

AD-A096 385

NAVAL POSTGRADUATE SCHOOL MONTEREY CA
NUTRIENT STUDY OF MESOSCALE THERMAL FEATURES OFF POINT SUR, CAL--ETC(U)
SEP 80 W E HANSON

F/G 8/10

UNCLASSIFIED

NL

2 OF 2

AD-A096 385



END
DATE
FILMED
4-81
DTIC

The predictive regression equation computed from 333 in situ measurements was compared with the equations developed using the slope derived from source water characteristics and the temperature of the ocean water used as the T-intercept. The nitrate concentrations for 11.85° and 14.0°C were computed.

The best fit linear regression (correlation, $r = -0.93$) based on underway in situ measurements was:

$$N = -3.24 T + 47.74.$$

where $N = \mu\text{M}$ nitrate and $T = ^\circ\text{C}$ temperature. The predictive regression equation, assuming no thermal exchange with the environment, was:

$$N_1 = -3.7 T + 57.35$$

The second approximation which corrected for wind mixing and atmospheric thermal exchange was:

$$N_2 = -3.1 T + 48.05$$

a. Comparison of Predicted Nitrate Concentration to That Computed by Regression Analysis of Observed Data

The solution to the equations are as follows:

for T_c of 11.85°C, $N = 9.82 \mu\text{M}$, $N_1 = 13.5 \mu\text{M}$, and $N_2 = 11.3 \mu\text{M}$ nitrate; for T_f of 14.0°C, $N = 2.94 \mu\text{M}$, $N_1 = 5.5 \mu\text{M}$, and $N_2 = 4.7 \mu\text{M}$ nitrate. The percentage of error ($\frac{N_1 - N}{N} \times 100$ and $\frac{N_2 - N}{N} \times 100$), associated in predicting the nitrate concentration at the cold center or most recently upwelled water appears to be ca. +37% for the first approximation,

N_1 , and ca. +15% for N_2 which accounted for wind mixing and thermal exchange. In the vicinity of the ocean front, the percentage of error increased; for T_f of 14.0°C, N_1 had an error of ca. +98% whereas N_2 had an error of ca. +58%. In both hindcasts the nutrient concentrations predicted were higher than those computed from the equation based on in situ surface measurements. Both hindcasts also deteriorated in reliability proceeding away from the cold center of the feature. The predictive equation which corrected for wind mixing and thermal exchange with the atmosphere had significantly less error than the equation that did not. Because nitrate and temperature are nonconservative within the upper layer of the ocean, the 15% error derived from linear regression should be considered reasonable. In all, the longer the upwelled water is in contact with the surface layer of the ocean, the more complex the interactions with the physical and biological environment may become, and the more unrealistic the simple predictive equations.

b. Summary of Conditions for Which This Test Appeared Satisfactory

This hindcast was applied only to a shallow upwelling system which satellite history showed to be in an initial stage of development. The prediction was based on knowledge of the temperature of the sea surface within the coldest thermal pattern detected, surface temperature of the oceanic front detected by thermal patterns, a vertical

temperature and nutrient profile within the upper 200m of the ocean seaward of the oceanic front, and atmospheric parameters to hindcast ocean-atmosphere thermal exchange [James, 1966]. In this special case, given this limited ground truth, it was possible to hindcast within 15% error the maximum nutrient concentration in an upwelling system detected by satellite imagery. It therefore seems reasonable to assume that at least the major patterns of nutrient distributions can, with further research, be inferred using satellite imagery and limited ground truth (i.e., data from buoys and AXBT's).

V. CONCLUSIONS

1. Inference of nutrient distribution by satellite detected upwelling systems is feasible.
2. Active upwelling systems are expected to have strong inverse linear correlations between nutrients and temperature.
3. The nutrient front position can be approximated closely by the thermal oceanic front.
4. The nutrient distribution within a feature can not be related to the sharpness of the thermal front.
5. To predict nutrient distributions, ground truth as well as satellite detected thermal patterns are required.
6. A linear regression can be used to forecast nutrient maxima for upwelling systems in the initial stage of development aided by only limited in situ data.
7. The approximation of nutrient concentrations by linear regression can be improved by estimating the effects of wind mixing and thermal exchange with the atmosphere.
8. With greater knowledge of source water characteristics (from in situ monitoring or historical data), stage of development (inferred from satellite images and in situ monitoring), and dynamic processes (wind mixing, advection, and heat transfer) a forecast of nutrient distributions with a surface thermal feature could be made.

Listing of Surface Data: Time, Latitude, Longitude,
Elapsed Distance, Nitrate, Phosphate, Nutrient Ratio,
ATP, Δ ATP/ATP, Chlorophyll, Temperature

99

10/10/10

[illegible]

27 SEPTEMBER 1979 CHEMICAL METEORSCALE (CRUISE IX)

1000 35 46.1 121 54.8

1000 35 46.1 121 54.8

1000 35 46.1 121 54.8

1000 35 46.1 121 54.8

1000 35 46.1 121 54.8

1000 35 46.1 121 54.8

1000 35 46.1 121 54.8

1000 35 46.1 121 54.8

1000 35 46.1 121 54.8

1000 35 46.1 121 54.8

1000 35 46.1 121 54.8

1000 35 46.1 121 54.8

1000 35 46.1 121 54.8

1000 35 46.1 121 54.8

104

PHYSICAL PROPERTIES SCALE (COLISE IX)

27 SEPTEMBER 1979

5/10 100000

QTY	LENGTH	WIDTH	THICKNESS	WEIGHT	PC4	WATER/PC4	ATP	CHL A	TEMP
1600	35 42.2	122 20.9			0.68	4.3	116.4	0.0000	15.0
					0.65	4.4		0.0000	15.0
					0.64	4.5		0.0000	15.0
					0.63	4.6		0.0000	15.0
					0.62	4.7		0.0000	15.0
					0.61	4.8		0.0000	15.0
					0.60	4.9		0.0000	15.0
					0.59	5.0		0.0000	15.0
					0.58	5.1		0.0000	15.0
					0.57	5.2		0.0000	15.0
					0.56	5.3		0.0000	15.0
					0.55	5.4		0.0000	15.0
					0.54	5.5		0.0000	15.0
					0.53	5.6		0.0000	15.0
					0.52	5.7		0.0000	15.0
					0.51	5.8		0.0000	15.0
					0.50	5.9		0.0000	15.0
					0.49	6.0		0.0000	15.0
					0.48	6.1		0.0000	15.0
					0.47	6.2		0.0000	15.0
					0.46	6.3		0.0000	15.0
					0.45	6.4		0.0000	15.0
					0.44	6.5		0.0000	15.0
					0.43	6.6		0.0000	15.0
					0.42	6.7		0.0000	15.0
					0.41	6.8		0.0000	15.0
					0.40	6.9		0.0000	15.0
					0.39	7.0		0.0000	15.0
					0.38	7.1		0.0000	15.0
					0.37	7.2		0.0000	15.0
					0.36	7.3		0.0000	15.0
					0.35	7.4		0.0000	15.0
					0.34	7.5		0.0000	15.0
					0.33	7.6		0.0000	15.0
					0.32	7.7		0.0000	15.0
					0.31	7.8		0.0000	15.0
					0.30	7.9		0.0000	15.0
					0.29	8.0		0.0000	15.0
					0.28	8.1		0.0000	15.0
					0.27	8.2		0.0000	15.0
					0.26	8.3		0.0000	15.0
					0.25	8.4		0.0000	15.0
					0.24	8.5		0.0000	15.0
					0.23	8.6		0.0000	15.0
					0.22	8.7		0.0000	15.0
					0.21	8.8		0.0000	15.0
					0.20	8.9		0.0000	15.0
					0.19	9.0		0.0000	15.0
					0.18	9.1		0.0000	15.0
					0.17	9.2		0.0000	15.0
					0.16	9.3		0.0000	15.0
					0.15	9.4		0.0000	15.0
					0.14	9.5		0.0000	15.0
					0.13	9.6		0.0000	15.0
					0.12	9.7		0.0000	15.0
					0.11	9.8		0.0000	15.0
					0.10	9.9		0.0000	15.0
					0.09	10.0		0.0000	15.0
					0.08	10.1		0.0000	15.0
					0.07	10.2		0.0000	15.0
					0.06	10.3		0.0000	15.0
					0.05	10.4		0.0000	15.0
					0.04	10.5		0.0000	15.0
					0.03	10.6		0.0000	15.0
					0.02	10.7		0.0000	15.0
					0.01	10.8		0.0000	15.0
					0.00	10.9		0.0000	15.0
					0.00	11.0		0.0000	15.0
					0.00	11.1		0.0000	15.0
					0.00	11.2		0.0000	15.0
					0.00	11.3		0.0000	15.0
					0.00	11.4		0.0000	15.0
					0.00	11.5		0.0000	15.0
					0.00	11.6		0.0000	15.0
					0.00	11.7		0.0000	15.0
					0.00	11.8		0.0000	15.0
					0.00	11.9		0.0000	15.0
					0.00	12.0		0.0000	15.0
					0.00	12.1		0.0000	15.0
					0.00	12.2		0.0000	15.0
					0.00	12.3		0.0000	15.0
					0.00	12.4		0.0000	15.0
					0.00	12.5		0.0000	15.0
					0.00	12.6		0.0000	15.0
					0.00	12.7		0.0000	15.0
					0.00	12.8		0.0000	15.0
					0.00	12.9		0.0000	15.0
					0.00	13.0		0.0000	15.0
					0.00	13.1		0.0000	15.0
					0.00	13.2		0.0000	15.0
					0.00	13.3		0.0000	15.0
					0.00	13.4		0.0000	15.0
					0.00	13.5		0.0000	15.0
					0.00	13.6		0.0000	15.0
					0.00	13.7		0.0000	15.0
					0.00	13.8		0.0000	15.0
					0.00	13.9		0.0000	15.0
					0.00	14.0		0.0000	15.0
					0.00	14.1		0.0000	15.0
					0.00	14.2		0.0000	15.0
					0.00	14.3		0.0000	15.0
					0.00	14.4		0.0000	15.0
					0.00	14.5		0.0000	15.0
					0.00	14.6		0.0000	15.0
					0.00	14.7		0.0000	15.0
					0.00	14.8		0.0000	15.0
					0.00	14.9		0.0000	15.0
					0.00	15.0		0.0000	15.0

[illegible]

2/2/20

MILITARY

0255

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99

TIME	LOCATION	LONGITUDE	29 NOVEMBER 1979	CEMICAL "C" SCALE (CPLIN" X)	ATC AC/L	CPLIN 90/M3	TEMP
0535	36 10.5	121 48.1	113 01		362.0		15.6
0538	36 11.1	121 48.7			426.0		15.1
0545	36 9.5	121 48.2			322.0		15.1
0555	36 5.2	121 48.4			445.0		15.1
0608	36 10.5	121 51.2			477.0		15.1
0622	36 12.2	121 48.6			522.0		15.1
					454.0		15.1
					475.0		15.1
					463.0		15.1
					524.0		15.1

TIME GMT	LATITUDE N/S/E/W	LONGITUDE E/W	29 NOVEMBER 1979	CHEMICAL MICROSCALE (POLIST' X)
0645	37 5.7	121 46.0	NO3 0.1	PC4 0.0
0703	36 7.6	121 46.2	NO3 0.1	PC4 0.0
0734	36 11.0	121 52.5	NO3 0.1	PC4 0.0
0747	36 12.7	121 50.2	NO3 0.1	PC4 0.0
0752	36 13.2	121 50.8	NO3 0.1	PC4 0.0
0800	36 12.7	121 51.5	NO3 0.1	PC4 0.0
0817	36 11.5	121 56.2	NO3 0.1	PC4 0.0

ITEM	QTY	UNIT	PRICE	AMOUNT	DATE	DESCRIPTION	REMARKS
0855	36	5.5	121 40.8				
0902	36	4.8	121 50.4				
0957	36	11.1	121 57.8				

ITEM	QTY	UNIT	PRICE	AMOUNT	DATE	DESCRIPTION	REMARKS
0855	36	5.5	121 40.8				
0902	36	4.8	121 50.4				
0957	36	11.1	121 57.8				

ITEM	QTY	UNIT	PRICE	AMOUNT	DATE	DESCRIPTION	REMARKS
0855	36	5.5	121 40.8				
0902	36	4.8	121 50.4				
0957	36	11.1	121 57.8				

TIME GMT	R/V POINT		29 NOVEMBER 1979		CHEMICAL WINDSCALE (CRUIS X)		PC4 (M)	MUTS RATIO 103/104	ATP KCAL	CHL A MG/M3	TEMP C
	LATITUDE N	LONGITUDE W	WIND M	WIND KNOTS							
1029	36 14.2	121 53.7	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
1110	36 17.1	121 50.8	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
1130	36 21.3	121 50.6	14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
			14.2	14.2	14.2	14.2	14.2	14.2	14.2	14.2	

TIME	29 NOVEMBER 1979		CHEMICAL MEASUREMENTS (CRUISE XI)				TEMP
	TIME	LOCATION	PC4	MUT3-RATIO	ATP	CHL A	
TIME	TIME	LOCATION	PC4	MUT3-RATIO	ATP	CHL A	TEMP
1149	36 21.5	122 2.8	113		234.0		12.35
			113				12.45
			113				12.55
			113				12.65
			113				12.75
			113				12.85
			113				12.95
			113				13.05
			113				13.15
			113				13.25
			113				13.35
			113				13.45
			113				13.55
			113				13.65
			113				13.75
			113				13.85
			113				13.95
			113				14.05
			113				14.15
			113				14.25
			113				14.35
			113				14.45
			113				14.55
			113				14.65
			113				14.75
			113				14.85
			113				14.95
			113				15.05
			113				15.15
			113				15.25
			113				15.35
			113				15.45
			113				15.55
			113				15.65
			113				15.75
			113				15.85
			113				15.95
			113				16.05
			113				16.15
			113				16.25
			113				16.35
			113				16.45
			113				16.55
			113				16.65
			113				16.75
			113				16.85
			113				16.95
			113				17.05
			113				17.15
			113				17.25
			113				17.35
			113				17.45
			113				17.55
			113				17.65
			113				17.75
			113				17.85
			113				17.95
			113				18.05
			113				18.15
			113				18.25
			113				18.35
			113				18.45
			113				18.55
			113				18.65
			113				18.75
			113				18.85
			113				18.95
			113				19.05
			113				19.15
			113				19.25
			113				19.35
			113				19.45
			113				19.55
			113				19.65
			113				19.75
			113				19.85
			113				19.95
			113				20.05
			113				20.15
			113				20.25
			113				20.35
			113				20.45
			113				20.55
			113				20.65
			113				20.75
			113				20.85
			113				20.95
			113				21.05
			113				21.15
			113				21.25
			113				21.35
			113				21.45
			113				21.55
			113				21.65
			113				21.75
			113				21.85
			113				21.95
			113				22.05
			113				22.15
			113				22.25
			113				22.35
			113				22.45
			113				22.55
			113				22.65
			113				22.75
			113				22.85
			113				22.95
			113				23.05
			113				23.15
			113				23.25
			113				23.35
			113				23.45
			113				23.55
			113				23.65
			113				23.75
			113				23.85
			113				23.95
			113				24.05
			113				24.15
			113				24.25
			113				24.35
			113				24.45
			113				24.55
			113				24.65
			113				24.75
			113				24.85
			113				24.95
			113				25.05
			113				25.15
			113				25.25
			113				25.35
			113				25.45
			113				25.55
			113				25.65
			113				25.75
			113				25.85
			113				25.95
			113				26.05
			113				26.15
			113				26.25
			113				26.35
			113				26.45
			113				26.55
			113				26.65
			113				26.75
			113				26.85
			113				26.95
			113				27.05
			113				27.15
			113				27.25
			113				27.35
			113				27.45
			113				27.55
			113				27.65
			113				27.75
			113				27.85
			113				27.95
			113				28.05
			113				28.15
			113				28.25
			113				28.35
			113				28.45
			113				28.55
			113				28.65
			113				28.75
			113				28.85
			113				28.95
			113				29.05
			113				29.15
			113				29.25
			113				29.35
			113				29.45
			113				29.55
			113				29.65
			113				29.75
			113				29.85
			113				29.95
			113				30.05
			113				30.15
			113				30.25
			113				30.35
			113				30.45
			113				30.55
			113				30.65
			113				30.75
			113				30.85
			113				30.95
			113				31.05
			113				31.15
			113				31.25
			113				31.35
			113				31.45
			113				31.55
			113				31.65
			113				31.75
			113				31.85
			113				31.95
			113				32.05
			113				32.15
			113				32.25
			113				32.35
			113				32.45
			113				32.55
			113				32.65
			113				32.75
			113				32.85
			113				32.95
			113				33.05
			113				33.15
			113				33.25
			113				33.35
			113				33.45
			113				33.55
			113				33.65
			113				33.75
			113				33.85
			113				33.95
			113				34.05
			113				34.15
			113				34.25
			113				34.35
			113				34.45
			113				34.55
			113				34.65
			113				34.75
			113				34.85
			113				34.95
			113				35.05
			113				35.15
			113				35.25
			113				35.35
			113				35.45
			113				35.55
			113				35.65
			113				35.75
			113				35.85
			113				35.95
			113				36.05
			113				36.15
			113				36.25
			113				36.35
			113				36.45
			113				36.55
			113				36.65
			113				36.75
			113				36.85
			113				36.95
			113				37.05
			113	</			

