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Analysis of UK submarine sonar data for comparison with similar US datasets

ABSTRACT

An analysis of upward-looking and sidescan sonar data collected by the Royal Navy in a series of submarine voyages between 1976 and 1996 will be carried out and presented in an agreed statistical format for comparison with US datasets in collaboration with Dr. W.B. Tucker III at CRREL (US/UK agreements on data presentation). The analysed data will be included in an international data management system to permit greater coverage of the Arctic Basin for the study of changes to the ice cover in response to climate variation.

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Data from years 1976, 1987 & 1991 are have been transferred to the NSIDC database, inclusive of statistical analyses and we are currently preparing for the transfer of the 1996 dataset, which corresponds closely to the 1996 SCICEX exercise. The close collaboration with Dr. Tucker at CRREL for the analysis of the latter data continues and we hope to meet with our US collaborators in the new year to facilitate the submission of a joint paper whereupon data and statistical files will subsequently be added to the database.

For the coming year, we have proposed to process an extensive dataset from 1992, to match the 1992 US dataset recently released by the US military, and a further dataset from 1991 to complete the archiving for this year. Both these datasets are held as paper chart records which required digitising, but the better than average positional/time information has facilitated successful transfer of the second of these data sets into useable formats for analysis. The additional information received from the UK Hydrographic has made the re-analysis of earlier 1991 data desirable to bring it into line with US/UK agreements and the new data from this year, though the differences are relatively slight. Statistical analyses of the new 1991 data will be carried out and old data will be reformatted before addition of the whole 1991 series to the NSIDC facility

The first phase of the programme has been carried out in tandem with the preparation of (now completed) and statistical analysis of (in progress) the 1996 sonar data set for comparison with the SCICEX data of our US collaborators. Two datasets collected using different instruments were made available for 1996 which will provide us with an opportunity to test the efficacy of the instrumentation with a view to making a better estimate of likely error in ice draft computations. The first part of the analysis has been to examine statistical parameters by degree of latitude for the new instrument (recorded digitally) where the data set has been subdivided into a Westerly & Easterly series in accordance with the sections specified in table 1. The statistical analyses for this first phase are represented graphically and as tables of parameters in appendix 1. The second phase of this programme is to complete a similar series of analyses for the second (older) instrument where the data are recorded as paper charts (manually digitised using a curve follower) to examine a) the likely systematic bias introduced as operator error and b) differences introduced as a result of instrument error. These will be reported on in the next interim report

The next phase of the programme, to be carried out in tandem with the processing of the 2000 dataset (postponed from 1999) as this is released, and it is envisaged that the completion of this part of the continuing study should be completed in one year subject to further delays in the 2000 expedition. The 1992 dataset includes more upward looking sonar data which will be digitised as before and analysed for posting onto the NSIDC database; this will be completed within the contractual period.

Subsequent phases of the analytical programme will extract data from the other expeditions listed as time and information permits, though it must be said that the earlier datasets present some technical problems as a result of the somewhat primitive recording devices employed at the time, which will delay incorporation into the database. We have entered into an exchange of expertise with our US collaborators to facilitate the inclusion of this very valuable data into the sonar database and progress has been made to allow for the limitations of these data.

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Table 1. Data Series Sectional Coordinates

Lat/Lon	<15w	10-15w	5-10w	0-5w	0-5e	5-10e
71-72					33	
72-73					36	
					37	
73-74		130			38	
					39	
74 -75		126			40	
		127			41	
75-76		124			42	
		125			43	
			146		44	
76-77			122		45	
			123		46	
			147			
			149			
77-78					47	
					48	
78-79			116		49	
					50	
79-80				197	51	
				198	52	
				199		
80-81				55	54	108
				56	109	
				57	110	
				58		
				59		
				112		
				195		
				196		
81-82				60	104	
				61	106	
				62		
				160		
				161		
				192		
				193		

Lat/Lon	>15 W	10-15 W	5-10 W	0-5 W	0-5 E	5-10 E
82-83			64	63		
			65			
			163			
			164			
			165			
			166			
			167			
			176			
			181			
			190			
			191			
83-84			67	66	100	102
84-85				68		
				69		
85-86			71			96
			72			
86-87				76		
87-88				77		
				79		
88-89				80		
				81		
89-90	83					84
	85					

APPENDIX 1. Statistical Analyses

TABLE 2. WEST

Lat	Sect	Mean	St.Dev	Median	Mode	% Level	Seg Len	Seg Draft
73	130	0.515	0.234	0.496	0.4	28.781	41.34	0.518
74	126	0.698	1.28	0.004	0.017	62.442	73.057	0.955
74	127	0.212	0.619	0.019	0.016	84.84	109.202	0.482
mean 74		0.487	1.073	0.014	0.016	73.641	91.13	0.719
75	124	0.334	1.518	0	0.022	86.707	164.532	0.844
75	125	0.723	1.36	0.022	0.018	59.104	80.326	0.933
75	126	0.467	0.971	0.01	0.025	63.509	76.57	0.589
mean 75		0.548	1.306	0.001	0.022	69.773	107.143	0.788
76	122	0.338	0.868	0	0.002	80.633	111.289	0.875
76	123	0.424	1.163	0	0.004	79.348	121.945	0.919
76	147	0.757	1.391	0.292	0.101	64.072	44.964	0.669
76	149	1.127	1.393	0.799	0.126	48.344	54.996	1.054
mean 76		0.652	1.265	0.163	0.058	68.099	83.299	0.879
78	116	1.597	1.818	1.169	0.893	34.682	37.455	1.288
79	197	2.415	2.087	2.342	0.06	43.167	66.105	2.619
79	198	1.401	1.584	0.709	0.022	58.055	86.354	1.981
79	199	1.088	1.109	0.89	0.101	68.145	66.116	1.19
mean 79		1.668	1.764	1.101	0.061	56.456	72.858	1.93
80	55	0.839	1.502	0.166	0.017	55.141	63.096	0.816
80	56	0.814	1.261	0.434	0.022	42.607	77.79	0.701
80	57	0.916	1.175	0.687	0.019	7.764	129.693	0.422
80	58	0.658	0.997	0.454	0.017	24.786	82.211	0.341
80	59	0.335	1.127	0	0.017	86.839	133.53	0.823
80	112	2.274	2.363	1.958	0.037	46.742	75.484	2.376
80	195	1.501	2.24	0.574	0.03	66.316	125.173	2.021
80	196	1.201	1.823	0.041	0.016	66.53	110.467	2.056
mean 80		0.956	1.624	0.306	0.022	49.591	99.681	1.195
81	60	2.108	2.3	1.301	0.002	27.675	55.732	1.387
81	61	2.194	2.443	1.538	0.005	39.851	74.359	1.915
81	62	1.406	1.728	0.78	0.04	50.872	51.266	1.124
81	160	1.395	1.815	0.798	0.017	67.072	107.772	1.575
81	161	1.435	1.653	0.969	0.016	72.148	118.355	1.733
81	192	1.246	1.181	1.23	0.004	57.822	50.407	1.635
81	193	1.295	1.557	1.05	0.004	53.598	60.156	1.596

Lat	Sect	Mean	St.Dev	Median	Mode	% Level	Seg Len	Seg Draft
81	194	1.161	1.686	0.392	0.095	69.557	90.81	2.01
mean 81		1.536	1.879	0.991	0.023	54.824	76.107	1.622
82	64	2.964	2.913	2.369	0.016	34.464	78.425	2.432
82	65	3.141	3.194	2.481	0.017	31.141	75.473	2.325
82	163	2.426	2.521	1.515	0.048	45.76	99.833	2.083
82	164	0.424	1.171	0.054	0.009	85.048	165.422	1.088
82	165	1.982	2.177	1.4	0	62.723	86.165	2.331
82	166	2.863	2.013	2.263	1.655	39.888	58.538	2.546
82	167	2.081	2.653	1.394	0.035	55.166	94.768	2.135
82	176	3.804	3.176	3.186	0	20.82	146.7	2.542
82	181	2.653	1.624	2.498	2.507	41.511	54.645	2.598
82	190	0.916	1.505	0	0.017	70.436	82.642	1.764
82	191	0.786	1.122	0.036	0.019	67.485	66.904	1.323
mean 82		2.122	2.555	1.594	0.393	50.404	91.774	2.106
83	66	3.139	2.583	2.655	0.002	28.661	64.515	2.583
83	67	2.678	2.686	2.329	0.017	36.326	67.865	2.204
mean 83		2.909	2.645	2.476	0.009	32.494	66.19	2.393
84	68	3.395	2.543	2.784	0.021	31.535	57.475	2.727
84	69	2.827	2.429	2.383	0.005	38.397	63.685	2.496
mean 84		3.087	2.498	2.573	0.013	34.966	60.58	2.612
85	71	3.637	2.817	2.902	0.002	25.215	64.969	2.741
85	72	3.411	2.19	2.817	0.001	26.457	59.807	2.7
mean 85		3.537	2.561	2.863	0.001	25.836	62.388	2.721
86	76	3.643	2.241	2.967	1.752	24.432	63.297	2.742
87	77	2.988	2.262	2.324	0.001	28.423	66.707	2.521
87	79	1.959	1.26	1.813	1.976	29.425	51.395	1.856
mean 87		2.357	1.789	1.912	0.988	28.924	59.051	2.189
88	80	2.931	2.152	2.425	0.001	30.627	63.659	2.481
88	81	3.627	2.328	2.902	1.805	21.235	79.322	2.76
mean 88		3.235	2.257	2.613	0.903	25.931	71.49	2.62
89	83	2.012	2.288	1.46	0.005	31.917	76.6	1.226
89	85	1.976	2.043	1.465	0	31.285	46.448	1.553
mean 89		1.996	2.182	1.463	0.003	31.601	61.524	1.389

