC. GAP*
WG98CAN-2006	B	245	12731	2:06:00	10812	12:15:00	*REC. GAP*
WG98CAN-2006	B	245	10508	13:29:00	8561	21:07:00	*REC. GAP*
WG98CAN-2006	B	245	8287	22:25:00	8255	22:34:00	
WG98CAN-161		250	4366	12:40:00	2789	19:18:00	*Double depth @ SOL*
WG98CAN-161	A	251	3000	0:14:00	20	15:46:00	
WG98CAN-163		251	100	19:22:00	173	19:41:00	*DNP*
WG98CAN-163	A	251/252	100	23:57:00	4445	20:00:00	
WG98CAN-165		253	4901	2:07:00	1037	20:20:00	
WG98CAN-165	A	254	1199	1:34:00	20	6:54:00	
WG98CAN-167		254	100	13:08:00	421	14:35:00	
WG98CAN-167	A	254	262	20:21:00	3552	12:11:00	
WG98CAN-167	B	255/256	3395	16:45:00	4981	:17	
WG98CAN-169		256	6491	5:35:00	5092	11:35:00	
WG98CAN-169	A	256/257	5298	16:23:00	20	15:40:00	
WG98CAN-171		258	100	8:50:00	3370	23:15:00	
WG98CAN-3059		259	3059	1:45:00	174	16:00:00	
WG98CAN-2006	C	260	6357	4:15:00	3674	17:58:00	
WG98CAN-3025		261	100	3:15:00	3373	18:55:00	
WG98CAN-3029		261	3293	2:03:00	3280	2:06:00	*DNP*
WG98CAN-3029	A	262	3293	22:10:00	3277	22:15:00	*DNP*
WG98CAN-3029	B	262	3293	7:56:00	20	22:39:00	
WG98CAN-3039		263	100	3:02:00	3372	19:25:00	
WG98CAN-3043		263/264	3292	22:24:00	20	13:03:00	
WG98CAN-3059	A	264	100	18:18:00	1040	22:19:00	

Gravity Ties

EW 9802

EW-9802 Bridgetown, Barbados, West Indies

Pier/Ship	Latitude	Longitude

Bollard 23, same pier as reference pier

Reference	Latitude	Longitude
	13 06.4N	59 37.9W

Bollard 34. 3rd Bollard from north end of breakwater at the deep water harbor.

	Id	Date	Mistie	Drift/Day	DC Shift
Pre Cruise	EW9801	2/13/98	1.70	0.01	1.56
Post Cruise	EW9802	3/12/98	1.87	0.01	1.70
Total Days		27.00	0.17		

Time	Entry	Value	
16:58	CDeck Level BELOW Pier	0.33	meters
16:58	Pier 1 L&R Value	1969.80	L&R
17:09	Reference L&R Value	1970.40	L&R
17:16	Pier 2 L&R Value	1969.83	L&R
	Reference Gravity	978294.44	mGals
	Gravity Meter Value (BGM Reading)	978297.50	mGals
	Potsdam Corrected	0	1 if corrected

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

Difference in meters between Gravity Meter and Pier: 5.83 meters

Height Cor = Pier Height * FAA Constant

5.83	0.31			1.81	mGals/min

Difference in mGals between Pier and Gravity Meter

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

1969.82	1970.40	1.06		-0.62	mGals

Pier Gravity = Reference + Delta mGals [+ Potsdam]

978294.44	-0.62	0.00		978293.82	mgals

Gravity @meter = Pier Gravity+Height Correction

978293.82	1.81			978295.63	mGals

Current Mistie = BGM Reading - Calculated Gravity

978297.50	978295.63			1.87	mGals

EW 9805

EW-9805 Halifax, Canada *OFFICIAL*

Pier/Ship	Latitude	Longitude
	44 38.171N	63 33.922W

Halifax Pier 22
On the line and between 4 and 5 th bollard;
3 feet off the 5th one towards 4th.

Reference	Latitude	Longitude
	N	W

N side of Western Union Warf (Cable Warf) in Halifax. Situated on the base of the sixth bollard. Station 9402-73 is described as directly in front of the bollard's concrete base. The spot is covered with wooden deck, unstable, therefore, reading was done on the base iteslf 25 cm above the original spot.

