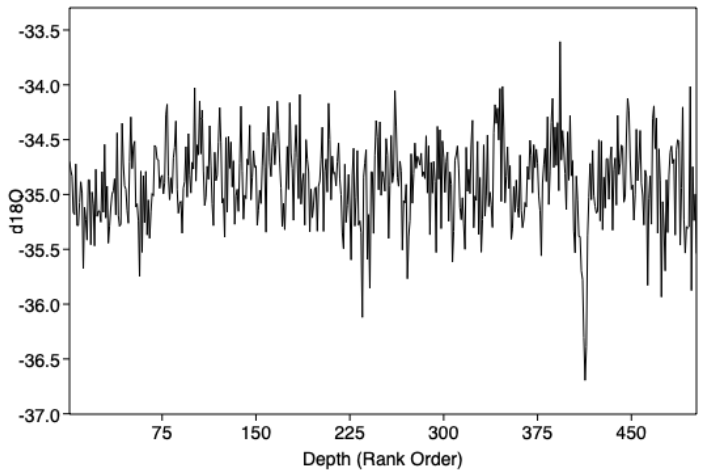
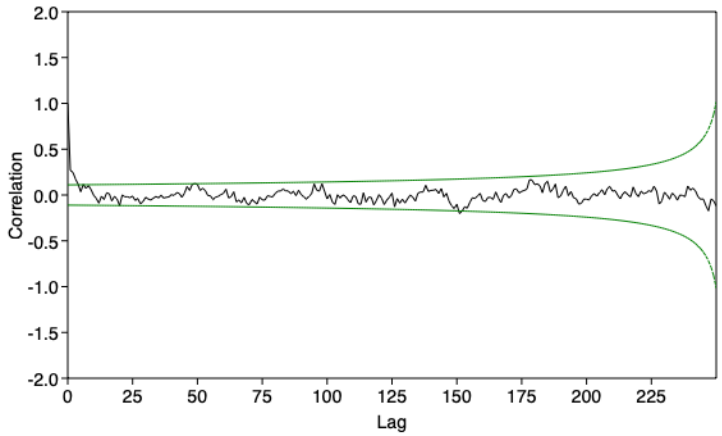
Lab 3 Assignment - Answer Sheet

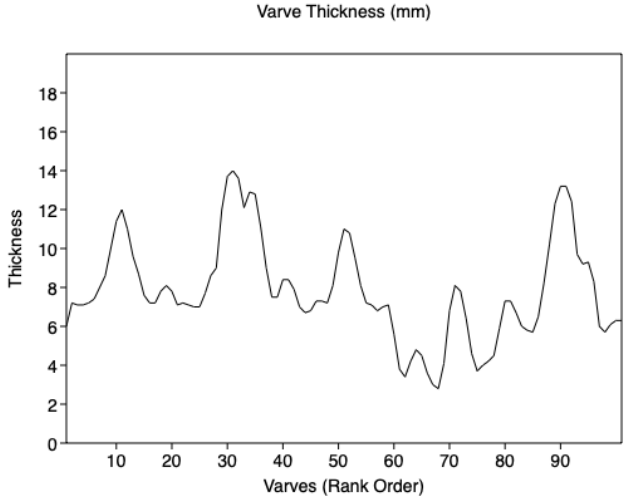
1. Plot data (10 points) and conduct an autocorrelation analysis of the Greenland ice core $\delta^{18}O$ data (10 points) and identify the time lags (if any) that exhibit a statistically significant correlation with this time series at or above the p = 0.95 level. (40 points)

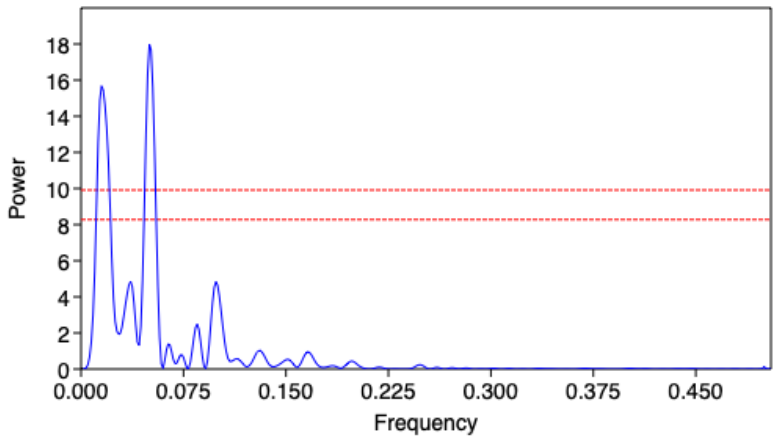




Significant offsets are recorded at offsets (lags) 6, 20, 49 and 151.