TIME	WAVELENGTH	WAVELENGTH	29 NOVEMBER 1979	PHYSICAL DESCRIPTION	PHYSICAL DESCRIPTION	PHYSICAL DESCRIPTION	PHYSICAL DESCRIPTION	PHYSICAL DESCRIPTION	PHYSICAL DESCRIPTION
1400	20 16.3	122	5.6	1400	20 16.3	122	5.6	1400	20 16.3
1415	26 18.7	122	5.4	1415	26 18.7	122	5.4	1415	26 18.7
1430	30 16.3	122	4.7	1430	30 16.3	122	4.7	1430	30 16.3
1445	36 18.7	122	5.4	1445	36 18.7	122	5.4	1445	36 18.7
1460	42 16.3	122	4.7	1460	42 16.3	122	4.7	1460	42 16.3
1475	48 18.7	122	5.4	1475	48 18.7	122	5.4	1475	48 18.7
1490	54 16.3	122	4.7	1490	54 16.3	122	4.7	1490	54 16.3
1505	60 18.7	122	5.4	1505	60 18.7	122	5.4	1505	60 18.7
1520	66 16.3	122	4.7	1520	66 16.3	122	4.7	1520	66 16.3
1535	72 18.7	122	5.4	1535	72 18.7	122	5.4	1535	72 18.7
1550	78 16.3	122	4.7	1550	78 16.3	122	4.7	1550	78 16.3
1565	84 18.7	122	5.4	1565	84 18.7	122	5.4	1565	84 18.7
1580	90 16.3	122	4.7	1580	90 16.3	122	4.7	1580	90 16.3
1595	96 18.7	122	5.4	1595	96 18.7	122	5.4	1595	96 18.7
1610	102 16.3	122	4.7	1610	102 16.3	122	4.7	1610	102 16.3
1625	108 18.7	122	5.4	1625	108 18.7	122	5.4	1625	108 18.7
1640	114 16.3	122	4.7	1640	114 16.3	122	4.7	1640	114 16.3
1655	120 18.7	122	5.4	1655	120 18.7	122	5.4	1655	120 18.7
1670	126 16.3	122	4.7	1670	126 16.3	122	4.7	1670	126 16.3
1685	132 18.7	122	5.4	1685	132 18.7	122	5.4	1685	132 18.7
1700	138 16.3	122	4.7	1700	138 16.3	122	4.7	1700	138 16.3
1715	144 18.7	122	5.4	1715	144 18.7	122	5.4	1715	144 18.7
1730	150 16.3	122	4.7	1730	150 16.3	122	4.7	1730	150 16.3
1745	156 18.7	122	5.4	1745	156 18.7	122	5.4	1745	156 18.7
1760	162 16.3	122	4.7	1760	162 16.3	122	4.7	1760	162 16.3
1775	168 18.7	122	5.4	1775	168 18.7	122	5.4	1775	168 18.7
1790	174 16.3	122	4.7	1790	174 16.3	122	4.7	1790	174 16.3
1805	180 18.7	122	5.4	1805	180 18.7	122	5.4	1805	180 18.7
1820	186 16.3	122	4.7	1820	186 16.3	122	4.7	1820	186 16.3
1835	192 18.7	122	5.4	1835	192 18.7	122	5.4	1835	192 18.7
1850	198 16.3	122	4.7	1850	198 16.3	122	4.7	1850	198 16.3
1865	204 18.7	122	5.4	1865	204 18.7	122	5.4	1865	204 18.7
1880	210 16.3	122	4.7	1880	210 16.3	122	4.7	1880	210 16.3
1895	216 18.7	122	5.4	1895	216 18.7	122	5.4	1895	216 18.7
1910	222 16.3	122	4.7	1910	222 16.3	122	4.7	1910	222 16.3
1925	228 18.7	122	5.4	1925	228 18.7	122	5.4	1925	228 18.7
1940	234 16.3	122	4.7	1940	234 16.3	122	4.7	1940	234 16.3
1955	240 18.7	122	5.4	1955	240 18.7	122	5.4	1955	240 18.7
1970	246 16.3	122	4.7	1970	246 16.3	122	4.7	1970	246 16.3
1985	252 18.7	122	5.4	1985	252 18.7	122	5.4	1985	252 18.7
2000	258 16.3	122	4.7	2000	258 16.3	122	4.7	2000	258 16.3
2015	264 18.7	122	5.4	2015	264 18.7	122	5.4	2015	264 18.7
2030	270 16.3	122	4.7	2030	270 16.3	122	4.7	2030	270 16.3
2045	276 18.7	122	5.4	2045	276 18.7	122	5.4	2045	276 18.7
2060	282 16.3	122	4.7	2060	282 16.3	122	4.7	2060	282 16.3
2075	288 18.7	122	5.4	2075	288 18.7	122	5.4	2075	288 18.7
2090	294 16.3	122	4.7	2090	294 16.3	122	4.7	2090	294 16.3
2105	300 18.7	122	5.4	2105	300 18.7	122	5.4	2105	300 18.7
2120	306 16.3	122	4.7	2120	306 16.3	122	4.7	2120	306 16.3
2135	312 18.7	122	5.4	2135	312 18.7	122	5.4	2135	312 18.7
2150	318 16.3	122	4.7	2150	318 16.3	122	4.7	2150	318 16.3
2165	324 18.7	122	5.4	2165	324 18.7	122	5.4	2165	324 18.7
2180	330 16.3	122	4.7	2180	330 16.3	122	4.7	2180	330 16.3
2195	336 18.7	122	5.4	2195	336 18.7	122	5.4	2195	336 18.7
2210	342 16.3	122	4.7	2210	342 16.3	122	4.7	2210	342 16.3
2225	348 18.7	122	5.4	2225	348 18.7	122	5.4	2225	348 18.7
2240	354 16.3	122	4.7	2240	354 16.3	122	4.7	2240	354 16.3
2255	360 18.7	122	5.4	2255	360 18.7	122	5.4	2255	360 18.7
2270	366 16.3	122	4.7	2270	366 16.3	122	4.7	2270	366 16.3
2285	372 18.7	122	5.4	2285	372 18.7	122	5.4	2285	372 18.7
2300	378 16.3	122	4.7	2300	378 16.3	122	4.7	2300	378 16.3
2315	384 18.7	122	5.4	2315	384 18.7	122	5.4	2315	384 18.7
2330	390 16.3	122	4.7	2330	390 16.3	122	4.7	2330	390 16.3
2345	396 18.7	122	5.4	2345	396 18.7	122	5.4	2345	396 18.7
2360	402 16.3	122	4.7	2360	402 16.3	122	4.7	2360	402 16.3
2375	408 18.7	122	5.4	2375	408 18.7	122	5.4	2375	408 18.7
2390	414 16.3	122	4.7	2390	414 16.3	122	4.7	2390	414 16.3
2405	420 18.7	122	5.4	2405	420 18.7	122	5.4	2405	420 18.7
2420	426 16.3	122	4.7	2420	426 16.3	122	4.7	2420	426 16.3
2435	432 18.7	122	5.4	2435	432 18.7	122	5.4	2435	432 18.7
2450	438 16.3	122	4.7	2450	438 16.3	122	4.7	2450	438 16.3
2465	444 18.7	122	5.4	2465	444 18.7	122	5.4	2465	444 18.7
2480	450 16.3	122	4.7	2480	450 16.3	122	4.7	2480	450 16.3
2495	456 18.7	122	5.4	2495	456 18.7	122	5.4	2495	456 18.7
2510	462 16.3	122	4.7	2510	462 16.3	122	4.7	2510	462 16.3
2525	468 18.7	122	5.4	2525	468 18.7	122	5.4	2525	468 18.7
2540	474 16.3	122	4.7	2540	474 16.3	122	4.7	2540	474 16.3
2555	480 18.7	122	5.4	2555	480 18.7	122	5.4	2555	480 18.7
2570	486 16.3	122	4.7	2570	486 16.3	122	4.7	2570	486 16.3
2585	492 18.7	122	5.4	2585	492 18.7	122	5.4	2585	492 18.7
2600	498 16.3	122	4.7	2600	498 16.3	122	4.7	2600	498 16.3
2615	504 18.7	122	5.4	2615	504 18.7	122	5.4	2615	504 18.7
2630	510 16.3	122	4.7	2630	510 16.3	122	4.7	2630	510 16.3
2645	516 18.7	122	5.4	2645	516 18.7	122	5.4	2645	516 18.7
2660	522 16.3	122	4.7	2660	522 16.3	122	4.7	2660	522 16.3
2675	528 18.7	122	5.4	2675	528 18.7	122	5.4	2675	528 18.7
2690	534 16.3	122	4.7	2690	534 16.3	122	4.7	2690	534 16.3
2705	540 18.7	122	5.4	2705	540 18.7	122	5.4	2705	540 18.7
2720	546 16.3	122	4.7	2720	546 16.3	122	4.7	2720	546 16.3
2735	552 18.7	122	5.4	2735	552 18.7	122	5.4	2735	552 18.7
2750	558 16.3	122	4.7	2750	558 16.3	122	4.7	2750	558 16.3
2765	564 18.7	122	5.4	2765	564 18.7	122	5.4	2765	564 18.7
2780	570 16.3	122	4.7	2780	570 16.3	122	4.7	2780	570 16.3
2795	576 18.7	122	5.4	2795	576 18.7	122	5.4	2795	576 18.7
2810	582 16.3	122	4.7	2810	582 16.3	122	4.7	2810	582 16.3
2825	588 18.7	122	5.4	2825	588 18.7	122	5.4	2825	588 18.7
2840	594 16.3	122	4.7	2840	594 16.3	122	4.7	2840	594 16.3
2855	600 18.7	122	5.4	2855	600 18.7	122	5.4	2855	600 18.7
2870	606 16.3	122	4.7	2870	606 16.3	122	4.7	2870	606 16.3
2885	612 18.7	122	5.4	2885	612 18.7	122	5.4	2885	612 18.7
2900	618 16.3	122	4.7	2900	618 16.3	122	4.7	2900	618 16.3
2915	624 18.7	122	5.4	2915	624 18.7	122	5.4	2915	624 18.7
2930	630 16.3	122	4.7	2930	630 16.3	122	4.7	2930	630 16.3
2945	636 18.7	122	5.4	2945	636 18.7	122	5.4	2945	636 18.7
2960	642 16.3	122	4.7	2960	642 16.3	122	4.7	2960	642 16.3
2975	648 18.7	122	5.4	2975	648 18.7	122	5.4	2975	648 18.7
2990	654 16.3	122	4.7	2990	654 16.3	122	4.7	2990	654 16.3
3005	660 18.7	122	5.4	3005	660 18.7	122	5.4	3005	660 18.7
3020	666 16.3	122	4.7	3020	666 16.3	122	4.7	3020	666 16.3
3035	672 18.7	122	5.4	3035	672 18.7	122	5.4	3035	672 18.7
3050	678 16.3	122	4.7	3050	678 16.3	122	4.7	3050	678 16.3
3065	684 18.7	122	5.4	3065	684 18.7	122	5.4	3065	684 18.7
3080	690 16.3	122	4.7	3080	690 16.3	122	4.7	3080	690 16.3
3095	696 18.7	122	5.4	3095	696 18.7	122	5.4	3095	696 18.7
3110	702 16.3	122	4.7	3110	702 16.3	122	4.7	3110	702 16.3
3125	708 18.7	122	5.4	3125	708 18.7	122	5.4	3125	708 18.7
3140	714 16.3	122	4.7	3140	714 16.3	122	4.7	3140	714 16.3
3155	720 18.7	122	5.4	3155	720 18.7	122	5.4	3155	720 18.7
3170	726 16.3	1							

STATION	LATITUDE N	LONGITUDE W	29 NOVEMBER 1979		CHEMICAL MICROSCALE (COLTISE XI)			CHL A MG/M3	TEMP C
			DISTANCE KM	TIME H:M	PC4 UM	NUTR. RATIO N:P3/PC4	ATC NG/L		
1840	36 13.8	122 3.8	285.5	1:05					12.0
			285.1	6.51					12.0
			285.1	5.23					12.0
			285.1	4.89					12.0
			285.1	4.78					12.0
1843	36 13.5	122 4.4	292.5	1:12					12.0
			292.5	1.12					12.0
			292.5	1.52					12.0
			292.5	2.55					12.0
			292.5						12.0
1847	36 14.1	122 5.5	297.8						77.0
			297.8						77.0
			297.8						77.0
			297.8						77.0
			297.8						77.0
1855	36 14.6	122 4.1	300.9						120.0
			300.9						120.0
			300.9						120.0
			300.9						120.0
			300.9						120.0
1912	36 12.7	122 2.8	301.1						125.0
			301.1						125.0
			301.1						125.0
			301.1						125.0
			301.1						125.0
1923	36 11.6	122 4.7	304.4						125.0
			304.4						125.0
			304.4						125.0
			304.4						125.0
			304.4						125.0
1943	36 13.6	122 7.3	307.5						114.0
			307.5						114.0
			307.5						114.0
			307.5						114.0
			307.5						114.0
			311.1						128.0
			311.1						128.0
			311.1						128.0
			311.1						128.0
			311.1						128.0
			312.5						65.0
			312.5						65.0
			312.5						65.0
			312.5						65.0
			312.5						65.0
			314.9						75.0
			314.9						75.0
			314.9						75.0
			314.9						75.0
			314.9						75.0

11

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1

100

[illegible]