TABLE3 WEST

Lat	Sect	L Mean	L St.Dev	L Median	L Mode	L Seg Len	L Seg Drt
73	130	0.46	0.198	0.447	0.401	23.773	0.513
74	126	0.157	0.535	0	0.017	91.237	0.71
74	127	0.054	0.196	0.009	0.016	184.767	0.281
mean 74		0.105	0.404	0	0.016	138.002	0.495
75	124	0.032	0.256	0	0.022	283.286	0.457
75	125	0.12	0.474	0	0.018	95.137	0.67
75	126	0.06	0.29	0	0.031	97	0.29
mean 75		0.075	0.367	0	0.024	158.474	0.473
76	122	0.076	0.412	0	0.002	178	0.618
76	123	0.045	0.266	0	0.004	192.341	0.4
76	147	0.348	0.428	0.218	0.101	57.619	0.555
76	149	0.657	0.549	0.53	0.126	53.373	0.866
mean 76		0.224	0.459	0	0.058	120.333	0.61
78	116	1.086	0.764	0.91	0.849	26.067	1.18
79	197	1.117	1.305	0.12	0.017	57.146	2.366
79	198	0.592	0.92	0.17	0.022	100.439	1.785
79	199	0.712	0.565	0.712	0.101	90.254	1.036
mean 79		0.779	0.97	0.413	0.047	82.613	1.729
80	55	0.186	0.501	0	0.017	69.488	0.661
80	56	0.146	0.347	0	0.005	66.288	0.532
80	57	0.076	0.228	0.003	0.005	20.201	0.117
80	58	0.073	0.266	0	0.031	40.753	0.194
80	59	0.084	0.394	0	0.017	231.243	0.58
80	112	0.684	1.079	0.109	0.037	71.013	2.058
80	195	0.453	0.706	0.242	0.037	165.605	1.556
80	196	0.325	0.848	0.001	0.016	146.987	1.752
mean 80		0.245	0.631	0	0.021	101.447	0.931
81	60	0.918	0.926	0.664	0.002	30.848	1.154
81	61	0.646	0.944	0.005	0.005	59.265	1.525
81	62	0.66	0.729	0.384	0.002	52.214	0.955
81	160	0.64	0.688	0.545	0.021	144.57	1.264
81	161	0.772	0.673	0.648	0.016	170.782	1.385
81	192	0.781	0.944	0.01	0.004	58.292	1.525
81	193	0.556	0.896	0	0.004	64.57	1.425
81	194	0.52	0.856	0.148	0.095	126.331	1.806

Lat	Sect	L Mean	L St.Dev	L Median	L Mode	L Seg Len	L Seg Drt
mean 81		0.673	0.828	0.328	0.019	88.359	1.38
82	64	0.839	1.164	0.021	0.016	54.142	1.905
82	65	0.851	1.204	0.008	0.017	47.006	1.747
82	163	0.695	0.76	0.606	0.048	91.367	1.644
82	164	0.108	0.338	0.046	0.009	281.375	0.801
82	165	1	0.982	1.122	0	108.537	2.086
82	166	1.779	0.919	1.732	1.655	46.841	2.277
82	167	0.577	0.855	0.06	0.035	104.784	1.728
82	176	0.696	1.098	0.017	0	61.086	1.714
82	181	2.026	1.007	2.428	2.557	45.367	2.475
82	190	0.337	0.818	0	0.017	116.419	1.56
82	191	0.359	0.718	0	0.004	90.301	1.177
mean 82		0.681	1.013	0.021	0.396	95.202	1.738
83	66	1.408	1.307	1.552	0.002	37.028	2.184
83	67	0.916	1.211	0.021	0.017	49.373	1.828
mean 83		1.134	1.278	0.299	0.009	43.201	2.006
84	68	1.746	1.144	2.116	0.009	36.299	2.331
84	69	1.208	1.158	1.445	0.005	48.845	2.104
mean 84		1.429	1.182	1.793	0.007	42.572	2.217
85	71	1.608	1.189	1.807	0.002	32.764	2.284
85	72	1.819	1.161	1.999	0.001	31.774	2.309
mean 85		1.704	1.181	1.893	0.001	32.269	2.296
86	76	1.889	0.768	1.842	1.752	31.13	2.264
87	77	1.506	0.961	1.741	0.001	37.92	2.159
87	79	1.745	0.496	1.844	1.939	30.344	1.836
mean 87		1.655	0.718	1.81	0.97	34.132	1.997
88	80	1.313	1.062	1.645	0.001	38.994	2.064
88	81	1.788	0.924	1.79	0	33.859	2.271
mean 88		1.479	1.041	1.708	0	36.426	2.168
89	83	0.38	0.797	0	0.005	49.236	0.64
89	85	1.024	0.754	1.069	0	29.062	1.279
mean 89		0.666	0.841	0.124	0.003	39.149	0.96

TABLE 4. WEST

Lat	Sect	R Mean	R St.Dev	R Median	R Mode	R Seg Len	R Seg Drt
73	130	0.537	0.242	0.524	0.51	58.944	0.523
74	126	1.592	1.601	1.191	0.031	54.877	1.2
74	127	1.078	1.176	0.664	0.065	33.206	0.684
mean 74		1.469	1.527	1.053	0.048	44.041	0.942
75	124	2.274	3.496	1.018	0	44.058	1.236
75	125	1.588	1.699	1.111	0.079	65.572	1.194
75	126	1.163	1.28	0.782	0.037	56.032	0.888
mean 75		1.51	1.87	0.957	0.038	55.221	1.106
76	122	1.422	1.304	1.033	0.088	43.467	1.137
76	123	1.858	1.891	1.231	0.046	50.679	1.445
76	147	1.465	2.034	0.75	0.284	32.309	0.782
76	149	1.556	1.741	0.998	0.694	56.607	1.241
mean 76		1.573	1.821	0.975	0.278	45.766	1.151
78	116	1.853	2.114	1.321	1.1	48.767	1.395
79	197	3.401	2.012	2.979	2.446	75.04	2.871
79	198	2.525	1.619	2.374	2.518	72.317	2.175
79	199	1.878	1.485	1.416	1.096	42.054	1.344
mean 79		2.785	1.884	2.522	2.02	63.137	2.13
80	55	1.631	1.874	0.984	0.044	56.687	0.971
80	56	1.306	1.444	0.907	0.563	89.292	0.869
80	57	0.983	1.194	0.754	0.024	238.521	0.726
80	58	0.847	1.069	0.677	0.024	123.668	0.489
80	59	1.96	2.321	1.381	0.005	35.25	1.067
80	112	3.663	2.286	3.221	2.6	79.9	2.691
80	195	3.551	2.727	2.915	2.195	84.538	2.489
80	196	2.944	1.97	2.618	0.092	73.947	2.361
mean 80		1.683	1.964	1.044	0.694	97.725	1.458
81	60	2.548	2.488	1.686	0.447	80.616	1.619
81	61	3.208	2.576	2.471	1.718	89.452	2.305
81	62	2.158	2.076	1.545	0.351	50.32	1.293
81	160	2.915	2.341	2.316	1.353	70.974	1.886
81	161	3.131	2.127	2.661	1.505	65.929	2.081
81	192	1.89	1.162	1.73	1.53	42.521	1.745
81	193	2.149	1.698	1.791	1.519	55.754	1.766
81	194	2.633	2.118	2.276	2.499	55.29	2.213

Lat	Sect	R Mean	R St.Dev	R Median	R Mode	R Seg Len	R Seg Drt
mean 81		2.569	2.218	1.984	1.365	63.857	1.863
82	64	4.069	2.923	3.289	2.217	102.633	2.958
82	65	4.16	3.264	3.302	0	103.94	2.903
82	163	3.873	2.556	3.319	1.856	108.3	2.522
82	164	2.203	2.164	1.675	0.034	49.469	1.375
82	165	3.625	2.575	2.824	1.898	63.975	2.574
82	166	3.568	2.201	2.994	2.133	70.164	2.813
82	167	3.918	2.913	3.073	1.795	84.794	2.541
82	176	4.613	3.032	3.937	2.471	232.314	3.371
82	181	3.091	1.809	2.617	2.523	63.923	2.721
82	190	2.301	1.815	1.962	0.082	48.865	1.968
82	191	1.676	1.269	1.444	0.077	43.508	1.47
mean 82		3.579	2.788	2.827	1.371	88.353	2.474
83	66	3.822	2.631	3.201	2.713	91.93	2.981
83	67	3.67	2.765	3.018	0.024	86.307	2.579
mean 83		3.75	2.696	3.116	1.368	89.119	2.78
84	68	4.136	2.638	3.42	2.54	78.593	3.122
84	69	3.823	2.455	3.105	2.346	78.564	2.889
mean 84		3.975	2.55	3.267	2.443	78.579	3.006
85	71	4.304	2.868	3.478	2.973	97.174	3.198
85	72	3.968	2.185	3.46	2.158	87.616	3.089
mean 85		4.157	2.596	3.47	2.566	92.395	3.143
86	76	4.192	2.264	3.6	2.068	95.051	3.214
87	77	3.567	2.348	2.775	2.012	95.493	2.883
87	79	2.044	1.448	1.793	1.807	72.31	1.876
mean 87		2.636	1.994	2.012	1.909	83.902	2.38
88	80	3.633	2.114	3.05	2.001	88.325	2.897
88	81	4.111	2.34	3.477	2.249	124.33	3.244
mean 88		3.856	2.235	3.229	2.125	106.327	3.071
89	83	2.759	2.357	2.288	0.023	103.589	1.803
89	85	2.394	2.271	1.767	0.361	63.833	1.827
mean 89		2.595	2.326	1.972	0.192	83.711	1.815