	Id	Date	Mistie	Drift/Day	DC Shift
Pre Cruise	EW9802	3/12/98	1.87	0.01	1.70
Post Cruise	EW9805	7/1/98	9.60	0.07	1.87
Total Days		111.00	7.73		

Time	Entry	Value	
16:48	CDeck Level BELOW Pier	1.00	meters
16:48	Pier 1 L&R Value	4121.22	L&R
17:45	Reference L&R Value	4123.89	L&R
18:02	Pier 2 L&R Value	4121.22	L&R
Jun-82	Reference Gravity	980563.61	mGals
16:48	Gravity Meter Value (BGM Reading)	980572.40	mGals
	Potsdam Corrected	0	1 if corrected

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

Difference in meters between Gravity Meter and Pier Height Cor = Pier Height * FAA Constant

				6.50	meters
6.50	0.31			2.02	mGals/min

Difference in mGals between Pier and Gravity Meter

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

4121.22	4123.89	1.06		-2.82	mGals

Pier Gravity = Reference + Delta mGals [+ Potsdam]

980563.61	-2.82	0.00		980560.79	mgals

Gravity @meter = Pier Gravity+Height Correction

980560.79	2.02			980562.80	mGals

Current Mistie = BGM Reading - Calculated Gravity

980572.40	980562.80			9.60	mGals

EW 9806

EW-9806 Halifax, Canada *OFFICIAL*

Pier/Ship	Latitude	Longitude
	44 38.171N	63 33.922W

Halifax Pier 22
On the line and between 4 and 5 th bollard;
3 feet off the 5th one towards 4th.

Reference	Latitude	Longitude
	N	W

N side of Western Union Warf (Cable Warf) in Halifax. Situated on the base of the sixth bollard. Station 9402-73 is described as directly in front of the bollard's concrete base. The spot is covered with wooden deck, unstable, therefore, reading was done on the base iteslf 25 cm above the original spot.

	Id	Date	Mistie	Drift/Day	DC Shift
Pre Cruise	EW9805	7/1/98	9.60	0.07	1.87
Post Cruise	EW9806	8/12/98	10.37	0.02	9.60
Total Days		42.00	0.77		

Time	Entry	Value	
12:58	CDeck Level BELOW Pier	0.50	meters
12:58	Pier 1 L&R Value	4121.46	L&R
14:22	Reference L&R Value	4123.83	L&R
14:50	Pier 2 L&R Value	4121.58	L&R
Jun-82	Reference Gravity	980563.61	mGals
14:50	Gravity Meter Value (BGM Reading)	980573.40	mGals
	Potsdam Corrected	0	1 if corrected

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

Difference in meters between Gravity Meter and Pier: 6.00 meters

Height Cor = Pier Height * FAA Constant

6.00	0.31			1.86	mGals/min

Difference in mGals between Pier and Gravity Meter

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

4121.52	4123.83	1.06		-2.44	mGals

Pier Gravity = Reference + Delta mGals [+ Potsdam]

980563.61	-2.44	0.00		980561.17	mgals

Gravity @meter = Pier Gravity+Height Correction

980561.17	1.86			980563.03	mGals

Current Mistie = BGM Reading - Calculated Gravity

980573.40	980563.03			10.37	mGals

EW 9807.1

EW-9807.1 Halifax, Canada *OFFICIAL*

Pier/Ship	Latitude	Longitude
	44 37.941N	63 33.908W

Halifax Pier 34
In Front of Door 11

Reference	Latitude	Longitude
	N	W

N side of Western Union Warf (Cable Warf) in Halifax.
Situated on the base of the sixth bollard.
Station 9402-73 is described as directly in front of the bollard's concrete base. The spot is covered with wooden deck, unstable, therefore, reading was done on the base iteslf 25 cm above the original spot.

	Id	Date	Mistie	Drift/Day	DC Shift
Pre Cruise	EW9806	8/12/98	10.37	0.02	9.60
Post Cruise	EW9807	8/29/98	11.06	0.04	10.37
Total Days		17.00	0.69		

Time	Entry	Value	
20:40	CDeck Level BELOW Pier	1.00	meters
20:40	Pier 1 L&R Value	4119.65	L&R
21:00	Reference L&R Value	4123.71	L&R
21:30	Pier 2 L&R Value	4119.68	L&R
Jun-82	Reference Gravity	980563.61	mGals
21:30	Gravity Meter Value (BGM Reading)	980572.40	mGals
	Potsdam Corrected	0	1 if corrected

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

Difference in meters between Gravity Meter and Pier: 6.50 meters

Height Cor = Pier Height * FAA Constant

6.50	0.31			2.02	mGals/min

Difference in mGals between Pier and Gravity Meter

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

4119.67	4123.71	1.06		-4.29	mGals

Pier Gravity = Reference + Delta mGals [+ Potsdam]

980563.61	-4.29	0.00		980559.32	mgals

Gravity @meter = Pier Gravity+Height Correction

980559.32	2.02			980561.34	mGals

Current Mistie = BGM Reading - Calculated Gravity

980572.40	980561.34			11.06	mGals

EW 9807.2

EW-9807 HALIFAX, CANADA

Pier/Ship	Latitude	Longitude	Reference	Latitude	Longitude
	44 38.171N	63 33.922W		N	W

Halifax Pier 22
On the line and between 4 and 5 th bollard;
3 feet off the 5th one towards 4th.