R/V ACANIA			10 JUNE 1980			CHEMICAL MESOSCALE (CRUISE XID		
TIME GMT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE KM	WIND SPEED m/s	P-4	NO3/P04	ATP L/G/L	ΔATP/ATP
0300	36 15.0	122 11.7	9.6	4.00	1.15	3.3	285.0	0.34
			1.2	3.95	1.15	3.3		
			1.9	4.10	1.35	3.3		
			2.5	4.24	1.35	3.3		
			3.1	4.46	1.36	3.5	48.0	0.09
			3.7	4.73	1.38	3.5		
			4.2	4.33	1.38	3.5		
			4.8	5.07	1.40	3.6		
			5.4	4.73				
			6.0	5.35	1.51	3.9		
			6.6	5.90	1.53	3.9	328.0	0.16
			7.1	5.95	1.57	4.0		
			7.7	6.05	1.57	4.1		
			8.3	6.23	1.50	4.2		
			8.9	6.53	1.48	4.4	241.0	0.24
0330	36 13.6	122 9.5	9.5	6.97	1.50	4.6		
			10.1	7.27	1.55	4.7		
			10.6	7.51	1.56	4.8		
			11.2	8.33	1.57	5.1		
			11.8	8.73	1.60	5.3	258.0	0.25
			12.3	8.43	1.63	5.4		
			12.8	8.73	1.63	5.4		
			13.3	9.89	1.65	5.6		
			13.9	10.73	1.70	5.8		
			14.4	11.00	1.77	6.1	168.0	0.17
			14.9	11.31	1.78	6.2		
			15.4	11.81	1.80	6.3		
			15.9	12.39	1.84	6.7		
			16.5	13.42	1.85	6.9	380.0	0.22
			17.0	13.49	1.90	7.0		
0400	36 9.7	122 7.4	17.5	13.17	1.93	6.7		
			18.0	13.51	1.96	6.3		
			18.5	13.51	1.96	6.3		
			19.0	13.24	1.97	6.6		
			19.6	13.05	1.97	6.6	1164.0	0.19
			20.2	12.88	1.71	5.3		
			20.8	12.71	1.72	5.3		
			21.5	12.5				
			22.1	12.3			1549.0	0.16
			22.7	12.0	1.57	5.1		
			23.3	11.8	1.59	5.1		
			24.0	11.6	1.62	5.2		
			24.6	11.4	1.64	5.3		
			25.2	11.2	1.65	5.3	931.0	0.33
			25.9	11.0				
			26.5	10.8	1.69	5.5		
			27.1	10.6	1.75	5.8		
			27.8	10.4				
			28.4	10.1				
			29.0	9.8				

CHL A
MG/MS

0.49
0.43
0.42
0.57
0.71
0.72
0.73
0.78
0.73
0.73
0.73
0.98
1.07
1.19
1.20
1.20
0.75
0.77
0.82
1.03
1.24
1.64
2.16
2.40
2.52
2.47
2.45
2.68
2.63
3.10
3.10
3.04
2.71
2.63
2.63
1.83
1.81
2.13

CHEMICAL MESUSCALE (CHUISE XII)

CHEMICAL MESUSCALE (CRUISE XII)

10 JUNE 1980

47° ACANIA

TIME GMT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE KM	W33 J4	PD4 J4	NUTR. RATIO NO3/PO4	ATP NO/L	$\frac{\Delta ATP}{ATP}$	CHL A $\mu g/L$	TEMP C
0612	35 51.9	121 54.0	51.2	0.29	0.95	0.3	86.0	0.06	0.52	13.33
			51.4	0.33	0.97	0.5			0.52	13.77
			51.6	0.33	0.97	0.5			0.51	13.55
			51.7	0.33	0.97	0.5			0.51	13.53
			51.8	0.33	0.97	0.5			0.51	13.52
			51.9	0.33	0.97	0.5			0.51	13.52
			52.0	0.33	0.97	0.5			0.51	13.52
			52.1	0.33	0.97	0.5			0.51	13.52
			52.2	0.33	0.97	0.5			0.51	13.52
			52.3	0.33	0.97	0.5			0.51	13.52
			52.4	0.33	0.97	0.5			0.51	13.52
			52.5	0.33	0.97	0.5			0.51	13.52
			52.6	0.33	0.97	0.5			0.51	13.52
			52.7	0.33	0.97	0.5			0.51	13.52
			52.8	0.33	0.97	0.5			0.51	13.52
0700	35 53.0	121 56.5	53.0	0.29	0.95	0.3	183.0	0.23	0.52	13.33
			53.1	0.33	0.97	0.5			0.52	13.77
			53.2	0.33	0.97	0.5			0.51	13.55
			53.3	0.33	0.97	0.5			0.51	13.53
			53.4	0.33	0.97	0.5			0.51	13.52
			53.5	0.33	0.97	0.5			0.51	13.52
			53.6	0.33	0.97	0.5			0.51	13.52
			53.7	0.33	0.97	0.5			0.51	13.52
			53.8	0.33	0.97	0.5			0.51	13.52
			53.9	0.33	0.97	0.5			0.51	13.52
			54.0	0.33	0.97	0.5			0.51	13.52
			54.1	0.33	0.97	0.5			0.51	13.52
			54.2	0.33	0.97	0.5			0.51	13.52
			54.3	0.33	0.97	0.5			0.51	13.52
			54.4	0.33	0.97	0.5			0.51	13.52
0734	35 53.9	121 57.5	57.5	0.29	0.95	0.3	226.0	0.23	0.52	13.33
			57.6	0.33	0.97	0.5			0.52	13.77
			57.7	0.33	0.97	0.5			0.51	13.55
			57.8	0.33	0.97	0.5			0.51	13.53
			57.9	0.33	0.97	0.5			0.51	13.52
			58.0	0.33	0.97	0.5			0.51	13.52
			58.1	0.33	0.97	0.5			0.51	13.52
			58.2	0.33	0.97	0.5			0.51	13.52
			58.3	0.33	0.97	0.5			0.51	13.52
			58.4	0.33	0.97	0.5			0.51	13.52
			58.5	0.33	0.97	0.5			0.51	13.52
			58.6	0.33	0.97	0.5			0.51	13.52
			58.7	0.33	0.97	0.5			0.51	13.52
			58.8	0.33	0.97	0.5			0.51	13.52
			58.9	0.33	0.97	0.5			0.51	13.52

CHEMICAL MESOSCALE (CRUISE XII)										
TIME LAT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE KM	PS4 %	NUTR. RATIO NO3/PO4	ATP NG/L	Δ ATP ATP	CHL A MG/M3	TEMP C	TEMP F
0800	35 54.7	121 54.3	69.4	1.12	2.1	152.0	0.30	0.45	13.1	55.6
			69.6	1.14	2.1			0.45	13.1	
			69.7	1.10	2.1			0.45	13.1	
			69.9	1.10	2.1			0.45	13.1	
			70.1	1.11	2.1			0.44	13.1	
			70.3	1.14	2.1			0.44	13.1	
			70.5	1.13	2.1			0.43	13.1	
			70.7	1.12	2.1			0.42	13.1	
			70.9	1.12	2.1			0.42	13.1	
			71.0	1.08	2.2			0.41	13.1	
			71.1	1.09	2.2			0.41	13.1	
			71.4	1.10	2.2			0.44	13.1	
0830	35 55.6	121 59.1	71.6	1.11	2.2	126.0	0.30	0.43	13.1	55.6
			71.7	1.11	2.2			0.42	13.1	
			71.8	1.11	2.2			0.41	13.1	
			72.0	1.13	2.3			0.41	13.1	
			72.1	1.11	2.2			0.40	13.1	
			72.2	1.10	2.2			0.40	13.1	
			72.5	1.10	2.2			0.39	13.1	
			72.6	1.11	2.2			0.38	13.1	
			72.9	1.08	2.0			0.37	13.1	
			73.0	1.09	2.1			0.36	13.1	
			73.2	1.10	2.1			0.36	13.1	
			73.3	1.12	2.1			0.34	13.1	
0900	35 56.4	122 0.0	73.5	1.11	2.1	121.0	0.19	0.34	13.1	55.6
			73.6	1.12	2.1			0.34	13.1	
			73.7	1.12	2.1			0.34	13.1	
			73.9	1.13	2.1			0.34	13.1	
			74.0	1.13	2.1			0.34	13.1	
			74.1	1.13	2.1			0.34	13.1	
			74.3	1.13	2.1			0.34	13.1	
			74.5	1.13	2.1			0.34	13.1	
			74.7	1.16	2.3			0.34	13.1	
			74.8	1.15	2.3			0.34	13.1	
			75.1	1.16	2.3			0.36	13.1	
			75.2	1.18	2.3			0.41	13.1	
			75.5	1.18	2.3	155.0	0.16	0.42	12.4	54.3
			75.8	1.18	2.3			0.42	12.4	
			75.9	1.18	2.3			0.43	12.4	
			76.0	1.18	2.3			0.43	12.4	

R/V ALANIA										10 JUNE 1980		CHEMICAL MEASURESCALE (CRUISE XII)				
TIME GMT	LATITUDE N, LONG W	DISTANCE KM	QJ3 UM	PJ4 UG	NUTR. RATIO NO3/PO4	ATP NG/L	$\frac{\Delta ATP}{ATP}$	CHL A $\mu g/L$	TEMP C							
0936	35 57.4	122 1.1	76.2	1.37				0.47	12.32							
			76.3	1.35				0.44	12.31							
			76.4	1.35				0.45	12.19							
			76.6	1.35				0.49	12.79							
			76.7	1.35				0.50	12.78							
			76.8	1.35				0.50	12.69							
			76.9	1.35				0.51	12.72							
			77.1	1.35				0.51	12.73							
			77.2	1.35				0.52	12.73							
			77.3	1.35				0.52	12.75							
1000	35 57.9	122 1.9	77.4	1.37				0.53	12.71							
			77.6	1.37				0.54	12.70							
			77.7	1.37				0.54	12.53							
			77.8	1.37				0.55	12.65							
			77.9	1.37			2.5	0.55	12.53							
			78.0	1.37			2.8	0.61	12.53							
			78.1	1.35			3.0	0.61	12.53							
			78.2	1.35			3.1	0.62	12.31							
			78.3	1.35			3.1	0.63	12.31							
			78.4	1.37			3.4	0.69	12.31							
1030	35 58.6	122 2.8	78.5	1.39				0.70	12.52							
			78.6	1.39				0.70	12.33							
			78.7	1.39				0.71	12.32							
			78.8	1.39				0.71	12.32							
			78.9	1.40				0.73	12.33							
			79.0	1.41				0.73	12.33							
			79.1	1.43				0.74	12.34							
			79.2	1.43				0.75	12.32							
			79.3	1.46				0.76	12.21							
			79.4	1.46				0.77	12.13							
1102	35 59.4	122 4.1	79.5	1.48				0.83	11.93							
			79.6	1.53				0.84	11.93							
			79.7	1.53				0.85	11.93							
			79.8	1.58				0.85	11.93							
			79.9	1.55				0.86	11.93							
			80.0	1.57				0.87	11.93							
			80.1	1.56				0.87	11.93							
			80.2	1.55				0.87	11.93							
			80.3	1.54				0.87	11.93							
			80.4	1.54				0.87	11.93							
1102	35 59.4	122 4.1	80.5	1.54				0.87	11.93							
			80.6	1.52				0.87	11.93							
			80.7	1.52				0.87	11.93							
			80.8	1.52				0.87	11.93							
			80.9	1.52				0.87	11.93							
			81.0	1.52				0.87	11.93							
			81.1	1.54				0.87	11.93							
			81.2	1.54				0.87	11.93							
			81.3	1.54				0.87	11.93							
			81.4	1.52				0.87	11.93							
1102	35 59.4	122 4.1	81.5	1.52				0.87	11.93							
			81.6	1.52				0.87	11.93							
			81.7	1.52				0.87	11.93							
			81.8	1.52				0.87	11.93							
			81.9	1.52				0.87	11.93							
			82.0	1.52				0.87	11.93							
			82.1	1.52				0.87	11.93							
			82.2	1.52				0.87	11.93							
			82.3	1.52				0.87	11.93							
			82.4	1.52				0.87	11.93							
1102	35 59.4	122 4.1	82.5	1.52				0.87	11.93							
			82.6	1.52				0.87	11.93							
			82.7	1.52				0.87	11.93							
			82.8	1.52				0.87	11.93							
			82.9	1.52				0.87	11.93							
			83.0	1.52				0.87	11.93							
			83.1	1.52				0.87	11.93							
			83.2	1.52				0.87	11.93							
			83.3	1.52				0.87	11.93							
			83.4	1.52				0.87	11.93							

WAVES

[illegible]

[illegible]