2. Plot data (10 points) and conduct an Fourier analysis of the Green River varve thickness data (10 points). Identify frequencies (if any) that exhibit a statistically significant power at or above the p = 0.99 level (20 points).



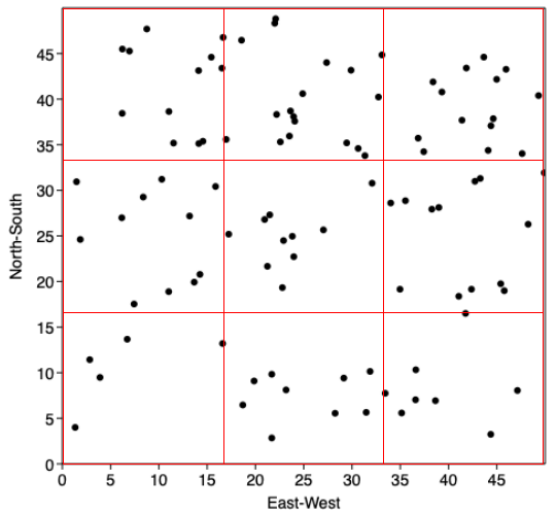


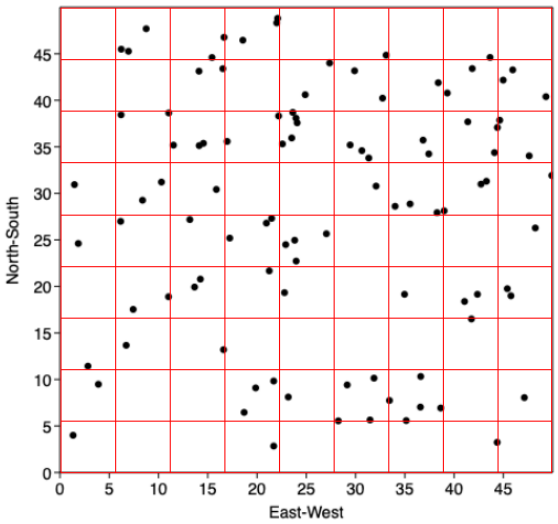
Two significant peaks occur in the power spectrum, the first at harmonic 0.15 (power:15.682) and the second at harmonic 0.05 (power: 17.991).

3. Plot data (10 points) and statistically test the hypotheses that the distribution of well locations recorded in the Sample Localities dataset conform to the following distributions.

   - uniform (30 points)
   - random (30 points)

   Accept the null hypothesis for these comparisons if there is a 97.5% probability they are true.



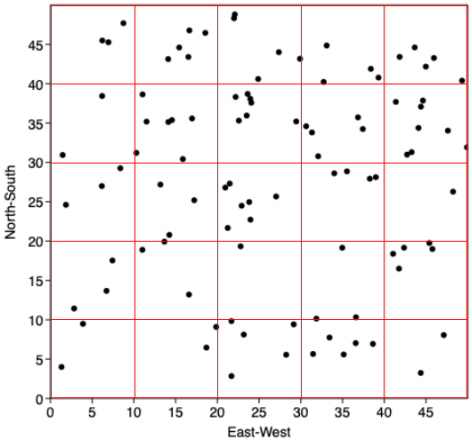


Uniform Distribution

Cell	Count	Expected	χ^2			
1	12	11.22	0.0542		$\chi^2_{obs.}$	11.3686
2	19	11.22	5.3947		dof	7
3	14	11.22	0.6888		$\chi^2_{\alpha=0.025,7.}$	14.0700
4	11	11.22	0.0043			
5	10	11.22	0.1327		Accept H_0	
6	13	11.22	0.2824		Distribution is uniform	
7	5	11.22	3.4482			
8	9	11.22	0.4393			
9	8	11.22	0.9241			
	11.22		11.3686			