N side of Western Union Warf (Cable Warf) in Halifax.
Situated on the base of the sixth bollard. Station 9402-73 is described as being directly in front of the bollard's concrete base. The reading was done on the base iteslf 25 cm above the original spot.

	Id	Julian	Date	Mistie	Drift/Day	DC Shift
Pre Cruise	EW9807.1	241 20:40	8/29/98	11.060	0.040	10.37
Post Cruise	EW9807.2	266 13:30	9/23/98	11.108	0.002	11.06
Total Days			25.00	0.048		

Time	Entry	Value	
9/23/98 12:00	CDeck Level BELOW Pier	1.00	meters
9/23/98 12:00	Pier 1 L&R Value	4121.31	L&R
9/23/98/12:30	Reference L&R Value	4123.70	L&R
9/23/98 13:00	Pier 2 L&R Value	4121.31	L&R
9/23/98/13:30	Reference Gravity	980563.61	mGals
6/1/82 0:00	Gravity Meter Value (BGM Reading)	980574.20	mGals
	Potsdam Corrected	0	1 if corrected

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

Difference in meters between Gravity Meter and Pier: 6.50 meters

Height Cor = Pier Height*	FAA Constant				
6.50	0.31			2.02	mGals/min

Difference in mGals between Pier and Gravity Meter

Pier (avg) -	Reference *	1.06 L&R/mGal		Delta L&R	
4121.31	4123.70	1.06		-2.53	mGals

Gravity in mGals at Pierside

Reference +	Delta mGals [+ Potsdam]			Pier Gravity	
980563.61	-2.53	0.00		980561.08	mgals

Gravity in mGals at Meter

Pier Gravity+	Height Correction			Gravity@meter	
980561.08	2.02			980563.09	mGals

Current Mistie

BGM Reading-	Calculated Gravity			Current Mistie	
980574.20	980563.09			11.11	mGals

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 DOP[1]**
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.

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[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.**

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 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

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))**

Post Processing

- **Raw gravity is filtered using a 6 minute gaussian filter and mGals are output. The raw mGals are represented by**

  mGals = gravitycount * scale + bias;

- **A second filter is then applied; an 8 minute Gaussian filter using the GMT system:**

  filter1D -G480 -R -E

- **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
```

- **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

- **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
```

File Formats

Raw File Formats

gpx.c - raw NMEA GPS

98+157:00:03:10.951 N 42 50.4311 W 061 18.8016 P-trimble

- P-trimble Pcode Fix
- D-trimble Differential Fix
- trimble S/A fix

gpx.c - raw MX4200 GPS Fix

98+157:00:03:00.159
$PMVXG,001,000300,4250.432,N,06118.781,W,00009.0,3*5D
time Latitude Longitude Alt *POS*

POS =

0. Not Navigating
1. Remote Position (from remote device)
2. 2D Solution
3. 3D Solution
4. 2D Differential
5. 3D Differential

vc.r - raw gravity counts

98+144:00:00:16.219 01:022466 00
CPU Time pp dddddd ss
| | |_____ status:
| | 00 = No DNV error; 01 = Platform DNV
| | 02 = Sensor DNV; 03 = Both DNV's
| |_____ count typically 025000 or 250000
|_____ counting interval, 01 or 10

Processed File Formats

n. - final navigation at even minute intervals

98+074:00:03:00.000 N 13 6.2214 W 59 37.9399 gp1 0.0 0.0
yr +day time Latitude Longitude gps set drift

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 time lat lon depth (meters)

m. - merged bathymetry, magnetics, gravity with final navigation.

98+123:04:36:03.895 N 14 9.0555 W 67 2.3969 gp3 276.9 0.2
yr day time lat lon id set drift
5034.9 37401.8 17.2 -1.6 978349.0 13.1 9.1 13.2
depth mag tot mag grv. raw_grv eotvos tot dc
intensity anomaly faa drift shift

vt.n - merged BGM-3 gravity with final nav.

yy+ddd:hh:mm:ss.mmm N 16 0.4273 W 73 20.3055 1980 -4.1
yr day time lat lon theog FAA

978416.9	27.6	9.9	13.2	-2.7	3.9	-2.8	3.8
raw_grav	eotvos	drift	dc	raw_vel		smooth_vel	
			shift	N	E	N	E