10 JUNE 1980				CHEMICAL MESOSCALE (CRUISE XII)			
TIME	LATITUDE	LONGITUDE	DISTANCE	PO4	NUTR-RATIO	ATP	ΔATP
GMT	NORTH	WEST	km	μM	N:P:PO4	NG/L	ATP
1430	36	122 12.7	103.1	1.16	5.7		
			103.3	1.16	5.8		
			103.6	1.16	5.8		
			103.9	1.16	5.8		
			104.1	1.16	5.8		
			104.4	1.16	5.8		
			104.6	1.16	5.8		
			104.9	1.16	5.8		
			105.2	1.16	5.8		
			105.4	1.16	5.8		
			105.7	1.16	5.8		
			105.9	1.16	5.8		
			106.2	1.16	5.8		
			106.5	1.16	5.8		
			106.7	1.16	5.8		
			107.1	1.16	5.8		
			107.4	1.16	5.8		
			107.7	1.16	5.8		
			108.1	1.16	5.8		
			108.5	1.16	5.8		
			109.2	1.16	5.8		
			109.5	1.16	5.8		
			109.9	1.16	5.8		
			110.2	1.16	5.8		
			110.6	1.16	5.8		
			110.9	1.16	5.8		
			111.3	1.16	5.8		
			111.6	1.16	5.8		
			112.0	1.16	5.8		
			112.4	1.16	5.8		
			112.7	1.16	5.8		
			113.0	1.16	5.8		
			113.4	1.16	5.8		
			113.8	1.16	5.8		
			114.1	1.16	5.8		
			114.5	1.16	5.8		
			114.8	1.16	5.8		
			115.2	1.16	5.8		
			115.5	1.16	5.8		
			115.9	1.16	5.8		
			116.2	1.16	5.8		
			116.6	1.16	5.8		
			116.9	1.16	5.8		
			117.3	1.16	5.8		
			117.6	1.16	5.8		
			118.0	1.16	5.8		
			118.3	1.16	5.8		
			118.7	1.16	5.8		
			119.0	1.16	5.8		
1500	36	122 14.7	103.1	1.54	5.3	250.0	0.42
			103.3	1.54	5.4		
			103.6	1.54	5.4		
			103.9	1.54	5.4		
			104.1	1.54	5.4		
			104.4	1.54	5.4		
			104.6	1.54	5.4		
			104.9	1.54	5.4		
			105.2	1.54	5.4		
			105.4	1.54	5.4		
			105.7	1.54	5.4		
			105.9	1.54	5.4		
			106.2	1.54	5.4		
			106.5	1.54	5.4		
			106.7	1.54	5.4		
			107.1	1.54	5.4		
			107.4	1.54	5.4		
			107.7	1.54	5.4		
			108.1	1.54	5.4		
			108.5	1.54	5.4		
			109.2	1.54	5.4		
			109.5	1.54	5.4		
			109.9	1.54	5.4		
			110.2	1.54	5.4		
			110.6	1.54	5.4		
			110.9	1.54	5.4		
			111.3	1.54	5.4		
			111.6	1.54	5.4		
			112.0	1.54	5.4		
			112.4	1.54	5.4		
			112.7	1.54	5.4		
			113.0	1.54	5.4		
			113.4	1.54	5.4		
			113.8	1.54	5.4		
			114.1	1.54	5.4		
			114.5	1.54	5.4		
			114.8	1.54	5.4		
			115.2	1.54	5.4		
			115.5	1.54	5.4		
			115.9	1.54	5.4		
			116.2	1.54	5.4		
			116.6	1.54	5.4		
			116.9	1.54	5.4		
			117.3	1.54	5.4		
			117.6	1.54	5.4		
			118.0	1.54	5.4		
			118.3	1.54	5.4		
			118.7	1.54	5.4		
			119.0	1.54	5.4		
			103.1	1.54	5.4	91.0	0.41
			103.3	1.54	5.4		
			103.6	1.54	5.4		
			103.9	1.54	5.4		
			104.1	1.54	5.4		
			104.4	1.54	5.4		
			104.6	1.54	5.4		
			104.9	1.54	5.4		
			105.2	1.54	5.4		
			105.4	1.54	5.4		
			105.7	1.54	5.4		
			105.9	1.54	5.4		
			106.2	1.54	5.4		
			106.5	1.54	5.4		
			106.7	1.54	5.4		
			107.1	1.54	5.4		
			107.4	1.54	5.4		
			107.7	1.54	5.4		
			108.1	1.54	5.4		
			108.5	1.54	5.4		
			109.2	1.54	5.4		
			109.5	1.54	5.4		
			109.9	1.54	5.4		
			110.2	1.54	5.4		
			110.6	1.54	5.4		
			110.9	1.54	5.4		
			111.3	1.54	5.4		
			111.6	1.54	5.4		
			112.0	1.54	5.4		
			112.4	1.54	5.4		
			112.7	1.54	5.4		
			113.0	1.54	5.4		
			113.4	1.54	5.4		
			113.8	1.54	5.4		
			114.1	1.54	5.4		
			114.5	1.54	5.4		
			114.8	1.54	5.4		
			115.2	1.54	5.4		
			115.5	1.54	5.4		
			115.9	1.54	5.4		
			116.2	1.54	5.4		
			116.6	1.54	5.4		
			116.9	1.54	5.4		
			117.3	1.54	5.4		
			117.6	1.54	5.4		
			118.0	1.54	5.4		
			118.3	1.54	5.4		
			118.7	1.54	5.4		
			119.0	1.54	5.4		
			103.1	1.54	5.4	232.0	0.37
			103.3	1.54	5.4		
			103.6	1.54	5.4		
			103.9	1.54	5.4		
			104.1	1.54	5.4		
			104.4	1.54	5.4		
			104.6	1.54	5.4		
			104.9	1.54	5.4		
			105.2	1.54	5.4		
			105.4	1.54	5.4		
			105.7	1.54	5.4		
			105.9	1.54	5.4		
			106.2	1.54	5.4		
			106.5	1.54	5.4		
			106.7	1.54	5.4		
			107.1	1.54	5.4		
			107.4	1.54	5.4		
			107.7	1.54	5.4		
			108.1	1.54	5.4		
			108.5	1.54	5.4		
			109.2	1.54	5.4		
			109.5	1.54	5.4		
			109.9	1.54	5.4		
			110.2	1.54	5.4		
			110.6	1.54	5.4		
			110.9	1.54	5.4		
			111.3	1.54	5.4		
			111.6	1.54	5.4		
			112.0	1.54	5.4		
			112.4	1.54	5.4		
			112.7	1.54	5.4		
			113.0	1.54	5.4		
			113.4	1.54	5.4		
			113.8	1.54	5.4		
			114.1	1.54	5.4		
			114.5	1.54	5.4		
			114.8	1.54	5.4		
			115.2	1.54	5.4		
			115.5	1.54	5.4		
			115.9	1.54	5.4		
			116.2	1.54	5.4		
			116.6	1.54	5.4		
			116.9	1.54	5.4		
			117.3	1.54	5.4		
			117.6	1.54	5.4		
			118.0	1.54	5.4		
			118.3	1.54	5.4		
			118.7	1.54	5.4		
			119.0	1.54	5.4		
			103.1	1.54	5.4	223.0	0.63
			103.3	1.54	5.4		
			103.6	1.54	5.4		
			103.9	1.54	5.4		
			104.1	1.54	5.4		
			104.4	1.54	5.4		
			104.6	1.54	5.4		
			104.9	1.54	5.4		
			105.2	1.54	5.4		
			105.4	1.54	5.4		
			105.7	1.54	5.4		
			105.9	1.54	5.4		
			106.2	1.54	5.4		
			106.5	1.54	5.4		
			106.7	1.54	5.4		
			107.1	1.54	5.4		
			107.4	1.54	5.4		
			107.7	1.54	5.4		
			108.1	1.54	5.4		
			108.5	1.54	5.4		
			109.2	1.54	5.4		
			109.5	1.54	5.4		
			109.9	1.54	5.4		
			110.2	1.54	5.4		
			110.6	1.54	5.4		
			110.9	1.54	5.4		
			111.3	1.54	5.4		
			111.6	1.54	5.4		
			112.0	1.54	5.4		
			112.4	1.54	5.4		
			112.7	1.54	5.4		
			1				

S/V ALACANIA			10 JUNE 1980			CHEMICAL MESOSCALE (CRUISE XII)			
TIME GMT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE KM	NJ3 U4	PO4 JM	NUTR. RATIO NO3/PO4	ATP NG/L	4ATP ATP	CHL A MG/100
1612	36 7.3	122 6.6	117.4	8.35	1.61	5.2			
			119.3	8.46	1.59	5.3			
			120.3	8.00	1.59	5.0	547.0	0.42	
			121.3						
			121.7						
			121.2						
			122.7						
			123.1						
			123.6						
			124.0						
1630	36 6.9	122 3.9	124.4						
			124.9	8.05	1.57	5.1			
			125.2	3.81	1.65	5.3			
			125.6	3.66					
			126.0	8.30			250.0	0.37	
			126.4	9.12					
			126.8	9.17					
			127.2	9.47					
			127.6	9.69					
			128.0	10.08					
1700	36 6.6	121 50.9	128.4	10.13					
			128.8	10.18					
			129.2	9.34					
			129.6	10.23					
			130.0	10.18			313.0	0.22	
			130.4	10.49					
			130.8	10.54					
			131.2						
			131.6	10.75					
			132.0	11.10					
1730	36 6.2	121 55.4	132.4	11.25					
			132.8	11.25					
			133.2	11.74			280.0	0.35	
			133.6	11.45					
			134.0	11.35					
			134.4	11.00					
			134.8						
			135.2	9.78					
			135.6	9.73					
			136.0	10.59					
1730	36 6.2	121 55.4	136.4	11.15					
			136.8	10.90			279.0	0.31	
			137.2	8.71					
			137.6	10.90					
			138.0						
			138.4	10.74					
			138.8	10.95					
			139.2	11.21					
			139.6	11.71			338.0	0.28	
			140.0						
1730	36 6.2	121 55.4	140.4	11.71					
			140.8						
			141.2						
			141.6						
			142.0						
			142.4						
			142.8						
			143.2						
			143.6						
			144.0						

S/V AGASSIA			10 JUNE 1980			CHEMICAL MESOSCALE (CRUISE XII)					
TIME GMT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE KM	NJ3 JA	PO4 UA	NUTR. RATIO NJ3/PO4	ATP NG/L	Δ ATP ATP	CHL A MG/M3	TEMP C	
1802	36 5.4	121 50.7	141.5	11.15						1.17	13.30
			141.9		1.77	7.1			1.21	13.30	
			142.3		1.81	7.4			1.26	13.30	
			143.3		1.83	7.4			1.36	13.30	
			143.8		1.89	7.3	291.0	0.34	1.40	13.30	
			144.2		1.96	7.5			1.52	13.30	
			145.2						1.55	13.30	
			145.6		2.22	7.4			1.58	13.30	
			146.1		2.10	8.2	184.0	0.34	1.61	13.30	
			146.5		2.16	8.2			1.62	13.30	
1828	36 4.9	121 46.5	147.0		1.97	7.9			1.63	13.30	
			147.4		1.97	7.9			1.63	13.30	
			147.9		2.11	7.9	239.0	0.30	1.69	13.30	
			148.4		2.10				1.70	13.30	
			149.3		2.08	7.7			1.73	13.30	
			149.7		2.11	7.5			1.77	13.30	
			150.1		2.13	7.5	146.0	0.33	1.86	13.30	
			150.4		2.01	7.7			1.86	13.30	
			150.7		2.02	7.6			1.86	13.30	
			151.0						1.84	13.30	
1838	36 4.8	121 45.6	151.3		2.10	7.6			1.83	13.30	
			151.7		2.07	7.8			1.83	13.30	
			152.0		2.05	7.8	133.0	0.42	1.83	13.30	
			152.3		2.05	7.9			1.82	13.30	
			152.6		2.02	7.9			1.81	13.30	
			152.9		2.02	7.8			1.81	13.30	
			153.3		2.02	7.8			1.81	13.30	
			153.6		2.03	7.7	205.0	0.29	1.80	13.30	
			153.9		2.07	7.7			1.82	13.30	
			154.2		2.04	7.5			1.83	13.30	
1906	36 4.5	121 48.6	154.5		2.15	7.9	199.0	0.53	1.82	13.30	
			154.9		2.16	7.8			1.82	13.30	
			155.2		2.13	7.9			1.82	13.30	
			155.5		2.18	7.9			1.82	13.30	
			155.8		2.24	8.4			1.82	13.30	
			156.2		2.24	8.4			1.82	13.30	
			156.6		2.20	8.1	285.0	0.19	1.82	13.30	
			157.0		2.27	8.1			1.82	13.30	
			157.4		2.27	8.2			1.82	13.30	
			157.8		2.23	9.3			1.82	13.30	
			158.2		2.09	7.9			1.82	13.30	
			158.6		2.03	6.9			1.82	13.30	
			158.9				351.0	0.38	1.82	13.30	
			159.3		1.92	7.1			1.82	13.30	
			159.7		1.93	7.3			1.82	13.30	
			160.1		1.89	7.0			1.82	13.30	
			160.5			6.0			1.82	13.30	
									1.82	13.30	
									1.82	13.30	
									1.82	13.30	

CHEMICAL MESUSCALE (CRUISE XII)

10 JUNE 1980

// AGAVIA

TIME GMT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE KM	WT3 UM	PG4 UM	NUTR. RATIO NO3/PO4	ATP NG/L	Δ ATP ATP	CHI A MG/W3	TEMP
1930	36 3.7	121 51.6	151.9	12.42	1.86		346.0	0.40	0.25	13.2
			161.3						0.32	13.54
			161.7						0.31	13.53
			163.1						0.26	13.52
			163.4						0.26	13.57
			163.8						0.24	13.57
			164.0						0.21	13.52
			164.4						0.20	13.52
			164.8						0.17	13.53
			165.2						0.13	13.53
			165.4						0.09	13.52
			165.9						0.09	13.51
			166.3						0.08	13.56
			166.7						0.03	13.49
			167.0						0.06	13.49
			167.4						0.06	13.35
			167.7						0.06	13.35
			168.1						0.06	13.11
			168.4						0.06	13.11
			168.8						0.06	13.12
			169.1						0.03	13.12
			169.4						0.03	13.38
			169.8						0.07	13.37
			170.1						0.07	13.33
			170.4						0.07	13.30
			170.7						0.07	13.31
			171.0						0.07	13.31
			171.3						0.07	13.31
			171.6						0.07	13.31
			171.9						0.07	13.31
			172.0						0.07	13.31
			172.4						0.07	13.31
			172.8						0.07	13.31
			173.1						0.07	13.31
			173.5						0.07	13.31
			173.9						0.07	13.31
			174.3						0.07	13.31
			174.7						0.07	13.31
			175.0						0.07	13.31
			175.4						0.07	13.31
			175.8						0.07	13.31
			176.2						0.07	13.31
			176.5						0.07	13.31
			176.9						0.07	13.31
			177.3						0.07	13.31
			177.7						0.07	13.31
			178.1						0.07	13.31
			178.5						0.07	13.31
			178.9						0.07	13.31
			179.3						0.07	13.31
			179.7						0.07	13.31
			180.1						0.07	13.31
			180.5						0.07	13.31
			180.9						0.07	13.31
			181.3						0.07	13.31
			181.7						0.07	13.31
			182.1						0.07	13.31
			182.5						0.07	13.31
			182.9						0.07	13.31
			183.3						0.07	13.31
			183.7						0.07	13.31
			184.1						0.07	13.31
			184.5						0.07	13.31
			184.9						0.07	13.31
			185.3						0.07	13.31
			185.7						0.07	13.31
			186.1						0.07	13.31
			186.5						0.07	13.31
			186.9						0.07	13.31
			187.3						0.07	13.31
			187.7						0.07	13.31
			188.1						0.07	13.31
			188.5						0.07	13.31
			188.9						0.07	13.31
			189.3						0.07	13.31
			189.7						0.07	13.31
			190.1						0.07	13.31
			190.5						0.07	13.31
			190.9						0.07	13.31
			191.3						0.07	13.31
			191.7						0.07	13.31
			192.1						0.07	13.31
			192.5						0.07	13.31
			192.9						0.07	13.31
			193.3						0.07	13.31
			193.7						0.07	13.31
			194.1						0.07	13.31
			194.5						0.07	13.31
			194.9						0.07	13.31
			195.3						0.07	13.31
			195.7						0.07	13.31
			196.1						0.07	13.31
			196.5						0.07	13.31
			196.9						0.07	13.31
			197.3						0.07	13.31
			197.7						0.07	13.31
			198.1						0.07	13.31
			198.5						0.07	13.31
			198.9						0.07	13.31
			199.3						0.07	13.31
			199.7						0.07	13.31
			200.1						0.07	13.31
			200.5						0.07	13.31
			200.9						0.07	13.31
			201.3						0.07	13.31
			201.7						0.07	13.31
			202.1						0.07	13.31
			202.5						0.07	13.31
			202.9						0.07	13.31
			203.3						0.07	13.31
			203.7						0.07	13.31
			204.1						0.07	13.31
			204.5						0.07	13.31
			204.9						0.07	13.31
			205.3						0.07	13.31
			205.7						0.07	13.31
			206.1						0.07	13.31
			206.5						0.07	13.31
			206.9						0.07	13.31
			207.3						0.07	13.31
			207.7						0.07	13.31
			208.1						0.07	13.31
			208.5						0.07	13.31
			208.9						0.07	13.31
			209.3						0.07	13.31
			209.7						0.07	13.31
			210.1						0.07	13.31
			210.5						0.07	13.31
			210.9						0.07	13.31
			211.3						0.07	13.31
			211.7						0.07	13.31
			212.1						0.07	13.31
			212.5						0.07	13.31
			212.9						0.07	13.31
			213.3						0.07	13.31
			213.7						0.07	13.31
			214.1						0.07	13.31
			214.5						0.07	13.31
			214.9						0.07	13.31
			215.3						0.07	13.31
			215.7						0.07	13.31
			216.1						0.07	13.31
			216.5						0.07	13.31
			216.9						0.07	13.31
			217.3						0.07	13.31
			217.7						0.07	13.31
			218.1						0.07	13.31
			218.5						0.07	13.31
			218.9						0.07	13.31
			219.3						0.07	13.31
			219.7						0.07	13.31
			220.1						0.07	13.31
			220.5						0.07	13.31
			220.9						0.07	13.31
			221.3						0.07	13.31
			221.7						0.07	13.31
			222.1						0.07	13.31
			222.5						0.07	13.31
			222.9						0.07	13.31
			223.3						0.07	13.31
			223.7						0.07	13.31
			224.1						0.07	13.31
			224.5						0.07	13.31
			224.9						0.07	13.31
			225.3						0.07	13.31
			225.7						0.07	13.31
			226.1						0.07	13.31
			226.5						0.07	13.31
			226.9						0.07	13.31
			227.3						0.07	13.31
			227.7						0.07	13.31
			228.1						0.07	13.31
			228.5						0.07	13.31
			228.9						0.07	13.31
			229.3						0.07	13.31
			229.7						0.07	13.31
			230.1						0.07	13.31
			230.5						0.07	13.31
			230.9						0.07	13.31
			231.3						0.07	13.31