Random Distribution (81 cells)

Ce	Cou	Prob.	Expect.	χ^2			
0	28	0.2910	23.5678	0.8335		$\chi^2_{obs.}$	3.8189
1	26	0.3592	29.0961	0.3294		dof	2
2	13	0.2217	17.9605	1.3701		$\chi^2_{\alpha=0.025,2.}$	5.9900
3-6	14	0.1278	10.3516	1.2859			
						Accept H_0	
						Distribution is normal	
	81	1.000	81	3.819			



Random Distribution (25 cells)

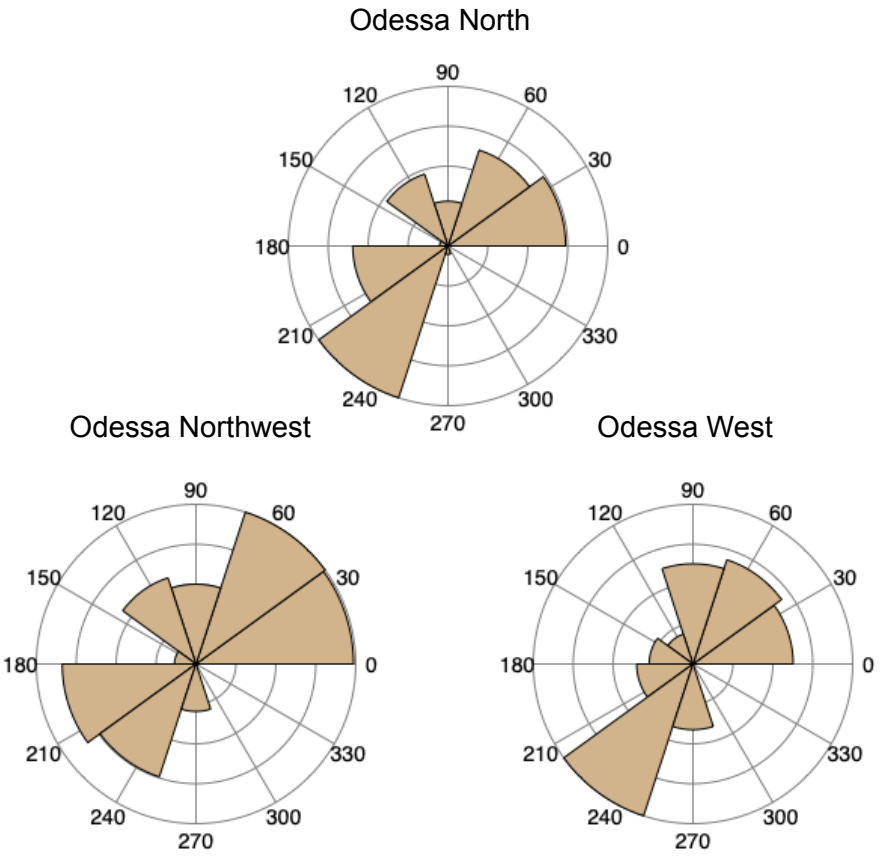
Cell	Count	Prob.	Cells (Combined)	Count (Combined)	Prob. (Combined)	Expect.	χ^2		
0	0	0.0183	0-2	6	0.2381	0.4579	0.4579	$\chi^2_{obs.}$	0.5044
1	2	0.0733	3-4	8	0.3907	1.8316	0.0155	dof	1
2	4	0.1465	5-8	11	0.3498	3.6631	0.0310	$\chi^2_{\alpha=0.025,1.}$	3.8400
3	6	0.1954							
4	2	0.1954						Accept H_0	
5	7	0.1563						Distribution is normal	
6	0	0.1042							
7	3	0.0595							
8	1	0.0298							
	25	0.979	0	25	0.979	6	0.504		