TABLE 5 WEST

Lat	Sect	% OW	No.Leads	No/100km	MeanWid	St.Dev.	Mode	Median
73	130	11.252	249	606.548	18.55	11.971	10.5	15
74	126	62.639	221	442.248	141.638	206.776	15.5	62
74	127	88.2	124	323.498	272.645	415.811	33.167	116.5
mean 74		75.42	172	382.873	188.725	305.17	24.333	81
75	124	87.88	52	227.362	386.519	584.328	34.5	211.5
75	125	61.294	195	473.209	129.528	525.26	11.5	41
75	146	69.184	164	568.103	121.78	164.794	11.5	68
mean 75		72.786	137	422.891	158.951	437.433	19.167	56
76	122	80.582	41	304.448	264.683	304.712	221.628	143
76	123	80.043	62	311.903	256.629	391.082	18.5	98.5
76	147	50.135	151	927.632	54.046	112.98	12.5	32
76	149	21.501	51	344.711	62.373	141.201	13.5	21
mean 76		58.065	76	472.173	124.934	248.612	66.532	38
78	116	6.42	32	285.714	22.469	14.393	11.5	16
79	197	25.764	61	122.22	210.803	350.364	33.786	54
79	198	33.862	81	162	209.025	519.937	21.5	59
79	199	23.932	86	208.783	114.628	162.813	15.5	54.5
mean 79		27.853	76	164.334	173.895	373.874	23.595	54
80	55	54.028	206	447.846	120.641	234.55	13.5	33.5
80	56	41.972	120	363.813	115.367	225.221	10.5	31.5
80	57	21.296	401	939.77	22.661	17.698	10.5	18
80	58	36.597	405	810.243	45.168	87.586	10.5	23
80	59	86.392	96	208.383	414.583	712.48	24.5	166
80	112	34.075	21	174.956	194.762	224.348	97	157
80	195	34.836	64	128.141	271.859	529.889	24.5	79
80	196	59.603	79	158.215	376.722	586.891	37.389	126
mean 80		46.1	174	403.921	112.878	312.058	28.549	26
81	60	12.504	181	362.457	34.497	43.995	10.5	19
81	61	25.653	86	172.103	149.058	320.03	16.5	37
81	62	24.974	226	453.06	55.124	89.764	10.5	25.5
81	160	30.975	67	135.146	229.194	278.414	62.167	124
81	161	24.95	39	78.083	319.538	381.714	256.203	149
81	192	32.884	84	176.526	186.286	435.5	26.5	47
81	193	38.334	93	204.76	187.215	424.371	20.5	64
81	194	45.92	111	227.194	202.117	292.897	14.5	70
81		29.524	110	226.166	129.462	279.922	52.171	34

Lat	Sect	% OW	No.Leads	No/100km	MeanWid	St.Dev.	Mode	Median
mean 81		29.524	110	226.166	129.462	279.922	52.171	34
82	64	24.376	98	196.165	124.265	267.509	10.5	48.5
82	65	23.499	126	252.182	93.183	122.038	15.5	43.5
82	163	19.687	10	55.645	353.8	313.308	0	291.5
82	164	83.85	14	132.225	634.143	1266.299	190.25	210
82	165	25.192	14	66.861	376.786	713.963	112	40.5
82	166	5.156	12	62.305	82.75	74.296	14.5	62.5
82	167	33.607	30	68.077	493.667	706.606	261.077	220.5
82	176	13.028	12	116.845	111.5	264.758	13.5	21
82	181	8.083	12	64.967	124.417	207.479	22.5	55
82	190	61.01	91	206.2	295.879	557.229	102.591	147
82	191	54.367	123	258.203	210.561	321.533	17.5	69
mean 82		31.987	49	134.516	208.613	435.358	69.083	65.5
83	66	12.81	81	162	79.074	110.808	10.5	32
83	67	25.48	142	284.672	89.507	185.296	19.5	36.5
mean 83		19.145	111	223.336	85.717	162.041	15	35
84	68	8.987	57	134.561	66.789	78.14	21.5	26
84	69	17.958	58	116.014	154.793	173.853	15.5	89
mean 84		13.473	57	125.287	111.174	141.65	18.5	46
85	71	8.353	19	101.539	82.263	57.895	81.763	69
85	72	6.896	15	100.718	68.467	57.776	67.967	44
mean 85		7.624	17	101.129	76.176	57.383	74.865	60.5
86	76	2.548	6	61.15	41.667	41.96	0	20
87	77	7.375	5	49.965	147.6	143.579	0	120
87	79	1.593	8	50.371	31.625	24.26	0	24
mean 87		4.484	6	50.168	76.231	103.265	0	27
88	80	9.484	20	98.174	96.6	130.132	51.5	49.5
88	81	3.104	7	44.343	70	92.928	0	38
mean 88		6.294	13	71.259	89.704	120.454	25.75	44
89	83	32.553	63	567.159	57.397	83.118	16.9	33
89	85	11.234	32	358.785	31.312	39.746	12.5	19
mean 89		21.894	47	462.972	48.611	72.328	14.7	28

TABLE 6 WEST

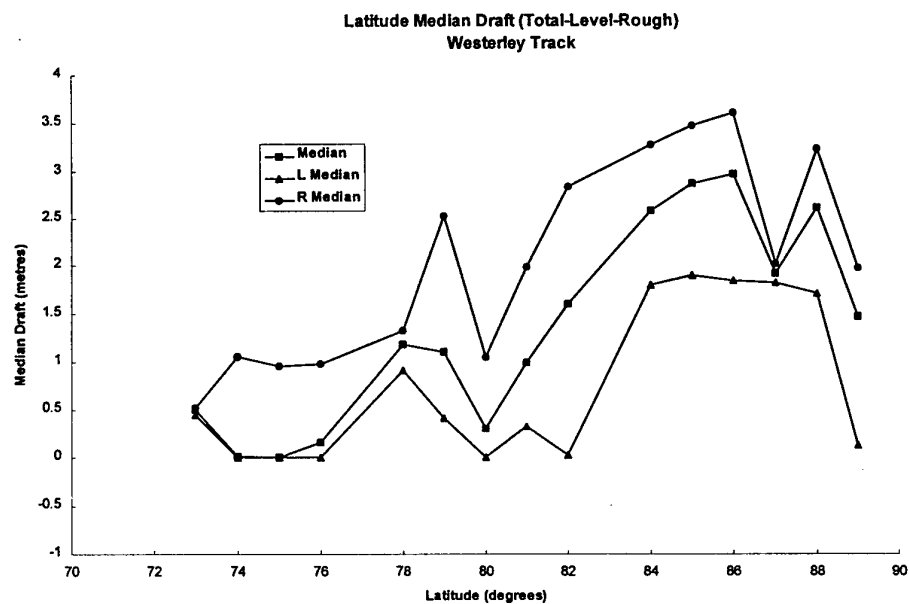
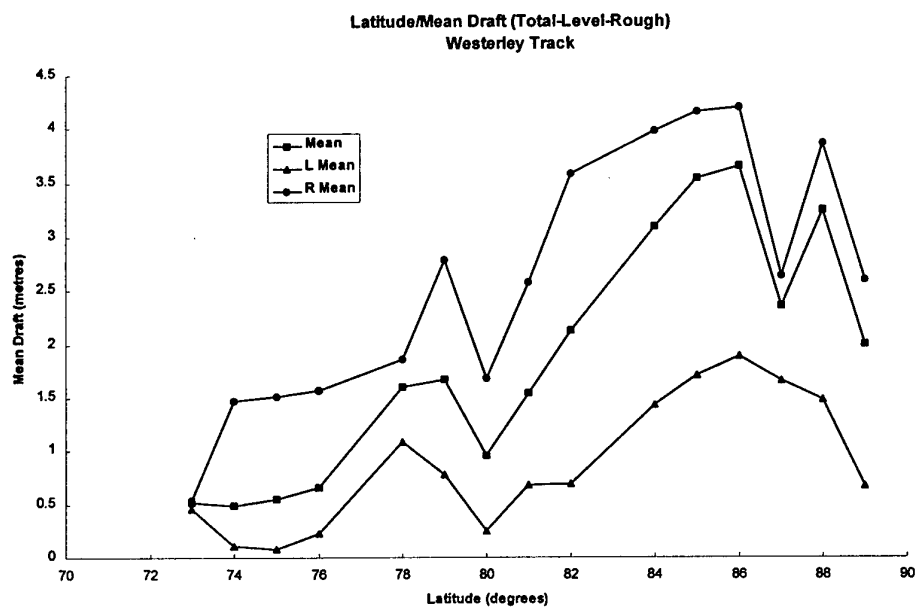
Lat	Sect	No.> 5	No/100k>5	Mn Dft>5	St.Dev>5	Mode>5	Median>5
73	130	0	0	0	0	0	0
74	126	26	52.029	6.707	1.699	10.758	6.022
74	127	3	7.827	6.329	0.706	0	6.468
mean 74		14	29.928	6.667	1.621	5.379	6.028
75	124	6	26.234	9.196	4.505	0	7.578
75	125	21	50.961	7.537	2.572	10.749	6.912
75	146	8	27.712	6.466	2.322	0	5.514
mean 75		11	34.969	7.576	2.956	3.583	6.422
76	122	0	0	0	0	0	0
76	123	11	55.338	7.145	1.764	0	6.477
76	147	7	43.003	9.379	2.295	0	10.406
76	149	22	148.699	8.223	2.085	5.284	9.257
mean 76		10	61.76	8.005	2.145	1.321	9.049
78	116	11	98.214	8.854	3.425	17.204	7.677
79	197	126	252.454	6.852	1.653	12.387	6.411
79	198	56	112	6.57	1.452	11.333	6.172
79	199	22	53.41	6.473	1.594	10.807	5.75
mean 79		68	139.288	6.734	1.593	11.509	6.327
80	55	44	95.656	7.663	2.418	0	6.62
80	56	17	51.54	7.756	1.925	0	7.045
80	57	13	30.466	8.841	3.641	13.794	7.882
80	58	6	12.004	10.788	6.43	11.751	8.803
80	59	19	41.242	7.815	2.484	10.961	6.826
80	112	38	316.588	7.23	2.399	10.789	6.355
80	195	85	170.187	7.581	2.635	10.304	6.508
80	196	64	128.174	6.838	1.73	5.343	6.168
mean 80		35	105.732	7.531	2.579	7.868	6.475
81	60	147	294.371	7.62	2.315	10.117	6.988
81	61	161	322.193	7.667	2.323	11.222	7.174
81	62	81	162.38	7.629	1.991	13.501	7.243
81	160	86	173.471	7.075	2.037	0	6.294
81	161	86	172.183	7.268	2.065	10.558	6.916
81	192	20	42.03	6.245	1.24	0	5.9
81	193	44	96.876	6.906	1.739	10.9	6.205
81	194	33	67.544	7.113	2.699	0	6.225