CHEMICAL MESUSCALE (CRUISE XII)

10 JUNE 1980

R/V ACANIA

TIME GMT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE SM	NJJ J4	PD4	NUUR.RATIO NU3/PD4	ATP MG/L	AATP ATP 0.33	CHI 4 10/100	
			179.4	11.11	1.59	5.6	157.0		1.02	11.32
			179.3	11.41	1.72	5.6			1.02	11.32
			180.2	11.71	1.74	5.6			1.02	11.32
			180.6	12.10	1.75	6.3			0.54	11.33
			181.0	12.35	1.80	6.3			0.53	11.33
			181.3	12.50	1.82	7.0			0.53	11.33
			181.5	12.62	1.82	7.0			0.53	11.33
2120	36 7.9	121 55.4	181.8	12.75	1.82	7.0	124.0	0.34	0.54	11.34
			182.0	12.90	1.82	7.0			1.15	11.34
			182.3	12.95	1.73	6.8			1.01	11.34
2130	36 7.8	121 56.2	182.7	12.35	1.73	6.8	246.0	0.34	1.01	11.34
			183.0	12.30	1.78	6.8			1.01	11.34
			183.4	12.25	1.78	6.8			1.01	11.34
			183.3	12.10	1.78	6.3			1.01	11.34
			184.1	11.45	1.78	6.3			1.01	11.34
			184.5	11.40	1.74	6.7			1.01	11.34
			184.9	11.35	1.74	6.7	200.0	0.35	1.01	11.34
			185.2	11.20	1.74	6.7			1.01	11.34
			185.6	10.31	1.72	6.3			1.02	11.34
			186.0	10.40	1.71	6.2			1.02	11.34
			186.3	10.52	1.71	6.2	223.0	0.27	1.09	11.34
			186.7	10.32	1.69	6.1			1.09	11.34
			187.0	10.37	1.66	6.2			1.09	11.34
			187.4	10.52	1.67	6.3			1.24	11.34
2158	36 6.7	121 59.3	187.3	10.52	1.65	6.1	255.0	0.36	1.40	11.34
			187.2	10.02	1.65	6.1			2.19	11.34
			181.6	9.23	1.60	5.6			2.54	11.34
			181.0	8.68	1.54	5.6			2.78	11.34
			182.4	8.19	1.54	5.3			2.63	11.34
			183.9	7.77	1.54	5.2			2.63	11.34
			184.7	7.75	1.52	5.2	786.0	0.33	2.79	11.34
			181.1	7.89	1.52	5.2			2.72	11.34
			181.5	8.19	1.59	5.2			2.57	11.34
			181.7	8.29	1.59	5.2			2.43	11.34
			182.3	8.93	1.57	5.6			1.03	11.34
			182.7	8.93	1.57	5.6			0.55	11.34
			183.1	7.79	1.55	5.1			1.03	11.34
			183.5	7.79	1.52	5.0			0.56	11.34
			183.9	7.84	1.56	5.0			0.56	11.34
2230	36 3.2	121 59.9	184.4	7.59	1.52	5.0			0.56	11.34
			184.8	7.30	1.52	4.8			0.56	11.34
			185.3	7.15	1.50	4.8			0.56	11.34
			185.7	7.15	1.50	4.8			0.56	11.34
			186.2	7.10	1.50	4.8			0.56	11.34
			186.6	7.10	1.47	4.8			0.56	11.34
			187.1	7.20	1.47	4.8			0.56	11.34
2244	36 1.5	121 59.9	187.4	7.15	1.50	4.8	246.0	0.30	0.56	11.34
			187.7	7.15	1.48	4.8			0.56	11.34
			187.7	6.95	1.43	4.7			0.56	11.34

21478. A/10

TIME GMT	LATITUDE LATN	LONGITUDE LON E	DISTANCE NM	NO. 3 US	NO. 4 US	NO. 3 NUTR. RATIO NUTR/POB4	ATP MG/L	$\frac{\Delta \text{ATP}}{\text{ATP}}$	CHL A MG/L	TEMP C
2310	36	3.0	122	1.6	1.47	4.7	152.0	0.24	0.41	12.15
				6.30	1.48	4.7			0.42	12.15
				6.30	1.47	4.7			0.42	12.11
				6.35	1.47	4.7			0.42	12.11
				6.30	1.47	4.6			0.42	12.17
				7.00	1.47	4.6	146.0		0.42	12.17
				6.26	1.47	4.6			0.42	12.13
				6.35	1.47	4.4			0.42	
				6.35	1.44	4.4			0.42	
				6.26	1.45	4.3	113.0	0.24	0.42	
				6.21	1.43	4.3			0.42	
				6.11	1.44	4.2			0.42	
				6.16	1.45	4.2			0.42	
				6.16	1.45	4.2	117.0	0.23	0.42	
				6.11	1.45	4.2			0.42	
				6.21	1.45	4.3			0.42	
				6.30	1.45	4.3			0.42	
2330	36	4.3	122	2.5	1.55	4.9	182.0	0.16	0.43	
				7.14	1.52	4.9			0.43	
				7.44	1.50	5.0	215.0	0.31	0.46	
				7.57	1.50	5.1			1.06	
				7.34	1.51	5.2			1.06	
				7.94	1.54	5.2	295.0	0.11	1.06	
				10.57	1.52	7.0			1.06	
				9.13	1.53	7.1			1.14	
				9.13	1.56	6.0			1.14	
				9.81	1.62	6.0			1.14	
				10.12	1.64	6.2	207.0	0.33	1.21	
				10.17	1.65	6.2			1.21	
				10.37	1.69	6.1			1.21	
				10.52	1.69	6.2			1.21	
				10.41	1.72	6.3	211.0	0.34	1.21	
				11.01	1.73	6.4			1.21	
				11.35	1.74	6.5			1.21	
				11.47	1.75	6.6			1.21	
				9.53	1.65	5.9	347.0	0.47	1.42	
				9.52	1.65	5.8			2.77	
				9.67	1.65	5.9			2.54	
				10.02	1.66	6.0			2.54	
				10.17	1.69	6.0			2.54	

4/V ACANIA				11 JUNE 1980				CHEMICAL MESOSCALE (CRJISF XII)			
TIME GMT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE NM	NO3 PPM	PO4 PPM	NUTR. RATIO NO3/PO4	ATP NG/L	ΔATP ATP	CHL A MG/M3	PO2 PPM	
0030	36 3.6	122 6.0	213.0	10.52	1.79	6.2	497.0	0.36	2.10	10.17	
			213.1	10.52	1.68	6.3			1.73	11.17	
			213.4	10.52	1.68	6.3			1.73	11.16	
			214.7	10.52	1.67	6.3			1.73	11.14	
			215.0	10.52	1.67	6.3			1.73	11.12	
			215.4	10.52	1.67	6.3	421.0	0.41	2.07	11.09	
			215.8	10.52	1.67	6.3			2.20	11.06	
			216.1	10.52	1.67	6.3			2.20	11.03	
			216.5	10.52	1.67	6.3			2.20	10.99	
			216.9	10.52	1.67	6.3	528.0	0.36	2.20	10.96	
			217.3	10.52	1.67	6.3			2.20	10.93	
			217.6	10.52	1.67	6.3			2.20	10.90	
0100	36 10.9	122 8.4	218.0	10.52	1.67	6.1	560.0	0.37	2.86	10.73	
			218.4	10.52	1.67	6.1			2.93	10.73	
			218.7	10.52	1.68	6.1			2.99	10.73	
			219.1	10.52	1.69	6.1			3.06	10.72	
			219.4	10.52	1.70	6.2	183.0	0.45	3.16	10.71	
			219.8	10.52	1.75	6.4			3.23	10.69	
			220.1	10.52	1.79	6.8			3.39	10.61	
			220.5	10.52	1.82	7.0			3.47	10.52	
			220.9	10.52	1.89	7.3			3.54	10.43	
			221.3	10.53	1.92	7.6			3.64	10.37	
			221.7	10.54					3.71	10.30	
			222.1	10.54			1.80	1.5	431.0	0.37	2.01
0130	36 11.7	122 9.9	221.5	10.54	1.80	1.5			2.01	10.23	
			221.8	10.54	1.81	1.4			2.07	10.23	
			222.1	10.54	1.83	1.3			2.11	10.23	
			222.4	10.54	1.82	1.3			2.15	10.23	
			222.7	10.54	1.77	1.2			2.17	10.23	
			223.0	10.54	1.74	1.0			2.19	10.23	
			223.3	10.54	1.72	0.9			2.21	10.23	
			223.6	10.54	1.73	0.9			2.23	10.23	
			223.9	10.54	1.74	0.9			2.25	10.23	
			224.2	10.54	1.73	0.9			2.27	10.23	
			224.5	10.54	1.74	0.9			2.29	10.23	
			224.8	10.54	1.73	0.9			2.31	10.23	
0200	36 12.3	122 11.3	224.1	10.54	1.74	0.9			2.33	10.23	
			224.4	10.54	1.73	0.9			2.35	10.23	
			224.7	10.54	1.69	0.8			2.37	10.23	
			225.0	10.54	1.68	0.8			2.39	10.23	
			225.3	10.54	1.68	0.8			2.41	10.23	
			225.6	10.54	1.68	0.8			2.43	10.23	
			225.9	10.54	1.68	0.8			2.45	10.23	
			226.2	10.54	1.68	0.8			2.47	10.23	
			226.5	10.54	1.68	0.8			2.49	10.23	
			226.8	10.54	1.68	0.8			2.51	10.23	
			227.1	10.54	1.68	0.8			2.53	10.23	
			227.4	10.54	1.68	0.8			2.55	10.23	

CHEMICAL MESOSCALE (CRUISE XII)

11 JUNE 1980

R/V ACANIA

TIME GMT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE KM	SD3 JA	SD4 JA	NO3/PO4 RATIO	ATP NG/L	Δ ATP ATP 0.01	CHL A MG/L	TEMP C
0230	36 12.2	122 9.2	224.7	11.38	1.83	6.3			1.23	15.57
			225.1	9.49	1.59	6.0			1.23	15.57
			225.3	10.71	1.73	6.2			1.19	15.34
			225.5	8.33	1.62	5.5			1.15	15.23
			225.7	11.36	1.70	6.5	327.0	0.36	1.21	15.27
			226.0	11.60	1.75	6.7			1.48	15.33
			226.2	13.04	1.44	7.1			1.47	15.33
			226.4	13.39	1.86	7.4			1.47	15.33
			226.6	14.03	1.95	7.4			1.47	15.33
			226.8	14.38	1.93	7.3	332.0	0.42	1.49	15.33
			227.1	14.34	1.94	7.4			1.43	15.13
			227.5	14.78	1.94	7.1			1.74	15.13
			228.2	14.63	1.95	7.6			1.74	15.13
			228.5	14.18	1.96	7.5	455.0	0.41	1.70	15.13
			228.9	14.33	1.95	7.3			1.75	15.13
			229.2	13.79	1.91	7.1			1.75	15.13
0300	36 11.9	122 5.7	229.6	11.60	1.93	6.6			1.74	15.13
			229.8	11.12	1.79	6.5	675.0	0.33	2.42	15.13
			230.3	11.66	1.72	6.2			2.42	15.13
			230.9	11.56	1.74	6.7			2.21	15.13
			231.3						2.14	15.13
			231.6						2.14	15.13
			232.0	11.69	1.75	6.7	360.0	0.41	2.06	15.13
			232.3	11.71	1.76	6.7			2.06	15.13
			232.7	10.71	1.77	6.1			2.06	15.13
			233.1	11.80	1.77	6.7			2.06	15.13
			233.4	11.36	1.77	6.5			2.06	15.13
			233.8	12.30			654.0	0.28	2.06	15.13
			234.1	14.93	1.77	8.4			2.06	15.13
			234.5	13.39	1.76	7.9			2.06	15.13
			234.8	13.49	1.76	7.7			2.06	15.13
			235.2	15.42	1.78	8.7	564.0	0.25	1.70	15.13
0330	36 11.9	122 2.1	235.5	17.60	1.79	8.8			1.70	15.13
			235.9	18.20	1.79	10.2			1.70	15.13
			236.3		1.80				1.70	15.13
			236.6						1.70	15.13
			237.0						1.70	15.13
			237.4						1.70	15.13
			237.6						1.70	15.13
			237.9				261.0	0.28	1.70	15.13
			238.1		1.35				1.70	15.13
			238.4		1.86				1.70	15.13
			238.7		1.33		434.0	0.29	1.70	15.13
			239.0						1.70	15.13
			239.2						1.70	15.13
			239.5						1.70	15.13
			239.7						1.70	15.13
			240.0						1.70	15.13

11 JUNE 1980										
CHEMICAL MESOSCALE (CRUISE XII)										
TIME GAT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE KM	NJ3 J4	PO4 J4	NUFR-RATIO NUF3/PO4	ATP NG/L 183.0	ΔATP ATP 0.23	CHL A 46/NG	TEMP DEG C
0400	36 11.7	121 59.5	241.3	13.59	2.29	8.1			1.07	17.7
			241.5	13.04	2.27	8.4			1.04	17.7
			241.8	13.24	2.28	8.3			0.98	17.7
			241.1	13.29	2.28	8.5			0.85	17.7
			241.3	13.24	2.28	8.5			0.85	17.7
			241.7	13.24	2.28	8.5			0.85	17.7
			241.9	13.24	2.28	8.5			0.85	17.7
			242.0	13.24	2.28	8.5			0.85	17.7
			242.6	13.24	2.28	8.5			0.85	17.7
			242.7	13.24	2.28	8.5			0.85	17.7
0430	36 10.3	121 58.1	243.0	13.24	2.29	8.5			0.85	17.7
			243.1	13.24	2.27	8.5			0.85	17.7
			243.2	13.24	2.27	8.5			0.85	17.7
			243.4	13.24	2.26	8.5			0.85	17.7
			243.6	13.24	2.26	8.5			0.85	17.7
			243.8	13.24	2.27	8.5			0.85	17.7
			243.9	13.24	2.27	8.5			0.85	17.7
			244.1	13.24	2.27	8.5			0.85	17.7
			244.2	13.24	2.25	8.5			0.85	17.7
			244.4	13.24	2.22	8.5			0.85	17.7
0500	36 8.8	121 59.4	244.5	13.25	2.21	8.3			1.05	17.5
			244.7	13.25	2.19	8.2			1.03	17.5
			244.9	13.25	2.09	7.9			1.23	17.5
			245.0	13.25	2.02	7.6			1.02	17.5
			245.2	13.25	1.91	7.1			1.12	17.5
			245.3	13.25	1.93	7.3			1.14	17.5
			245.5	13.24	1.93	7.4			1.16	17.5
			245.8	13.24	1.90	7.2			1.24	17.5
			245.9	13.25	1.85	7.0			1.32	17.5
			246.1	13.25	1.82	6.9			1.30	17.5
			246.2	12.03	1.80	6.8			1.36	17.1
			246.5	11.66	1.73	6.7			1.34	17.1
			246.7	11.69	1.72	6.6			1.33	17.1
			247.0	11.16	1.69	6.6			1.33	17.1
			247.5	11.16	1.71	6.5			1.40	17.1
			247.8	11.06	1.70	6.4			1.40	17.1
			248.0	10.31	1.68	6.4			1.61	17.1
			248.3	10.31	1.65	6.4			1.73	17.1
			248.5	10.27	1.65	6.2			1.81	17.1
			248.9	9.37	1.67	5.9			2.01	17.1
			249.3	9.23	1.69	5.9			1.64	17.1
			249.5	9.23	1.64	5.9			1.64	17.1
			249.8	9.23	1.58	5.8			1.84	17.1