4. Plot data (10 points) and statistically test for mean directional differences in the the three Midland Basin (Odessa) well field fracture patterns. Accept the null hypotheses is there is a 90% probability of it being true. (30 points)

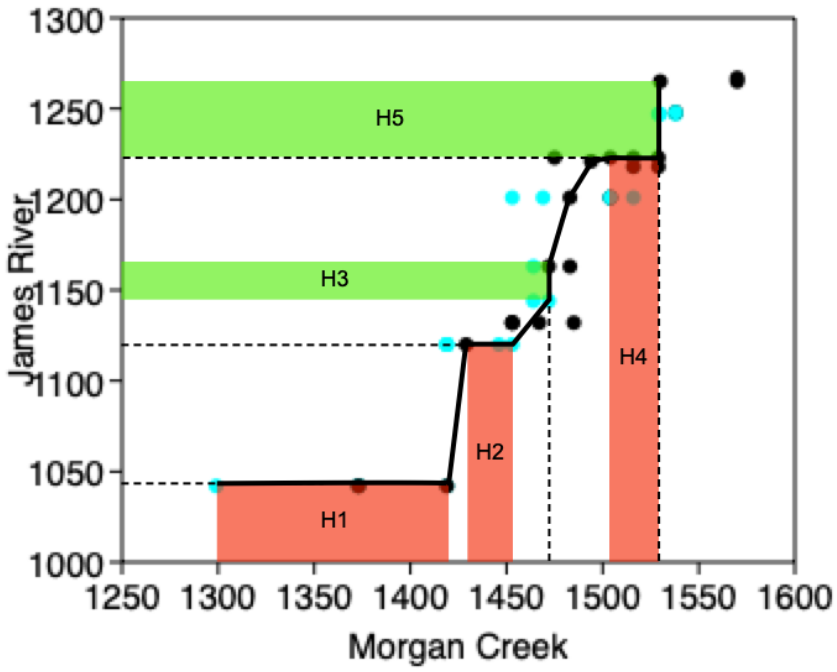
Statistics	Odessa North	Odessa Northwest
N	218	376
Mean	133.06°·	97.33°
Rayleigh's *R*	26.351	79.7212
Overall *k*	0.36303	
Overall *R*	102.28	
U	4.621	
p	0.03	
Interpretation	Reject H_0, samples have different means	

Statistics	Odessa North	Odessa West
N	218	376
Mean	133.06°·	115.6°
Rayleigh's *R*	26.351	15.6240
Overall *k*	0.19572	
Overall *R*	41.52	
U	0.47435	
p	0.49137	
Interpretation	Accept H_0, samples have same mean	

Statistics	Odessa Northwest	Odessa West
N	376	376
Mean	97.33°	115.6°
Rayleigh's *R*	79.7212	15.6240
Overall *k*	0.3281	
Overall *R*	94.683	
U	0.78388	
p	0.37632	
Interpretation	Accept H_0, samples have same mean	



5. Plot data (10 points) and present a graphic analysis of the stratigraphic correlation between the Morgan Creek and James River sections of Palmer's (1954) Texas trilobite data (Palmer Riley Data (MC & JR).txt). (30 points) Based on your results give positions and relative durations of any implied missing time intervals in both sections. (30 points)



Hiatus	James River	Morgan Creek
1	1042	1373 - 1419
2	1120	1429 - 1453
3	1144 -1163	1472
4	1223	1504 - 1529
5	1223 - 1265	1529

6. Use the CONOP routine to construct composite stratigraphic ranges for 26 Cambrian taxa occurring in 7 Riley Formation sections collected by Palmer (1954). (10 points) Use this result to construct a biodiversity history for these data over the interval. (30 points)

Taxon	FAD	LAD
Angulotreta triangularis	0	5
Labiostria conveximarginata	1	11
Coosia cf.albertensis	2	10
Kormagnostus simplex	3	14
Tricrepicephalus coria	4	9
Kinsabia varigata	6	12
Dictyonina perforata	7	13
Crepicephalus australis	8	16
Coosella beltensis	15	22
Dunderbergia variagranula	17	23
Opisthotreta depressa	19	24
Aphelaspis walcotti	20	25
Kingstonia pontotocensis	21	26