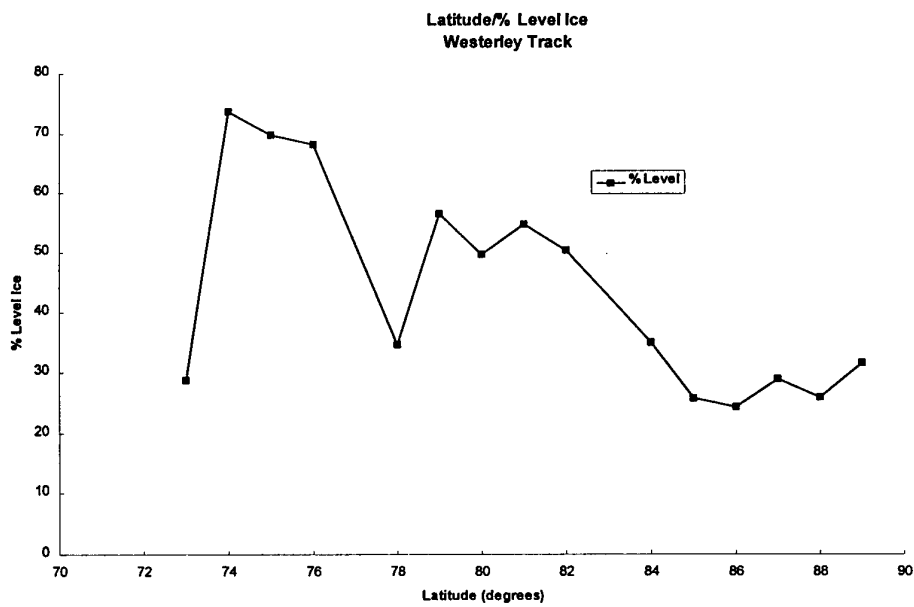
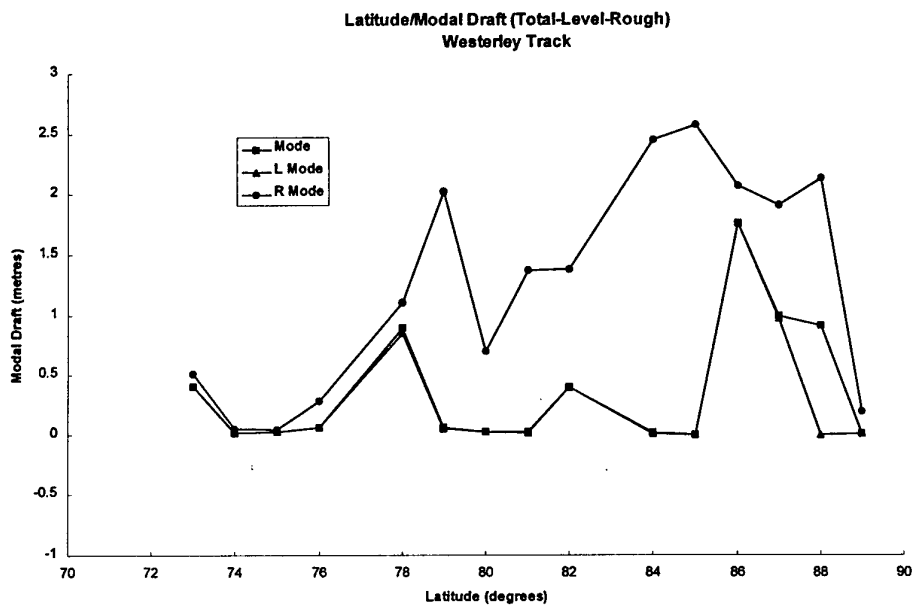
Lat	Sect	No.> 5	No/100k>5	Mn Dft>5	St.Dev>5	Mode>5	Median>5
mean 81		82	166.381	7.4	2.188	7.037	6.785
82	64	219	438.368	8.117	2.761	10.922	7.424
82	65	220	440.317	8.49	3.535	11.23	7.397
82	163	59	328.307	7.673	2.158	11.915	7.16
82	164	4	37.779	9.139	0.225	0	9.083
82	165	34	162.376	8.047	2.264	0	7.863
82	166	62	321.911	7.205	2.209	5.996	6.281
82	167	120	272.306	7.948	2.748	11.596	7.173
82	176	65	632.911	8.378	2.918	10.335	7.559
82	181	43	232.797	6.97	1.877	11.309	6.32
82	190	28	63.446	6.489	1.582	0	6.071
82	191	15	31.488	6.345	1.624	10.501	5.726
mean 82		79	269.273	7.974	2.859	7.619	7.092
83	66	210	420	7.973	2.446	11.226	7.451
83	67	183	366.866	8.096	2.639	10.834	7.593
mean 83		196	393.433	8.03	2.535	11.03	7.484
84	68	181	427.29	8.081	2.762	10.486	7.298
84	69	207	414.05	7.582	2.484	10.485	6.662
mean 84		194	420.67	7.815	2.626	10.485	6.985
85	71	97	518.384	8.269	3.089	10.235	6.958
85	72	76	510.307	7.362	2.07	10.635	6.612
mean 85		86	514.345	7.871	2.72	10.435	6.882
86	76	59	601.305	7.491	2.036	11.842	7.165
87	77	39	389.727	7.592	2.246	0	7.141
87	79	8	50.371	7.718	2.363	0	7.023
mean 87		23	220.049	7.614	2.24	0	7.141
88	80	92	451.6	7.083	1.708	11.573	6.813
88	81	94	595.464	7.655	2.346	0	6.86
mean 88		93	523.532	7.372	2.07	5.787	6.849
89	83	37	333.093	6.477	1.821	10.711	5.628
89	85	25	280.3	8.157	4.735	6.289	6.691
mean 89		31	306.697	7.155	3.387	8.5	6.092

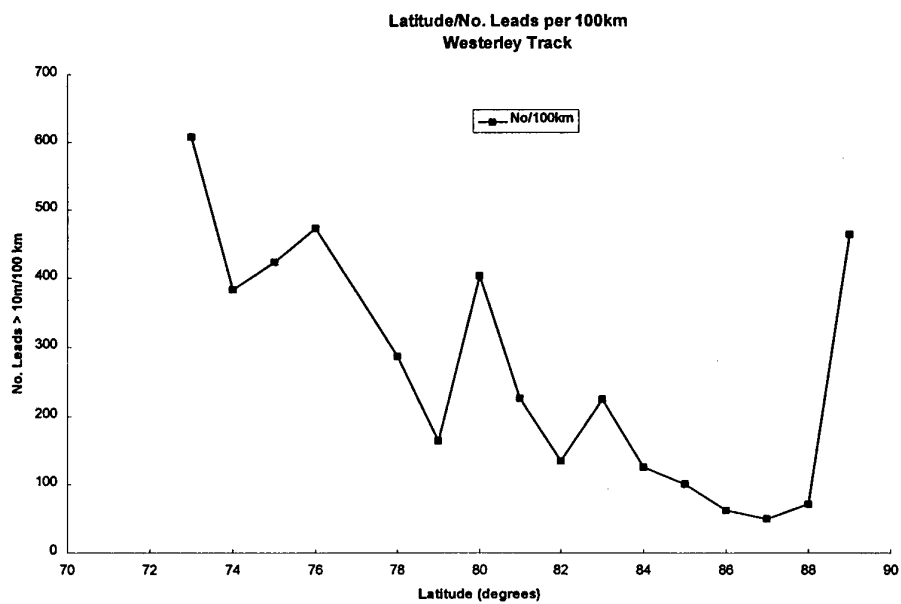
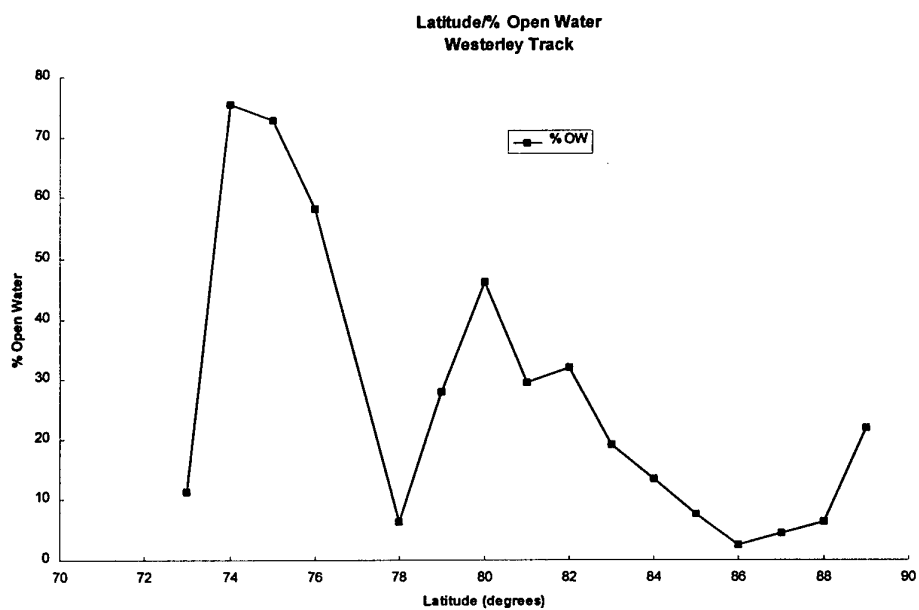
TABLE 7.WEST