R/V ACANIA				11 JUNE 1980				CHMICAL MESOSCALE (CRUISE XII)			
TIME GMT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE KM	NJ3 UV	PD4 JA	MUTR. RATIO NR3/PC4	ATP NG/L	ΔATP ATP	CHL A MG/L	TEMP C	
0530	36 7.1	122 0.9	250.3	3.03	1.56	5.8	408.0	0.35	1.52	11.16	
			251.0	9.08	1.54	5.9			1.51	11.13	
			251.4	9.03	1.55	5.7			1.50	11.13	
			251.7	8.93	1.60	5.8			0.74	11.11	
			251.9	8.93	1.60	5.9	537.0	0.22	0.74	11.11	
			252.0	7.72	1.65	6.2			0.76	11.02	
			252.2	10.52	1.71	6.5			0.72	11.31	
			252.4	11.11	1.71	6.5	212.0	0.20	0.77	11.31	
			252.7	10.70	1.65	6.5			0.77	11.31	
			253.2	9.72	1.64	5.9			0.77	11.31	
0600	36 5.6	122 2.4	253.4	9.03	1.50	5.7			0.77	11.31	
			253.6	8.68	1.56	5.6	217.0	0.23	0.77	11.37	
			253.9	8.44	1.56	5.6			0.66	11.37	
			254.2	8.09	1.53	5.2			0.66	11.71	
			254.5	8.14	1.56	5.2			0.68	11.75	
			254.8	7.89	1.53	5.0			0.65	11.75	
			255.1	7.49	1.51	5.1			0.61	12.12	
			255.4	7.74	1.52	5.1			0.61	12.25	
			255.7	7.00	1.43	4.5			0.57	12.37	
			256.0	6.40	1.41	4.3			0.53	12.37	
0630	36 3.7	122 4.2	256.3	6.01	1.41	4.1			0.52	12.41	
			256.6	5.50	1.36	4.1			0.52	12.34	
			257.1	5.51	1.35	4.0			0.52	12.34	
			257.4	5.46	1.35	4.0			0.52	12.34	
			257.7	5.39	1.33	3.7			0.48	12.34	
			258.0	4.97	1.33	3.5			0.44	12.34	
			258.3	4.52	1.29	3.1			0.47	12.57	
			258.5	3.83	1.25	3.0			0.47	12.57	
			258.6	3.80	1.23	2.9			0.43	12.34	
			258.8	3.50	1.23	2.6	160.0	0.11	0.39	12.34	
0700	36 2.6	122 5.1	259.0	3.00	1.19	2.3			0.39	12.34	
			259.1	2.69	1.19	2.2			0.39	12.34	
			259.3	2.54	1.17	2.1			0.39	12.34	
			259.4	2.44	1.16	2.0			0.39	12.34	
			259.6	2.29	1.16	1.8	134.0	0.16	0.39	12.34	
			259.9	2.04	1.13	1.6			0.39	12.34	
			260.1	1.85	1.11	1.6			0.42	12.34	
			260.2	1.75	1.11	1.5			0.42	12.34	
			260.4	1.75	1.12	1.5	87.0	0.09	0.42	12.32	
			260.5	1.70	1.10	1.5			0.41	12.32	
0730	36 2.6	122 5.1	260.7	1.65	1.09	1.4			0.41	12.32	
			260.8	1.55	1.09	1.3			0.41	12.32	
0740	36 2.6	122 5.1	260.9	1.40	1.09	1.3			0.41	12.32	
			261.1		1.09				0.41	12.34	

R/V ACAVIA				11 JUNE 1980				CHEMICAL MESOSCALE (CRUISE XII)			
TIME GMT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE KM	CHL A MG/L	ATP NG/L	ATP ATP	CHL A MG/L	ATP NG/L	ATP ATP	CHL A MG/L	ATP NG/L
0730	36 1.8	122 5.8	261.2	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			261.3	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			261.4	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			261.5	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			261.6	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			261.7	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			261.8	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			261.9	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			262.0	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			262.1	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			262.2	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			262.3	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
0800	36 2.5	122 5.0	262.4	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			262.5	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			262.6	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			262.7	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			262.8	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			262.9	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			263.0	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			263.1	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			263.2	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			263.3	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			263.4	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			263.5	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
0830	36 3.3	122 4.2	263.6	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			263.7	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			263.8	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			263.9	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			264.0	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			264.1	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			264.2	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			264.3	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			264.4	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			264.5	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			264.6	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0
			264.7	0.41	76.0	0.01	0.41	76.0	0.01	0.41	76.0

CHEMICAL MESOSCALL (CRUISE XII)									
11 JUNE 1980									
TIME GMT	LATITUDE NADP	LONGITUDE WES	DISTANCE KM	WJ3	PM4 UM	NUIN-RATIO N-3/PO4	ATP NG/L	Δ ATP ATP	CHL A MG/M3
0900	36 4.2	122 3.6	267.5	2.25	1.09	2.1	113.0		0.26
			267.6	2.35	1.09	2.2			0.24
			267.7	2.45	1.12	2.3			0.24
			267.9	2.55	1.12	2.4			0.24
			268.0	2.74	1.12	2.5	130.0	0.05	0.24
			268.1	2.84	1.13	2.5			0.24
			268.2	2.94	1.13	2.5			0.24
			268.3	2.79	1.11	2.5			0.24
			268.4	2.79	1.12	2.5			0.24
			268.6	2.79	1.12	2.5	131.0	0.11	0.24
			268.7	2.79	1.12	2.5			0.24
			268.8	2.79	1.12	2.5			0.24
0930	36 5.0	122 3.1	269.0	2.79	1.12	2.5			0.24
			269.1	2.94	1.11	2.5	176.0	0.13	0.24
			269.2	2.94	1.14	2.5			0.24
			269.3	2.94	1.14	2.5			0.24
			269.4	2.94	1.13	2.5			0.24
			269.5	2.94	1.13	2.5			0.24
			269.6	2.94	1.13	2.5			0.24
			269.7	2.94	1.17	2.5	104.0	0.14	0.24
			269.8	2.94	1.16	2.5			0.24
			269.9	2.94	1.13	2.5			0.24
			270.0	2.94	1.13	2.5			0.24
			270.1	2.94	1.17	2.5			0.24
1000	36 5.8	122 2.7	270.2	2.94	1.17	2.5	138.0	0.22	0.24
			270.3	2.94	1.15	2.5			0.24
			270.4	2.94	1.20	2.5			0.24
			270.5	2.94	1.22	2.5			0.24
			270.6	2.94	1.22	2.5			0.24
			270.7	2.94	1.22	2.5	122.0	0.06	0.24
			270.8	2.94	1.24	2.5			0.24
			270.9	2.94	1.25	2.5			0.24
			271.0	2.94	1.25	2.5			0.24
			271.1	2.94	1.25	2.5			0.24
			271.2	2.94	1.28	2.5	153.0	0.13	0.24
			271.3	2.94	1.29	2.5			0.24
			271.4	2.94	1.30	2.5			0.24
			271.5	2.94	1.30	2.5			0.24
			271.6	2.94	1.31	2.5			0.24
			271.7	2.94	1.31	2.5	170.0	0.18	0.24
			271.8	2.94	1.31	2.5			0.24
			271.9	2.94	1.31	2.5			0.24
			272.0	2.94	1.31	2.5			0.24
			272.1	2.94	1.31	2.5			0.24
			272.2	2.94	1.31	2.5	159.0	0.13	0.24
			272.3	2.94	1.32	2.5			0.24
			272.4	2.94	1.32	2.5			0.24
			272.5	2.94	1.32	2.5			0.24
			272.6	2.94	1.32	2.5			0.24
			272.7	2.94	1.32	2.5			0.24
			272.8	2.94	1.32	2.5			0.24

11 JUNE 1980				CHEMICAL MESOSCALE (CRUISE XII)						
TIME GMT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE NM	WJ3 U1	PO4 U1	NUTR. RATIO 103/P14	ATP MG/L	$\frac{\Delta ATP}{ATP}$ 0.33	CHI A 40/M3	TEMP C
1102	36 7.7	122 1.9	272.9	9.34	1.36	5.3	118.0	0.30	0.46	11.56
			273.0	9.34	1.36	5.2			0.46	11.56
			273.1	9.33	1.39	5.2			0.46	11.56
			273.3	9.33	1.40	5.4			0.47	11.53
			273.4	9.33	1.45	5.6			0.47	11.41
			273.5	9.36	1.45	6.0			0.46	11.35
			273.7	9.36	1.46	6.0			0.46	11.35
			273.8	9.39	1.47	6.1			0.45	11.37
			273.9	9.41	1.47	6.1			0.45	11.37
			274.0	9.46	1.49	6.1			0.47	11.34
1130	36 8.8	122 1.9	274.1	9.40	1.49	6.3	164.0	0.25	0.46	11.33
			274.2	9.40	1.53	6.4			0.47	11.33
			274.3	9.40	1.52	6.5			0.47	11.33
			274.4	9.39	1.55	6.5			0.45	11.34
			274.5	9.39	1.57	6.8			0.65	11.33
			274.6	9.40	1.59	7.0			1.09	10.73
			274.7	9.41	1.60	7.0			1.35	10.77
			274.8	9.42	1.52	6.6			1.73	10.72
			274.9	9.45	1.50	6.6			2.14	10.72
			275.0	9.45	1.50	6.5			2.64	10.72
1130	36 8.8	122 1.9	275.1	9.45	1.50	6.4	331.0	0.37	3.19	11.32
			275.2	9.45	1.50	6.4			3.30	11.33
			275.3	9.45	1.49	6.4			3.63	11.33
			275.4	9.45	1.49	6.4			3.80	11.37
			275.5	9.50	1.51	6.3			4.01	11.36
			275.6	9.55	1.52	6.3			4.04	11.36
			275.7	9.60	1.49	6.4			4.20	11.35
			275.8	9.65	1.49	6.5			4.35	11.35
			275.9	9.65	1.48	6.5			4.51	11.34
			276.0	9.60	1.48	6.5			4.67	11.32
1200	36 10.1	122 2.1	276.1	9.94	1.41	6.5	277.0	0.34	4.83	11.30
			276.2	9.94	1.41	6.7			5.09	11.31
			276.3	10.04	1.50	6.7			5.43	11.31
			276.4	10.04	1.49	6.7			5.74	11.31
			276.5	9.93	1.50	6.7			5.89	11.29
			276.6	9.93	1.49	6.5			5.93	11.29
			276.7	9.94	1.52	6.5			5.93	11.29
			276.8	10.29	1.53	6.7			5.93	11.29
			276.9	10.34	1.52	6.8			5.93	11.29
			277.0	10.34	1.52	6.8			5.93	11.29

R/V ACANIA				11 JUNE 1980				CHEMICAL MESOSCALE (CRUISE XII)			
TIME GMT	LATITUDE NORTH	LONGITUDE WEST	DISTANCE KM	TIME	TEMP °C	NO.3/NO.4	ATP µg/L	ΔATP/ATP%	CHL A µg/L	TEMP °C	
1228	36 11.4	122 2.4	241.8	04	1.54	6.8			4.73	1.52	
			242.0	05	1.53	6.8			5.49	1.55	
			242.1	06	1.53	6.8			5.49	1.55	
			242.3	07	1.53	6.8			4.08	1.55	
			242.5	08	1.54	7.2			4.08	1.55	
			242.7	09	1.54	7.2			3.13	1.55	
			242.9	10	1.54	7.2			3.13	1.55	
			243.0	11	1.54	7.2			2.40	1.55	
			243.2	12	1.54	7.2			2.40	1.55	
			243.4	13	1.54	7.2			2.14	1.55	
			243.6	14	1.54	7.2			2.02	1.55	
			243.8	15	1.54	7.2			1.78	1.55	
1300	36 12.9	122 2.6	243.9	16	1.54	7.9	123.0	0.38	1.78	1.55	
			244.1	17	1.54	7.9			1.55	1.55	
			244.3	18	1.54	7.9			1.36	1.55	
			244.5	19	1.54	7.9			1.36	1.55	
			244.7	20	1.54	7.9			1.24	1.55	
			244.9	21	1.54	7.9			1.24	1.55	
			245.1	22	1.54	7.9			1.15	1.55	
			245.3	23	1.54	7.9			1.15	1.55	
			245.5	24	1.54	7.9			1.04	1.55	
			245.7	25	1.54	7.9			1.04	1.55	
			245.9	26	1.54	7.9			0.95	1.55	
			246.1	27	1.54	7.9			0.95	1.55	
1330	36 14.5	122 2.6	246.3	28	1.54	8.3	130.0	0.17	1.04	1.55	
			246.5	29	1.54	8.3			0.95	1.55	
			246.7	30	1.54	8.3			0.95	1.55	
			246.9	31	1.54	8.3			0.95	1.55	
			247.1	32	1.54	8.3			0.93	1.55	
			247.3	33	1.54	8.3			1.04	1.55	
			247.5	34	1.54	8.3			1.05	1.55	
			247.7	35	1.54	8.3			1.14	1.55	
			247.9	36	1.54	8.3			1.14	1.55	
			248.1	37	1.54	8.3			1.14	1.55	
			248.3	38	1.54	8.3			1.14	1.55	
			248.5	39	1.54	8.3			1.14	1.55	
1330	36 14.5	122 2.6	248.7	40	1.54	8.6	193.0	0.32	1.05	1.55	
			248.9	41	1.54	8.6			1.14	1.55	
			249.1	42	1.54	8.6			1.14	1.55	
			249.3	43	1.54	8.6			1.14	1.55	
			249.5	44	1.54	8.6			1.14	1.55	
			249.7	45	1.54	8.6			1.14	1.55	
			249.9	46	1.54	8.6			1.14	1.55	
			250.1	47	1.54	8.6			1.14	1.55	
			250.3	48	1.54	8.6			1.14	1.55	
			250.5	49	1.54	8.6			1.14	1.55	
			250.7	50	1.54	8.6			1.14	1.55	
			250.9	51	1.54	8.6			1.14	1.55	

2000

154

APPENDIX B

Listing of Nansen Cast Data: Station, Time, Latitude
Longitude, Depth, Salinity, Temperature, Density,
Nitrate, ATP

STATION #	TIME GMT	LATITUDE NORTH	LONGITUDE WEST	DEPTH M	SALINITY PPT	TEMPERATURE DEG C	DENSITY SIGMA T	NO3 UM	ATP NG/L
1	2002	36 15.8	122 4.8	2.5	33.423	14.30	26.47	1.44	79.0
				25.0	33.423	12.31	26.35	9.80	41.0
				50.0	32.366	10.20	25.49	18.21	
				100.0	33.746	9.43	26.54	21.54	
				200.0	34.034	8.14	26.78	27.03	
2	2134	36 11.4	121 59.7	300.0	34.091	7.73	26.84	30.06	
				400.0	34.158	7.46	26.90	32.05	
				2.5	33.470	14.80	26.54	0.76	57.0
				25.0	33.470	13.17	26.42	7.14	156.0
				50.0	33.478	10.99	26.35	14.88	
3	2241	36 12.1	122 3.0	100.0	33.731	9.80	26.53	20.25	
				175.0	33.987	8.28	26.74	25.19	
				292.0	34.097	7.51	26.85	30.81	
				395.0	34.164	7.00	26.92	33.33	
				2.5	33.483	13.00	26.43	6.61	112.0
4	2343	36 12.0	122 8.0	25.0	33.493	12.69	26.41	8.14	105.0
				50.0	33.483	10.85	26.35	15.24	
				100.0	33.827	9.34	26.60	21.86	
				180.0	34.009	8.30	26.76	25.87	
				280.0	34.021	7.47	26.79	25.79	
5	0044	36 16.2	122 9.9	360.0	34.111	7.12	26.88	32.65	
				2.5	33.489	13.65	26.47	3.44	65.0
				25.0	33.489	12.73	25.42	8.34	86.0
				50.0	33.523	11.99	26.41	11.79	31.0
				100.0	33.814	9.62	26.44	19.77	
6	0136	36 19.1	122 12.9	200.0	33.969	7.26	26.76	24.91	
				300.0	34.076	6.86	26.86	30.60	
				400.0	34.272	6.54	27.03	34.78	
				2.5	33.547	12.90	26.48	5.33	99.0
				25.0	33.547	12.58	26.46	8.02	162.0
7	0300	36 22.0	122 3.8	50.0	33.587	10.64	26.42	16.21	14.0
				100.0	33.751	8.28	26.54	21.37	
				180.0	34.007	8.37	26.76	25.04	
				295.0	34.121	7.29	26.89	30.58	
				400.0	34.227	6.81	26.98	34.76	
8	0136	36 19.1	122 12.9	2.5	33.425	13.20	26.40	3.68	157.0
				25.0	33.425	13.22	26.40	5.68	25.0
				50.0	33.552	12.21	26.45	11.25	98.0
				100.0	33.676	9.74	26.48	20.04	
				172.0	34.202	7.85	26.92	28.47	
9	0300	36 22.0	122 3.8	296.0	34.050	7.42	26.82	33.33	
				400.0	34.296	6.93	27.03	35.85	
				2.5	33.509	12.70	26.44	7.05	85.0
				25.0	33.509	12.51	26.43	9.52	108.0
				50.0	33.520	11.63	26.36	13.51	35.0
10	0300	36 22.0	122 3.8	100.0	33.509	10.34	26.36	19.39	
				185.0	34.009	7.98	26.77	30.28	
				300.0	34.116	7.44	26.87	33.24	
				400.0	34.132	6.90	26.90	35.23	

APPENDIX C

Computer Programs

158

[illegible]


```

FORTRAN IV G LEVEL 21
0001 SUBROUTINE CCRREL (M,N,CCES,YCES)
0002   REAL X(100),Y(100),XSUM,YSUM,X2SUM,Y2SUM,X3SUM
0003   INTEGER M,N
0004   XSUM=0.0
0005   YSUM=0.0
0006   X2SUM=0.0
0007   Y2SUM=0.0
0008   DO 10 I=1,M
0009     X(I)=X(I)+X(I)*X(I)
0010     Y(I)=Y(I)+Y(I)*Y(I)
0011     XSUM=XSUM+X(I)
0012     YSUM=YSUM+Y(I)
0013     X2SUM=X2SUM+X(I)*X(I)
0014     Y2SUM=Y2SUM+Y(I)*Y(I)
0015   10 CONTINUE
0016   CCRREL=(XSUM*YSUM-X2SUM*Y2SUM)/(XSUM*YSUM-X2SUM*Y2SUM)
0017   RETURN
0018   WRITE (6,2) M
0019   20 FORMAT (17,5)
0020   17 1,100,2,14)
0021   RETURN
0022   END
0023