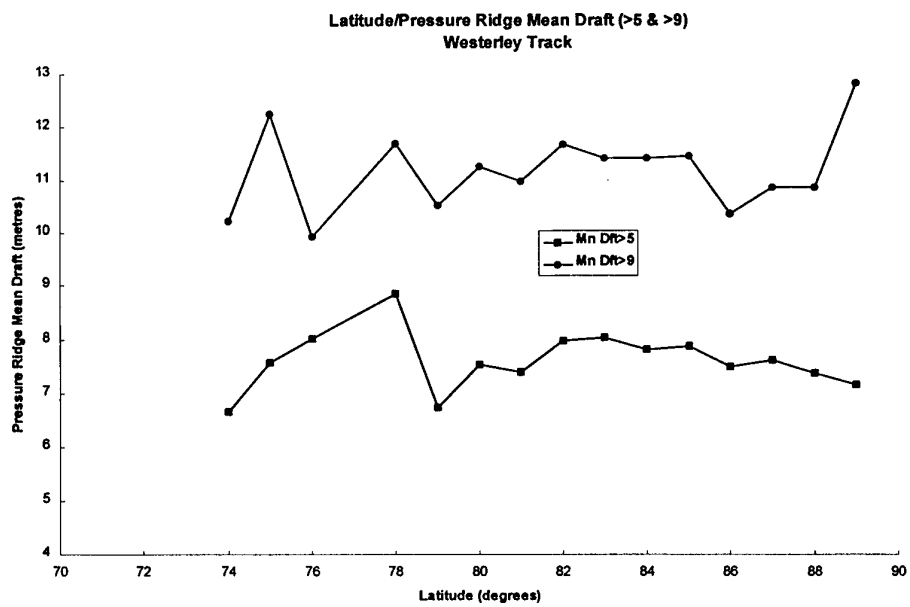
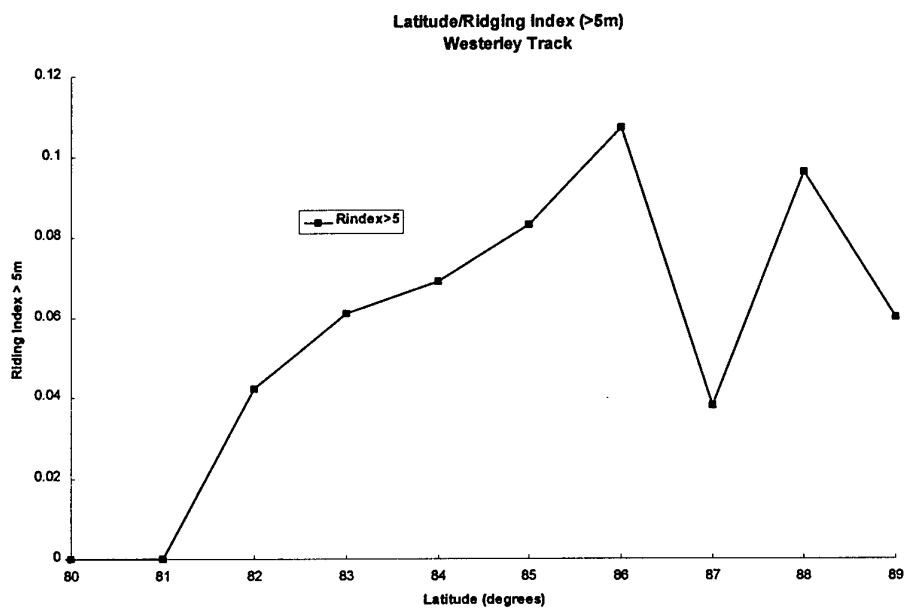
Lat	Sect	No.> 9	No/100k>9	Mn Dft>9	St.Dev>9	Median>9
73	130	0	0	0	0	0
74	126	4	8.004	10.21	0.693	10.3
74	127	0	0	0	0	0
mean 74		2	4.002	10.21	0.693	10.3
75	124	0	0	0	0	0
75	125	5	12.134	11.321	2.367	10.749
75	146	0	0	0	0	0
mean 75		1	4.045	12.249	2.394	11.977
76	122	0	0	0	0	0
76	123	3	15.092	9.812	0.317	9.853
76	147	5	30.716	10.702	0.483	10.942
76	149	14	94.627	9.66	0.498	9.631
mean 76		5	35.109	9.918	0.632	9.761
78	116	5	44.643	11.694	3.117	10.485
79	197	12	24.043	10.695	1.694	10.246
79	198	4	8	10.253	0.888	10.208
79	199	0	0	0	0	0
mean 79		5	10.681	10.523	1.461	10.246
80	55	14	30.436	10.643	1.98	10.025
80	56	5	15.159	10.231	1.131	10.222
80	57	5	11.718	12.35	3.428	10.444
80	58	3	6.002	16.037	4.533	15.577
80	59	6	13.024	10.921	1.234	11.067
80	112	7	58.319	10.88	3.123	9.688
80	195	21	42.046	11.438	2.377	10.884
80	196	8	16.022	10.484	1.153	10.323
mean 80		8	24.091	11.243	2.5	10.368
81	60	31	62.078	11.22	2.036	10.433
81	61	39	78.047	10.889	2.174	10.31
81	62	16	32.075	10.757	1.689	10.05
81	160	13	26.222	10.796	2.089	10.105
81	161	16	32.034	10.73	1.632	10.155
81	192	0	0	0	0	0
81	193	6	13.21	10.422	0.623	10.388
81	194	4	8.187	13.187	3.108	13.462

Lat	Sect	No.> 9	No/100k>9	Mn Dft>9	St.Dev>9	Median>9
mean 81		15	31.482	10.965	1.995	10.294
82	64	71	142.119	11.434	2.13	10.934
82	65	71	142.102	12.388	3.72	11.268
82	163	18	100.161	10.379	1.475	10.058
82	164	3	28.334	9.208	0.218	9.104
82	165	9	42.982	11.178	1.478	10.8
82	166	11	57.113	11.344	1.317	11.822
82	167	28	63.538	11.934	2.726	11.008
82	176	23	223.953	11.832	1.706	12.117
82	181	4	21.656	11.715	1.629	11.309
82	190	3	6.798	10.642	1.23	11.017
82	191	0	0	0	0	0
mean 82		21	75.342	11.67	2.681	10.998
83	66	53	106	11.295	2.213	10.626
83	67	51	102.241	11.529	2.279	11.057
mean 83		52	104.121	11.41	2.238	10.867
84	68	56	132.2	11.49	2.18	11.173
84	69	49	98.012	11.34	2.112	10.775
mean 84		52	115.106	11.42	2.14	11.104
85	71	31	165.669	11.982	2.592	11.503
85	72	18	120.862	10.537	1.035	10.582
mean 85		24	143.266	11.451	2.253	10.716
86	76	15	152.874	10.364	1.232	10.029
87	77	9	89.937	10.827	1.943	9.905
87	79	0	0	0	0	0
mean 87		4	44.969	10.855	1.801	9.929
88	80	13	63.813	10.378	0.997	10.272
88	81	23	145.699	11.116	1.877	10.428
mean 88		18	104.756	10.85	1.639	10.359
89	83	3	27.008	11.302	1.025	10.783
89	85	6	67.272	13.572	7.61	10.416
mean 89		4	47.14	12.815	6.144	10.64









Latitude/Pressure Ridge Median Draft (>5m & >9m)

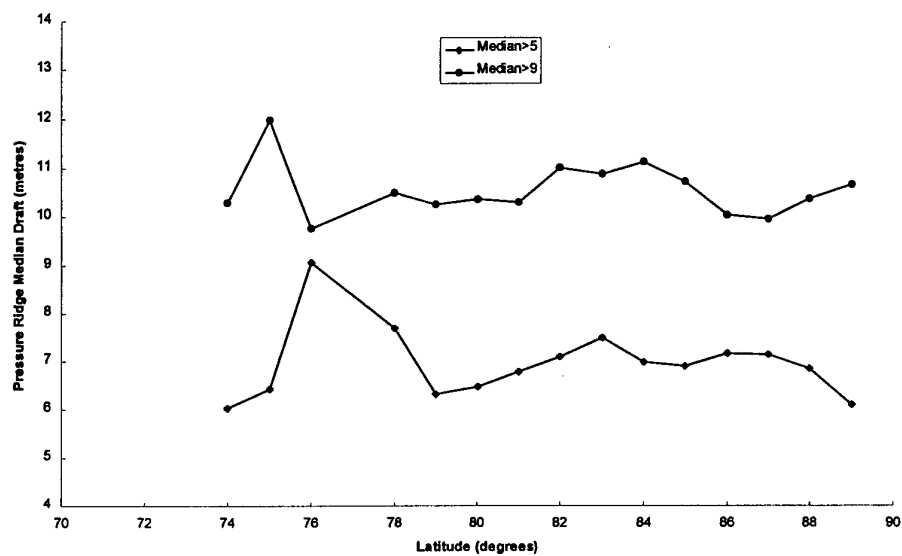


TABLE 8 EAST

Lat	Sect	Mean	St.Dev	Median	Mode	% Level	Seg Len	Seg Draft
71	133	0.78	0.767	0.551	0.095	40.715	42.658	0.771
72	36	0.889	0.738	0.77	0.607	41.343	34.874	0.86
72	37	0.459	0.395	0.432	0.001	47.499	37.064	0.566
mean 72		0.582	0.553	0.496	0.304	44.421	35.969	0.713
73	38	0.628	0.605	0.509	0.016	28.322	43.997	0.494
73	39	0.446	0.31	0.41	0.016	45.643	39.031	0.455
mean 73		0.533	0.483	0.454	0.016	36.983	41.514	0.474
74	40	0.731	0.761	0.53	0.3	33.547	44.22	0.635
74	41	1.301	0.359	1.301	1.304	21.165	41.434	1.366
mean 74		1.022	0.656	1.031	0.802	27.356	42.827	1.001
75	42	1.108	0.384	1.114	1.102	11.778	73.42	1.154
75	43	1.249	0.365	1.24	1.2	16.044	59.736	1.276
75	44	1.255	0.35	1.256	1.303	37.267	31.505	1.345
mean 75		1.204	0.373	1.206	1.202	21.696	54.887	1.258
76	45	1.077	0.792	0.81	0.3	48.485	27.936	1.164
76	46	0.411	0.338	0.37	0.25	67.877	28.042	0.451
mean 76		0.717	0.678	0.474	0.275	58.181	27.989	0.807
77	47	0.318	0.213	0.279	0.185	66.241	30.788	0.346
77	48	0.317	0.2	0.282	0.25	62.255	26.441	0.352
mean 77		0.317	0.207	0.281	0.218	64.248	28.614	0.349
78	49	0.392	0.22	0.362	0.25	51.273	26.819	0.413
78	50	0.346	0.219	0.299	0.1	70.643	33.862	0.394
mean 78		0.369	0.221	0.33	0.175	60.958	30.341	0.403
79	51	1.149	1.125	0.724	0.101	52.334	41.155	0.942
79	52	1.495	2.381	0.199	0.008	54.015	72.213	0.936
mean 79		1.321	1.866	0.611	0.054	53.175	56.684	0.939
80	54	2.417	2.266	1.813	0.05	25.345	60.858	1.641
80	108	1.777	1.873	1.248	0.068	28.175	53.626	1.508
80	109	2.383	1.947	2.345	0.065	30.956	56.457	2.094
80	110	1.768	1.775	1.588	0.06	38.085	55.947	1.655

Lat	Sect	Mean	St.Dev	Median	Mode	% Level	Seg Len	Seg Draft
mean 80		2.199	2.118	1.715	0.061	30.641	56.722	1.725
81	104	2.027	1.631	1.488	1.133	24.963	54.517	1.735
81	106	2.093	1.789	1.811	0.002	24.384	73.431	1.77
mean 81		2.048	1.684	1.539	0.567	24.674	63.974	1.752
83	100	3.008	2.411	2.112	1.511	27.282	63.494	2.165
83	102	2.494	1.809	1.918	1.651	29.399	54.815	2.07
mean 83		2.762	2.16	2.008	1.581	28.341	59.155	2.117
85	96	2.8	1.783	2.368	2.124	28.194	53.549	2.447
89	84	1.976	1.818	1.649	0.105	37.138	56.283	1.528

TABLE 9 EAST

Lat	Sect	L Mean	L St.Dev	L Median	L Mode	L Seg Len	L Seg Drt
71	133	0.438	0.67	0.145	0.095	34.866	0.719
72	36	0.733	0.573	0.634	0	28.886	0.808
72	37	0.321	0.382	0.272	0.001	35.236	0.549
mean 72		0.429	0.476	0.35	0	32.061	0.678
73	38	0.355	0.332	0.304	0.028	24.946	0.46
73	39	0.358	0.301	0.299	0.016	35.602	0.428
mean 73		0.357	0.313	0.301	0.022	30.274	0.444
74	40	0.508	0.516	0.408	0.056	29.669	0.604
74	41	1.294	0.306	1.294	1.358	17.554	1.384
mean 74		0.824	0.588	0.827	0.707	23.611	0.994
75	42	1.087	0.302	1.115	1.277	17.321	1.154
75	43	1.192	0.239	1.198	1.239	19.191	1.269
75	44	1.281	0.307	1.272	1.134	23.497	1.34
mean 75		1.224	0.3	1.22	1.217	20.003	1.254
76	45	1.013	0.797	0.685	0.274	27.108	1.147
76	46	0.372	0.24	0.339	0.25	38.047	0.421
mean76		0.616	0.612	0.405	0.262	32.577	0.784

Lat	Sect	L Mean	L St.Dev	L Median	L Mode	L Seg Len	L Seg Drt
77	47	0.273	0.188	0.238	0.1	40.788	0.314
77	48	0.282	0.178	0.253	0.101	32.904	0.332
mean 77		0.277	0.183	0.245	0.101	36.846	0.323
78	49	0.367	0.212	0.329	0.251	27.502	0.392
78	50	0.324	0.211	0.272	0.1	47.843	0.379
mean 78		0.342	0.213	0.297	0.175	37.672	0.385
79	51	0.807	0.709	0.592	0.114	43.04	0.844
79	52	0.231	0.518	0.064	0.008	78.128	0.635
mean 79		0.518	0.684	0.187	0.061	60.584	0.739
80	54	0.87	0.944	0.742	0.05	30.849	1.33
80	108	0.967	1.014	0.517	0.071	30.333	1.323
80	109	1.162	1.257	0.573	0.065	34.724	1.817
80	110	0.714	1.038	0.131	0.06	42.615	1.413
mean 80		0.892	1.025	0.514	0.061	34.63	1.471
81	104	1.437	0.66	1.311	1.179	27.289	1.597
81	106	0.55	1.09	0.001	0.002	36.074	1.189
mean 81		1.158	0.918	1.183	0.591	31.681	1.393
83	100	1.546	0.762	1.511	1.566	34.787	1.885
83	102	1.654	0.673	1.645	1.662	32.231	1.869
mean 83		1.599	0.722	1.593	1.614	33.509	1.877
85	96	1.936	0.889	2.091	2.112	30.195	2.226
89	84	0.861	0.924	0.268	0.003	41.804	1.258

TABLE 10 EAST

Lat	Sect	R Mean	R St.Dev	R Median	R Mode	R Seg Len	R Seg Drt
71	133	1.013	0.741	0.864	0.329	50.393	0.822
72	36	0.993	0.814	0.852	0.607	40.841	0.912
72	37	0.586	0.361	0.531	0.401	38.889	0.584
mean 72		0.712	0.576	0.595	0.504	39.865	0.748
73	38	0.732	0.65	0.593	0.402	63.012	0.527
73	39	0.519	0.298	0.48	0.403	42.466	0.481
mean 73		0.635	0.531	0.532	0.403	52.739	0.504
74	40	0.841	0.834	0.593	0.305	58.771	0.667
74	41	1.303	0.371	1.303	1.308	65.272	1.348
mean 74		1.096	0.664	1.094	0.806	62.022	1.007
75	42	1.111	0.393	1.113	1.002	129.355	1.153
75	43	1.259	0.382	1.254	1.205	100.184	1.283
75	44	1.239	0.372	1.245	1.317	39.504	1.349
mean 75		1.198	0.389	1.2	1.175	89.681	1.262
76	45	1.139	0.781	0.941	0.3	28.764	1.181
76	46	0.489	0.465	0.435	0.307	18.026	0.48
mean 76		0.861	0.738	0.584	0.303	23.395	0.831
77	47	0.403	0.232	0.366	0.259	20.787	0.378
77	48	0.374	0.221	0.34	0.254	19.97	0.371
mean 77		0.388	0.226	0.352	0.257	20.379	0.374
78	49	0.417	0.225	0.399	0.301	26.136	0.434
78	50	0.398	0.23	0.371	0.301	19.882	0.409
mean 78		0.41	0.227	0.388	0.301	23.009	0.422
79	51	1.506	1.348	1.073	0.122	39.267	1.04
79	52	2.95	2.809	2.146	0.023	66.315	1.237
mean 79		2.207	2.299	1.592	0.072	52.791	1.138
80	54	2.927	2.337	2.344	1.333	90.866	1.952
80	108	2.087	2.024	1.531	0.769	76.744	1.693
80	109	2.923	1.948	2.736	2.71	78.48	2.376
80	110	2.411	1.814	2.132	0.161	69.279	1.897

Lat	Sect	R Mean	R St.Dev	R Median	R Mode	R Seg Len	R Seg Drt
mean 80		2.706	2.207	2.218	1.243	78.842	1.979
81	104	2.216	1.795	1.607	1.095	81.605	1.873
81	106	2.582	1.685	2.467	0.011	110.246	2.342
mean 81		2.334	1.768	1.816	0.553	95.926	2.107
83	100	3.541	2.576	2.64	1.868	91.967	2.443
83	102	2.832	2	2.258	1.843	77.4	2.27
mean 83		3.207	2.349	2.431	1.856	84.684	2.357
85	96	3.128	1.917	2.66	2.452	76.902	2.668
89	84	2.619	1.887	2.313	1.636	70.761	1.797

TABLE 11 EAST

Lat	Sect	% OW	No.Leads	No/100km	MeanWid	St.Dev.	Mode	Median
71	33	32.659	75	653.538	49.973	39.37	17.5	46
72	36	14.782	97	480.364	30.773	27.09	17.5	23
72	37	30.68	304	608	50.461	468.051	11.5	16
mean 72		22.731	200	544.182	45.698	407.669	14.5	18
73	38	24.992	386	844.38	29.598	27.145	11.5	18
73	39	32.678	347	694	47.086	35.96	10.5	38
mean 73		28.835	366	769.19	37.877	32.789	11	24
74	40	23.464	353	760.252	30.864	26.031	10.5	18
74	41	0.281	8	16.545	17	6.547	0	15
mean 74		11.873	180	388.398	30.557	25.837	5.25	18
75	42	0.544	20	40	13.6	2.583	10.5	13.5
75	43	0.07	3	6	11.667	1.155	0	11
75	44	0.344	12	24	14.333	2.387	12.5	14
mean 75		0.319	11	23.333	13.686	2.483	7.667	13
76	45	17.578	275	646.329	27.196	16.779	14.5	24
76	46	37.82	563	1126	33.588	24.578	29.5	29
mean 76		27.699	419	886.164	31.49	22.512	22	27
77	47	52.444	672	1344	39.021	35.069	12.5	29
77	48	51.454	771	1542	33.368	26.458	10.5	27

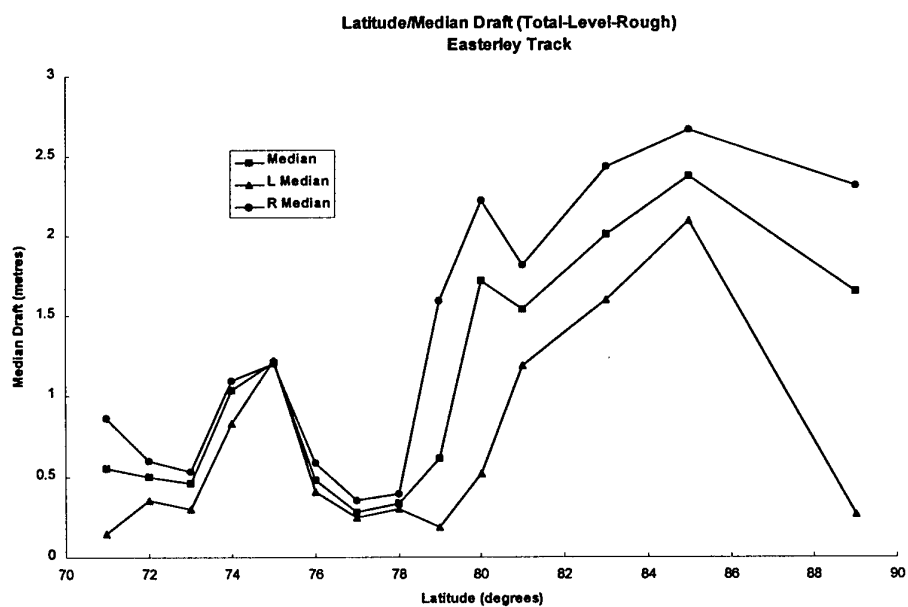
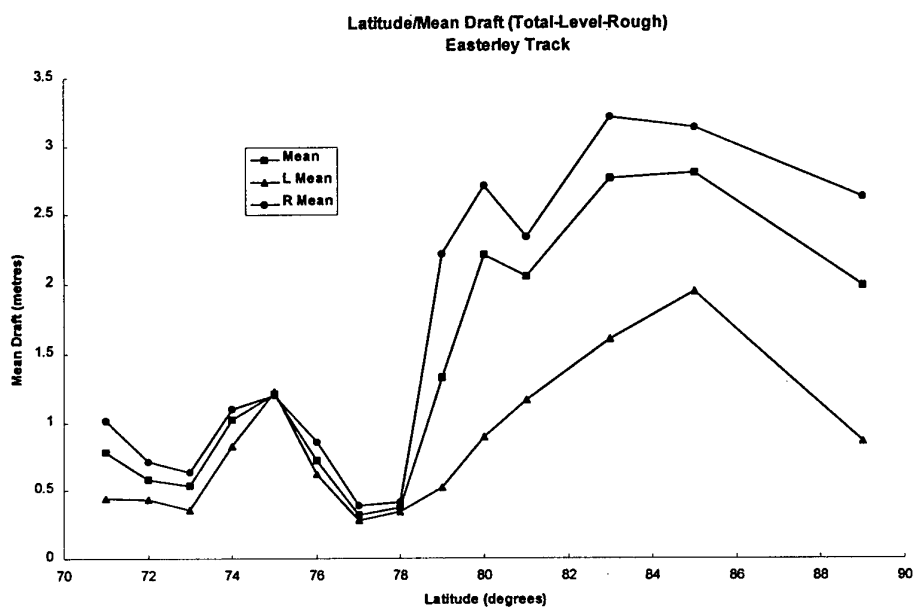
Lat	Sect	% OW	No.Leads	No/100km	MeanWid	St.Dev.	Mode	Median
mean 77		51.949	721	1443	36.001	30.887	11.5	27
78	49	37.804	791	1618.745	23.354	18.914	19.5	20
78	50	49.426	627	1254.452	39.4	50.634	17.5	24
mean 78		43.615	709	1436.599	30.449	37.358	18.5	21
79	51	20.308	277	564.166	35.996	36.488	18.5	23
79	52	53.936	133	274.476	196.504	286.583	23.5	103
mean 79		37.122	205	419.321	88.063	181.837	21	27
80	54	12.9	104	238.669	54.048	66.124	21.5	35
80	108	13.2	52	365.888	36.077	36.289	10.5	19.5
80	109	11.87	20	234.577	50.6	61.65	28.5	27.5
80	110	31.457	52	446.812	70.404	67.618	20.5	43
mean 80		17.357	57	321.486	53.377	61.327	20.25	30
81	104	1.858	22	103.734	17.909	11.447	11.5	13.5
81	106	24.033	46	457.211	52.565	43.55	10.5	38.5
mean 81		12.946	34	280.473	41.353	39.77	11	29
83	100	1.241	5	32.14	38.6	25.235	0	30
83	102	1.922	12	84.193	22.833	13.016	10.5	18
mean 83		1.582	8	58.166	27.471	18.18	5.25	20
85	96	3.78	7	53.135	71.143	48.461	0	61
89	84	22.652	61	294.501	76.918	185.136	15.5	32

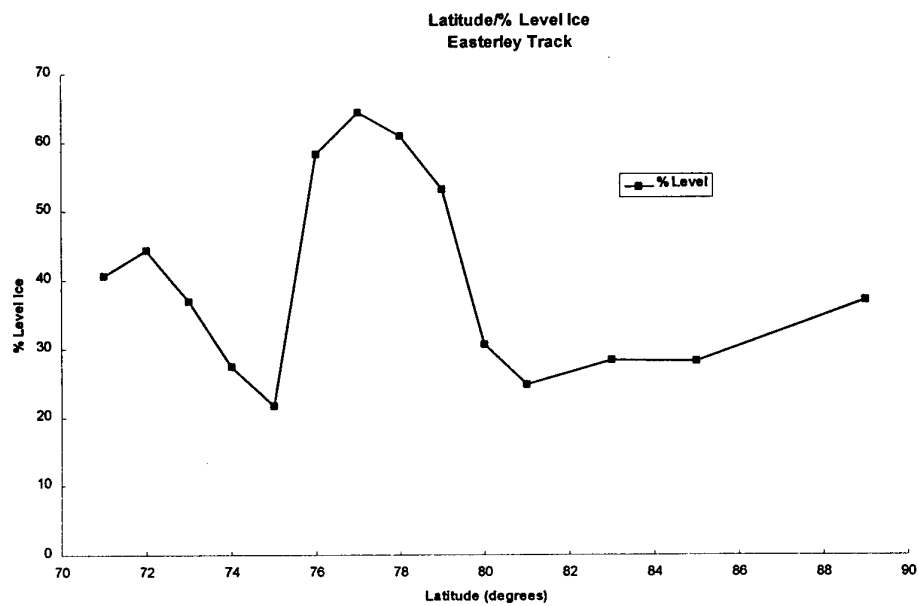
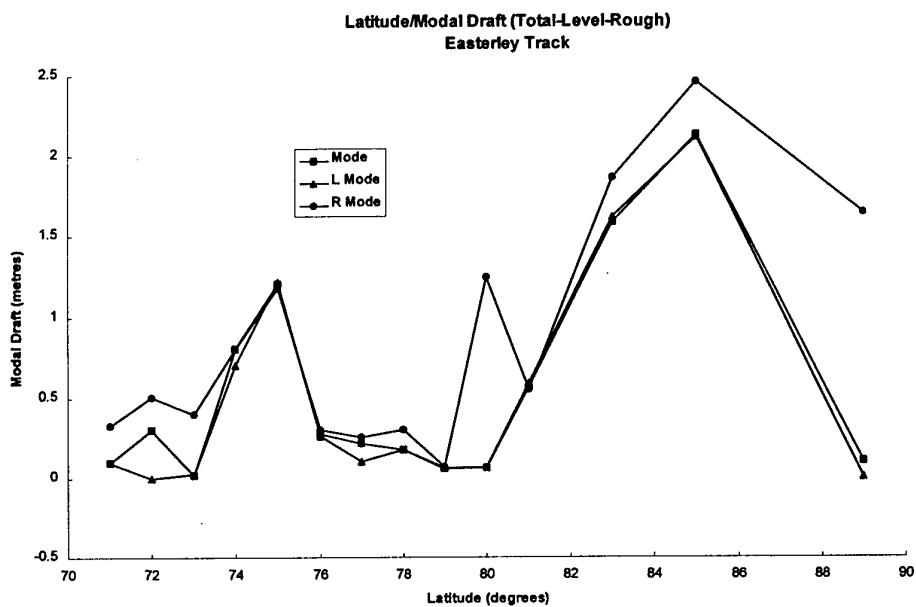
TABLE 12 EAST

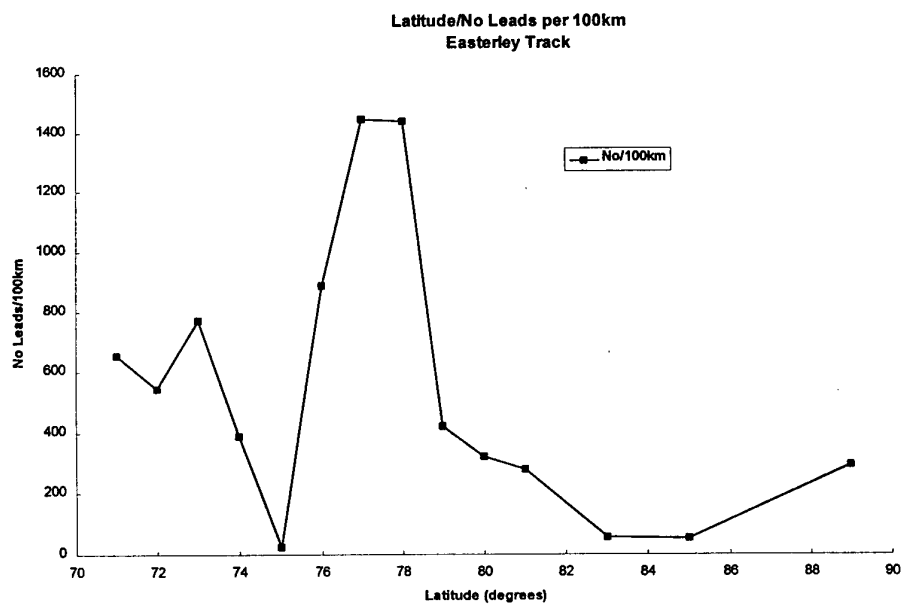
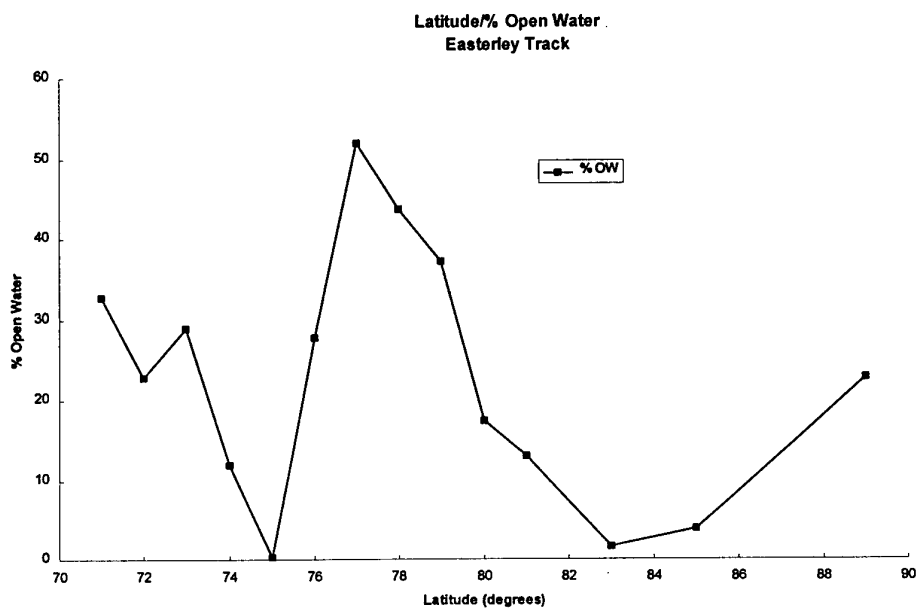
Lat	Sect	No.> 5	No.> 9	No/100k>5	No/100k>9	Mn Dft>5	Mn Dft>9	St.Dev>5	St.Dev>9
71	33	0	0	0	0	0	0	0	0
72	36	4	4	19.809	19.809	10.588	10.588	0.714	0.714
72	37	0	0	0	0	0	0	0	0
mean 72		2	2	9.904	9.904	10.588	10.588	0.714	0.714
73	38	8	0	17.5	0	5.587	0	0.587	0
73	39	0	0	0	0	0	0	0	0
mean 73		4	0	8.75	0	5.587	0	0.587	0
74	40	8	0	17.229	0	6.241	0	0.887	0
74	41	0	0	0	0	0	0	0	0
mean 74		4	0	8.615	0	6.241	0	0.887	0
75	42	0	0	0	0	0	0	0	0
75	43	0	0	0	0	0	0	0	0
75	44	0	0	0	0	0	0	0	0
mean 75		0	0	0	0	0	0	0	0
76	45	0	0	0	0	0	0	0	0
76	46	0	0	0	0	0	0	0	0
mean 76		0	0	0	0	8.854	0	4.654	0

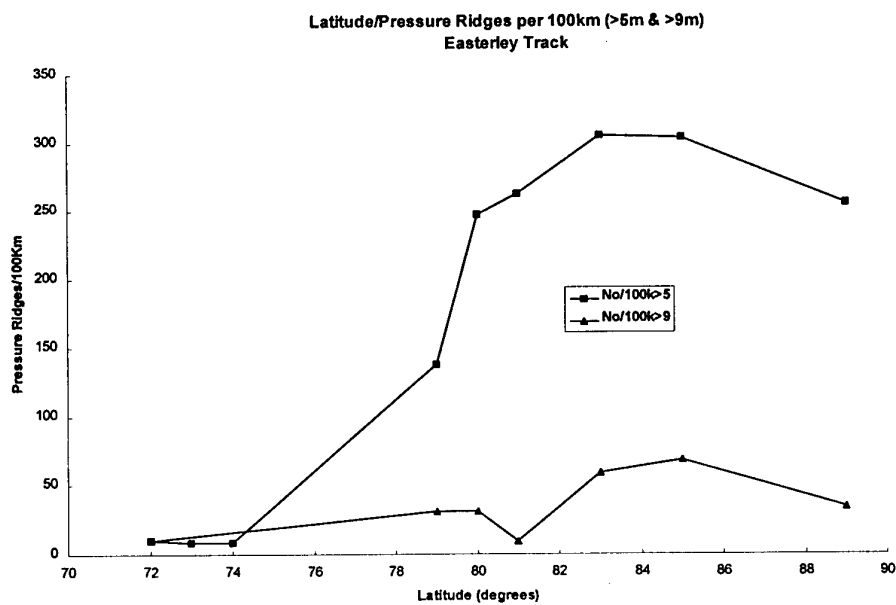
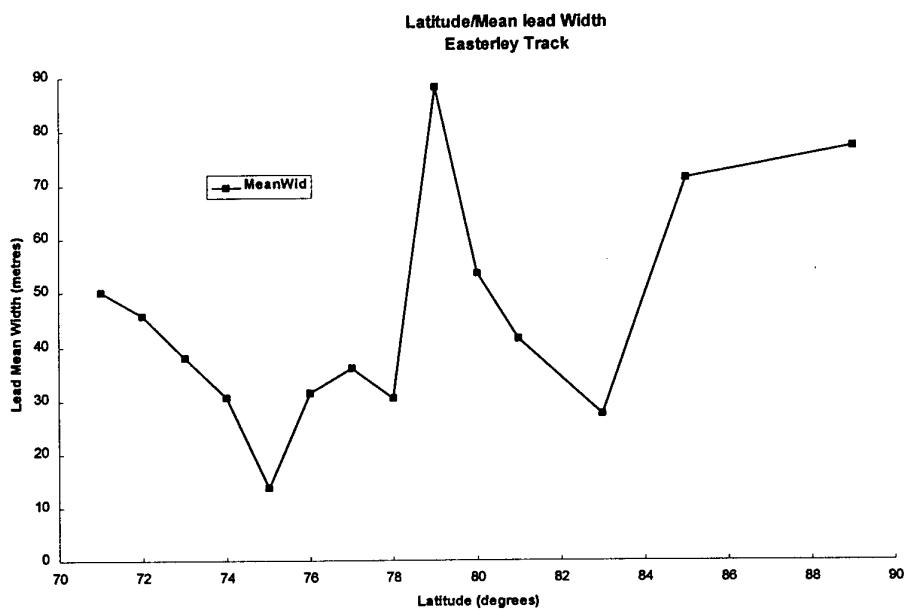
Lat	Sect	No.> 5	No.> 9	No/100k>5	No/100k>9	Mn Dft>5	Mn Dft>9	St.Dev>5	St.Dev>9
77	47	0	0	0	0	0	0	0	0
77	48	0	0	0	0	0	0	0	0
mean 77		0	0	0	0	0	0	0	0
78	49	0	0	0	0	0	0	0	0
78	50	0	0	0	0	0	0	0	0
mean 78		0	0	0	0	0	0	0	0
79	51	32	0	65.174	0	6.175	0	1.091	0
79	52	102	30	210.5	61.912	8.251	11.983	2.869	2.309
mean 79		67	15	137.837	30.956	7.755	11.906	2.705	2.31
80	54	150	27	344.234	61.962	7.391	11.189	2.159	1.713
80	108	31	5	218.126	35.182	7.192	12.618	2.793	2.912
80	109	21	0	246.305	0	6.884	0	1.629	0
80	110	21	3	180.443	25.778	6.567	9.962	1.592	0.983
mean 80		55	8	247.277	30.73	7.238	11.245	2.173	1.884
81	104	46	4	216.899	18.861	6.869	11.58	1.908	2.86
81	106	31	0	308.12	0	5.738	0	0.678	0
mean 81		38	2	262.51	9.43	6.414	11.58	1.628	2.86

Lat	Sect	No.> 5	No.> 9	No/100k>5	No/100k>9	Mn Dft>5	Mn Dft>9	St.Dev>5	St.Dev>9
83	100	60	14	385.678	89.992	7.577	11.177	2.384	1.738
83	102	32	4	224.514	28.064	7.497	12.733	2.326	1.219
mean 83		46	9	305.096	59.028	7.549	11.523	2.352	1.737
85	96	40	9	303.628	68.316	7.249	10.002	1.803	1.023
89	84	53	7	255.878	33.795	6.883	10.159	1.752	1.326









Latitude/Pressure Ridge Mean Draft (>5 & >9)
Easterley Track