```

DATE = 0010

11/2/14

DATE = 0010

CCREL

FORTRAN IV G LEVEL 21

0001

0002

0003

0004

0005

0006

0007

0008

0009

0010

0011

0012

0013

0014

0015

0016

0017

0018

0019

0020

0021

0022

0023

GRAPHIC REPRESENTATION GIVEN CRYPT SOURCE DECK

```
REAL NC3, A
DIMENSION SAL(7), TEMP(7), ADJ(1), D(44), SI(49), T(49), A(49)
DISPLASICA AIP(7), X(7), Y(7), A(49), X1(49), Y1(49)
```

```

FONTMAN LV 3 LEVEL 21      DATE = 00177      15/03/22
MAIN
50 CALL PLOTG (SAL,DEPTH,7,2,1,5, / TEMPERATURE (DEG C) / NITRATE (UM)
   1 / COMPOSITE: SALINITY (PPT) / TEMPERATURE (DEG C) / NITRATE (UM)
60 CALL PLOTG (SAL,DEPTH,7,2,1,5, / TEMPERATURE (DEG C) / NITRATE (UM)
   1 / COMPOSITE: SALINITY (PPT) / TEMPERATURE (DEG C) / NITRATE (UM)
70 CALL PLOTG (SAL,DEPTH,7,2,1,5, / TEMPERATURE (DEG C) / NITRATE (UM)
   1 / COMPOSITE: SALINITY (PPT) / TEMPERATURE (DEG C) / NITRATE (UM)
80 CALL PLOTG (SAL,DEPTH,7,2,1,5, / TEMPERATURE (DEG C) / NITRATE (UM)
   1 / COMPOSITE: SALINITY (PPT) / TEMPERATURE (DEG C) / NITRATE (UM)
90 CALL PLOTG (SAL,DEPTH,7,2,1,5, / TEMPERATURE (DEG C) / NITRATE (UM)
   1 / COMPOSITE: SALINITY (PPT) / TEMPERATURE (DEG C) / NITRATE (UM)
91 CALL PLOTG (SAL,DEPTH,7,2,1,5, / TEMPERATURE (DEG C) / NITRATE (UM)
   1 / COMPOSITE: SALINITY (PPT) / TEMPERATURE (DEG C) / NITRATE (UM)
   IF (L - 1) GO TO 31
61 L=1
62 L=2
63 L=3
64 L=4
65 L=5
66 L=6
67 L=7
68 L=8
69 L=9
70 L=10
71 L=11
72 L=12
73 L=13
74 L=14
75 L=15
76 L=16
77 L=17
78 L=18
79 L=19
80 L=20
81 L=21
82 L=22
83 L=23
84 L=24
85 L=25
86 L=26
87 L=27
88 L=28
89 L=29
90 L=30
91 L=31
92 L=32
93 L=33
94 L=34
95 L=35
96 L=36
97 L=37
98 L=38
99 L=39
0001 L=40
0002 L=41
0003 L=42
0004 L=43
0005 L=44
0006 L=45
0007 L=46
0008 L=47
0009 L=48
0010 L=49
0011 L=50
0012 L=51
0013 L=52
0014 L=53
0015 L=54
0016 L=55
0017 L=56
0018 L=57
0019 L=58
0020 L=59
0021 L=60
0022 L=61
0023 L=62
0024 L=63
0025 L=64
0026 L=65
0027 L=66
0028 L=67
0029 L=68
0030 L=69
0031 L=70
0032 L=71
0033 L=72
0034 L=73
0035 L=74
0036 L=75
0037 L=76
0038 L=77
0039 L=78
0040 L=79
0041 L=80
0042 L=81
0043 L=82
0044 L=83
0045 L=84
0046 L=85
0047 L=86
0048 L=87
0049 L=88
0050 L=89
0051 L=90
0052 L=91
0053 L=92
0054 L=93
0055 L=94
0056 L=95
0057 L=96
0058 L=97
0059 L=98
0060 L=99
0061 L=100
0062 L=101
0063 L=102
0064 L=103
0065 L=104
0066 L=105
0067 L=106
0068 L=107
0069 L=108
0070 L=109
0071 L=110
0072 L=111
0073 L=112
0074 L=113
0075 L=114
0076 L=115
0077 L=116
0078 L=117
0079 L=118
0080 L=119
0081 L=120
0082 L=121
0083 L=122
0084 L=123
0085 L=124
0086 L=125
0087 L=126
0088 L=127
0089 L=128
0090 L=129
0091 L=130
0092 L=131
0093 L=132
0094 L=133
0095 L=134
0096 L=135
0097 L=136
0098 L=137
0099 L=138
0100 L=139
0101 L=140
0102 L=141
0103 L=142
0104 L=143
0105 L=144
0106 L=145
0107 L=146
0108 L=147
0109 L=148
0110 L=149
0111 L=150
0112 L=151
0113 L=152
0114 L=153
0115 L=154
0116 L=155
0117 L=156
0118 L=157
0119 L=158
0120 L=159
0121 L=160
0122 L=161
0123 L=162
0124 L=163
0125 L=164
0126 L=165
0127 L=166
0128 L=167
0129 L=168
0130 L=169
0131 L=170
0132 L=171
0133 L=172
0134 L=173
0135 L=174
0136 L=175
0137 L=176
0138 L=177
0139 L=178
0140 L=179
0141 L=180
0142 L=181
0143 L=182
0144 L=183
0145 L=184
0146 L=185
0147 L=186
0148 L=187
0149 L=188
0150 L=189
0151 L=190
0152 L=191
0153 L=192
0154 L=193
0155 L=194
0156 L=195
0157 L=196
0158 L=197
0159 L=198
0160 L=199
0161 L=200
0162 L=201
0163 L=202
0164 L=203
0165 L=204
0166 L=205
0167 L=206
0168 L=207
0169 L=208
0170 L=209
0171 L=210
0172 L=211
0173 L=212
0174 L=213
0175 L=214
0176 L=215
0177 L=216
0178 L=217
0179 L=218
0180 L=219
0181 L=220
0182 L=221
0183 L=222
0184 L=223
0185 L=224
0186 L=225
0187 L=226
0188 L=227
0189 L=228
0190 L=229
0191 L=230
0192 L=231
0193 L=232
0194 L=233
0195 L=234
0196 L=235
0197 L=236
0198 L=237
0199 L=238
0200 L=239
0201 L=240
0202 L=241
0203 L=242
0204 L=243
0205 L=244
0206 L=245
0207 L=246
0208 L=247
0209 L=248
0210 L=249
0211 L=250
0212 L=251
0213 L=252
0214 L=253
0215 L=254
0216 L=255
0217 L=256
0218 L=257
0219 L=258
0220 L=259
0221 L=260
0222 L=261
0223 L=262
0224 L=263
0225 L=264
0226 L=265
0227 L=266
0228 L=267
0229 L=268
0230 L=269
0231 L=270
0232 L=271
0233 L=272
0234 L=273
0235 L=274
0236 L=275
0237 L=276
0238 L=277
0239 L=278
0240 L=279
0241 L=280
0242 L=281
0243 L=282
0244 L=283
0245 L=284
0246 L=285
0247 L=286
0248 L=287
0249 L=288
0250 L=289
0251 L=290
0252 L=291
0253 L=292
0254 L=293
0255 L=294
0256 L=295
0257 L=296
0258 L=297
0259 L=298
0260 L=299
0261 L=300
0262 L=301
0263 L=302
0264 L=303
0265 L=304
0266 L=305
0267 L=306
0268 L=307
0269 L=308
0270 L=309
0271 L=310
0272 L=311
0273 L=312
0274 L=313
0275 L=314
0276 L=315
0277 L=316
0278 L=317
0279 L=318
0280 L=319
0281 L=320
0282 L=321
0283 L=322
0284 L=323
0285 L=324
0286 L=325
0287 L=326
0288 L=327
0289 L=328
0290 L=329
0291 L=330
0292 L=331
0293 L=332
0294 L=333
0295 L=334
0296 L=335
0297 L=336
0298 L=337
0299 L=338
0300 L=339
0301 L=340
0302 L=341
0303 L=342
0304 L=343
0305 L=344
0306 L=345
0307 L=346
0308 L=347
0309 L=348
0310 L=349
0311 L=350
0312 L=351
0313 L=352
0314 L=353
0315 L=354
0316 L=355
0317 L=356
0318 L=357
0319 L=358
0320 L=359
0321 L=360
0322 L=361
0323 L=362
0324 L=363
0325 L=364
0326 L=365
0327 L=366
0328 L=367
0329 L=368
0330 L=369
0331 L=370
0332 L=371
0333 L=372
0334 L=373
0335 L=374
0336 L=375
0337 L=376
0338 L=377
0339 L=378
0340 L=379
0341 L=380
0342 L=381
0343 L=382
0344 L=383
0345 L=384
0346 L=385
0347 L=386
0348 L=387
0349 L=388
0350 L=389
0351 L=390
0352 L=391
0353 L=392
0354 L=393
0355 L=394
0356 L=395
0357 L=396
0358 L=397
0359 L=398
0360 L=399
0361 L=400
0362 L=401
0363 L=402
0364 L=403
0365 L=404
0366 L=405
0367 L=406
0368 L=407
0369 L=408
0370 L=409
0371 L=410
0372 L=411
0373 L=412
0374 L=413
0375 L=414
0376 L=415
0377 L=416
0378 L=417
0379 L=418
0380 L=419
0381 L=420
0382 L=421
0383 L=422
0384 L=423
0385 L=424
0386 L=425
0387 L=426
0388 L=427
0389 L=428
0390 L=429
0391 L=430
0392 L=431
0393 L=432
0394 L=433
0395 L=434
0396 L=435
0397 L=436
0398 L=437
0399 L=438
0400 L=439
0401 L=440
0402 L=441
0403 L=442
0404 L=443
0405 L=444
0406 L=445
0407 L=446
0408 L=447
0409 L=448
0410 L=449
0411 L=450
0412 L=451
0413 L=452
0414 L=453
0415 L=454
0416 L=455
0417 L=456
0418 L=457
0419 L=458
0420 L=459
0421 L=460
0422 L=461
0423 L=462
0424 L=463
0425 L=464
0426 L=465
0427 L=466
0428 L=467
0429 L=468
0430 L=469
0431 L=470
0432 L=471
0433 L=472
0434 L=473
0435 L=474
0436 L=475
0437 L=476
0438 L=477
0439 L=478
0440 L=479
0441 L=480
0442 L=481
0443 L=482
0444 L=483
0445 L=484
0446 L=485
0447 L=486
0448 L=487
0449 L=488
0450 L=489
0451 L=490
0452 L=491
0453 L=492
0454 L=493
0455 L=494
0456 L=495
0457 L=496
0458 L=497
0459 L=498
0460 L=499
0461 L=500
0462 L=501
0463 L=502
0464 L=503
0465 L=504
0466 L=505
0467 L=506
0468 L=507
0469 L=508
0470 L=509
0471 L=510
0472 L=511
0473 L=512
0474 L=513
0475 L=514
0476 L=515
0477 L=516
0478 L=517
0479 L=518
0480 L=519
0481 L=520
0482 L=521
0483 L=522
0484 L=523
0485 L=524
0486 L=525
0487 L=526
0488 L=527
0489 L=528
0490 L=529
0491 L=530
0492 L=531
0493 L=532
0494 L=533
0495 L=534
0496 L=535
0497 L=536
0498 L=537
0499 L=538
0500 L=539
0501 L=540
0502 L=541
0503 L=542
0504 L=543
0505 L=544
0506 L=545
0507 L=546
0508 L=547
0509 L=548
0510 L=549
0511 L=550
0512 L=551
0513 L=552
0514 L=553
0515 L=554
0516 L=555
0517 L=556
0518 L=557
0519 L=558
0520 L=559
0521 L=560
0522 L=561
0523 L=562
0524 L=563
0525 L=564
0526 L=565
0527 L=566
0528 L=567
0529 L=568
0530 L=569
0531 L=570
0532 L=571
0533 L=572
0534 L=573
0535 L=574
0536 L=575
0537 L=576
0538 L=577
0539 L=578
0540 L=579
0541 L=580
0542 L=581
0543 L=582
0544 L=583
0545 L=584
0546 L=585
0547 L=586
0548 L=587
0549 L=588
0550 L=589
0551 L=590
0552 L=591
0553 L=592
0554 L=593
0555 L=594
0556 L=595
0557 L=596
0558 L=597
0559 L=598
0560 L=599
0561 L=600
0562 L=601
0563 L=602
0564 L=603
0565 L=604
0566 L=605
0567 L=606
0568 L=607
0569 L=608
0570 L=609
0571 L=610
0572 L=611
0573 L=612
0574 L=613
0575 L=614
0576 L=615
0577 L=616
0578 L=617
0579 L=618
0580 L=619
0581 L=620
0582 L=621
0583 L=622
0584 L=623
0585 L=624
0586 L=625
0587 L=626
0588 L=627
0589 L=628
0590 L=629
0591 L=630
0592 L=631
0593 L=632
0594 L=633
0595 L=634
0596 L=635
0597 L=636
0598 L=637
0599 L=638
0600 L=639
0601 L=640
0602 L=641
0603 L=642
0604 L=643
0605 L=644
0606 L=645
0607 L=646
0608 L=647
0609 L=648
0610 L=649
0611 L=650
0612 L=651
0613 L=652
0614 L=653
0615 L=654
0616 L=655
0617 L=656
0618 L=657
0619 L=658
0620 L=659
0621 L=660
0622 L=661
0623 L=662
0624 L=663
0625 L=664
0626 L=665
0627 L=666
0628 L=667
0629 L=668
0630 L=669
0631 L=670
0632 L=671
0633 L=672
0634 L=673
0635 L=674
0636 L=675
0637 L=676
0638 L=677
0639 L=678
0640 L=679
0641 L=680
0642 L=681
0643 L=682
0644 L=683
0645 L=684
0646 L=685
0647 L=686
0648 L=687
0649 L=688
0650 L=689
0651 L=690
0652 L=691
0653 L=692
0654 L=693
0655 L=694
0656 L=695
0657 L=696
0658 L=697
0659 L=698
0660 L=699
0661 L=700
0662 L=701
0663 L=702
0664 L=703
0665 L=704
0666 L=705
0667 L=706
0668 L=707
0669 L=708
0670 L=709
0671 L=710
0672 L=711
0673 L=712
0674 L=713
0675 L=714
0676 L=715
0677 L=716
0678 L=717
0679 L=718
0680 L=719
0681 L=720
0682 L=721
0683 L=722
0684 L=723
0685 L=724
0686 L=725
0687 L=726
0688 L=727
0689 L=728
0690 L=729
0691 L=730
0692 L=731
0693 L=732
0694 L=733
0695 L=734
0696 L=735
0697 L=736
0698 L=737
0699 L=738
0700 L=739
0701 L=740
0702 L=741
0703 L=742
0704 L=743
0705 L=744
0706 L=745
0707 L=746
0708 L=747
0709 L=748
0710 L=749
0711 L=750
0712 L=751
0713 L=752
0714 L=753
0715 L=754
0716 L=755
0717 L=756
0718 L=757
0719 L=758
0720 L=759
0721 L=760
0722 L=761
0723 L=762
0724 L=763
0725 L=764
0726 L=765
0727 L=766
0728 L=767
0729 L=768
0730 L=769
0731 L=770
0732 L=771
0733 L=772
0734 L=773
0735 L=774
0736 L=775
0737 L=776
0738 L=777
0739 L=778
0740 L=779
0741 L=780
0742 L=781
0743 L=782
0744 L=783
0745 L=784
0746 L=785
0747 L=786
0748 L=787
0749 L=788
0750 L=789
0751 L=790
0752 L=791
0753 L=792
0754 L=793
0755 L=794
0756 L=795
0757 L=796
0758 L=797
0759 L=798
0760 L=799
0761 L=800
0762 L=801
0763 L=802
0764 L=803
0765 L=804
0766 L=805
0767 L=806
0768 L=807
0769 L=808
0770 L=809
0771 L=810
0772 L=811
0773 L=812
0774 L=813
0775 L=814
0776 L=815
0777 L=816
0778 L=817
0779 L=818
0780 L=819
0781 L=820
0782 L=821
0783 L=822
0784 L=823
0785 L=824
0786 L=825
0787 L=826
0788 L=827
0789 L=828
0790 L=829
0791 L=830
0792 L=831
0793 L=832
0794 L=833
0795 L=834
0796 L=835
0797 L=836
0798 L=837
0799 L=838
0800 L=839
0801 L=840
0802 L=841
0803 L=842
0804 L=843
0805 L=844
0806 L=845
0807 L=846
0808 L=847
0809 L=848
0810 L=849
0811 L=850
0812 L=851
0813 L=852
0814 L=853
0815 L=854
0816 L=855
0817 L=856
0818 L=857
0819 L=858
0820 L=859
0821 L=860
0822 L=861
0823 L=862
0824 L=863
0825 L=864
0826 L=865
0827 L=866
0828 L=867
0829 L=868
0830 L=869
0831 L=870
0832 L=871
0833 L=872
0834 L=873
0835 L=874
0836 L=875
0837 L=876
0838 L=877
0839 L=878
0840 L=879
0841 L=880
0842 L=881
0843 L=882
0844 L=883
0845 L=884
0846 L=885
0847 L=886
0848 L=887
0849 L=888
0850 L=889
0851 L=890
0852 L=891
0853 L=892
0854 L=893
0855 L=894
0856 L=895
0857 L=896
0858 L=897
0859 L=898
0860 L=899
0861 L=900
0862 L=901
0863 L=902
0864 L=903
0865 L=904
0866 L=905
0867 L=906
0868 L=907
0869 L=908
0870 L=909
0871 L=910
0872 L=911
0873 L=912
0874 L=913
0875 L=914
0876 L=915
0877 L=916
0878 L=917
0879 L=918
0880 L=919
0881 L=920
0882 L=921
0883 L=922
0884 L=923
0885 L=924
0886 L=925
0887 L=926
0888 L=927
0889 L=928
0890 L=929
0891 L=930
0892 L=931
0893 L=932
0894 L=933
0895 L=934
0896 L=935
0897 L=936
0898 L=937
0899 L=938
0900 L=939
0901 L=940
0902 L=941
0903 L=942
0904 L=943
0905 L=944
0906 L=945
0907 L=946
0908 L=947
0909 L=948
0910 L=949
0911 L=950
0912 L=951
0913 L=952
0914 L=953
0915 L=954
0916 L=955
0917 L=956
0918 L=957
0919 L=958
0920 L=959
0921 L=960
0922 L=961
0923 L=962
0924 L=963
0925 L=964
0926 L=965
0927 L=966
0928 L=967
0929 L=968
0930 L=969
0931 L=970
0932 L=971
0933 L=972
0934 L=973
0935 L=974
0936 L=975
0937 L=976
0938 L=977
0939 L=978
0940 L=979
0941 L=980
0942 L=981
0943 L=982
0944 L=983
0945 L=984
0946 L=985
0947 L=986
0948 L=987
0949 L=988
0950 L=989
0951 L=990
0952 L=991
0953 L=992
0954 L=993
0955 L=994
0956 L=995
0957 L=996
0958 L=997
0959 L=998
0960 L=999
0961 L=1000
0962 L=1001
0963 L=1002
0964 L=1003
0965 L=1004
0966 L=1005
0967 L=1006
0968 L=1007
0969 L=1008
0970 L=1009
0971 L=1010
0972 L=1011
0973 L=1012
0974 L=1013
0975 L=1014
0976 L=1015
0977 L=1016
0978 L=1017
0979 L=1018
0980 L=1019
0981 L=1020
0982 L=1021
0983 L=1022
0984 L=1023
0985 L=1024
0986 L=1025
0987 L=1026
0988 L=1027
0989 L=1028
0990 L=1029
0991 L=1030
0992 L=1031
0993 L=1032
0994 L=1033
0995 L=1034
0996 L=1035
0997 L=1036
0998 L=1037
0999 L=1038
1000 L=1039
1001 L=1040
1002 L=1041
1003 L=1042
1004 L=1043
1005 L=1044
1006 L=1045
1007 L=1046
1008 L=1047
1009 L=1048
1010 L=1049
1011 L=1050
1012 L=1051
1013 L=1052
1014 L=1053
1015 L=1054
1016 L=1055
1017 L=1056
1018 L=1057
1019 L=1058
1020 L=1059
1021 L=1060
1022 L=1061
1023 L=1062
1024 L=1063
1025 L=1064
1026 L=1065
1027 L=1066
1028 L=1067
1029 L=1068
1030 L=1069
1031 L=1070
1032 L=1071
1033 L=1072
1034 L=1073
1035 L=1074
1036 L=1075
1037 L=1076
1038 L=1077
1039 L=1078
1040 L=1079
1041 L=1080
1042 L=1081
1043 L=1082
1044 L=1083
1045 L=1084
1046 L=1085
1047 L=1086
1048 L=1087
1049 L=1088
1050 L=1089
1051 L=1090
1052 L=1091
1053 L=1092
1054 L=1093
1055 L=1094
1056 L=1095
1057 L=1096
1058 L=1097
1059 L=1098
1060 L=1099
1061 L=1100
1062 L=1101
1063 L=1102
1064 L=1103
1065 L=1104
1066 L=1105
1067 L=1106
1068 L=1107
1069 L=1108
1070 L=1109
1071 L=1110
1072 L=1111
1073 L=1112
1074 L=1113
1075 L=1114
1076 L=1115
1077 L=1116
1078 L=1117
1079 L=1118
1080 L=1119
1081 L=1120
1082 L=1121
1083 L=1122
1084 L=1123
1085 L=1124
1086 L=1125
1087 L=1126
1088 L=1127
1089 L=1128
1090 L=1129
1091 L=1130
1092 L=1131
1093 L=1132
1094 L=1133
1095 L=1134
1096 L=1135
1097 L=1136
1098 L=1137
1099 L=1138
1100 L=1139
1101 L=1140
1102 L=1141
1103 L=1142
1104 L=1143
1105 L=1144
1106 L=1145
1107 L=1146
1108 L=1147
1109 L=1148
1110 L=1149
1111 L=1150
1112 L=1151
1113 L=1152
1114 L=1153
1115 L=1154
1116 L=1155
1117 L=1156
1118 L=1157
1119 L=1158
1120 L=1159
1121 L=1160
1122 L=1161
1123 L=1162
1124 L=1163
1125 L=1164
1126 L=1165
1127 L=1166
1128 L=1167
1129 L=1168
1130 L=1169
1131 L=1170
1132 L=1171
1133 L=1172
1134 L=1173
1135 L=1174
1136 L=1175
1137 L=1176
1138 L=1177
1139 L=1178
1140 L=1179
1141 L=1180
1142 L=1181
1143 L=1182
1144 L=1183
1145 L=1184
1146 L=1185
1147 L=1186
1148 L=1
```


[illegible]

BIBLIOGRAPHY

- Anonymous, Technicon Industrial Systems Technical Publication No. TA 1-0170-20, Operational Manual for the Technicon Auto Analyzer II System, 1972.
- Anonymous, Technicon Industrial Systems Industrial Method No. 177-72-WM, Ortho Phosphate in Water and Seawater, January 1973.
- Anonymous, Technicon Industrial Systems Industrial Method No. 100-70-W/B, Nitrate and Nitrite in Water and Waste Water, January 1978.
- Barber, R.T., A Comparison of the Biological Productivity in Several Coastal Upwelling Regions, paper presented at IDOE International Symposium on Coastal Upwelling, Los Angeles, California, 4 February 1980.
- Blasco, D., Phytoplankton Strategies in the Upwelling Regions, paper presented at IDOE International Symposium on Coastal Upwelling, Los Angeles, California, 5 February 1980.
- Boyd, C.M., and Smith, S.L., Interaction of Plankton Populations in the Surface Waters of the Peruvian Upwelling Region: A Study in Mapping, paper presented at IDOE Symposium on Coastal Upwelling, Los Angeles, California, 5 February 1980.
- Bronsink, S.H., Microplanktonic ATP - Biomass and GTP - Productivity Associated with Upwelling off Point Sur, California, Master's Thesis, Naval Postgraduate School, Monterey, 1980.
- Conrad, J.W., Relationships Between Sea Surface Temperature and Nutrients in Satellite Detected Oceanic Fronts, Master's Thesis, Naval Postgraduate School, Monterey, 1980.
- James, R.W., Ocean Thermal Structure Forecasting, SP-105 Antisubmarine Warfare Environmental Prediction Services, V. 5, p. 74-133, 1966.
- Johnson, J.E., Subsurface Dynamical Properties of Variable Features Seen in Satellite IR Imagery off Point Sur and Their Acoustic Significance, Master's Thesis, Naval Postgraduate School, Monterey, 1980.

- Maul, G.A., and Sidran, M., "Atmospheric Effects on Ocean Surface Temperature Sensing from the NOAA Satellite Scanning Radiometer," Journal of Geophysical Research, V. 78(12), p. 1909, 1973.
- Paulson, G.P., A Study of Nutrient Variations in the Surface and Mixed Layer of Monterey Bay Using Automatic Analysis Techniques, Master's Thesis, Naval Postgraduate School, Monterey, 1972.
- Traganza, E.D., Nestor, D.A., and McDonald, A.K., "Satellite Observations of a Nutrient Upwelling off the Coast of California," Journal of Geophysical Research, V. 85(C7), p. 4101-4106, 1980.
- Traganza, E.D., Conrad, J.W., and Breaker, L.C., "Satellite Observations of a 'Cyclonic Upwelling System' and 'Giant Plume' in the California Current," (in press Journal of Geophysical Research), 1980.

INITIAL DISTRIBUTION LIST

	No. Copies
1. Defense Technical Information Center Cameron Station Alexandria, VA 22314	2
2. Library, Code 0142 Naval Postgraduate School Monterey, CA 93940	2
3. Chairman, Code 68 Department of Oceanography Naval Postgraduate School Monterey, CA 93940	1
4. Chairman, Code 65 Department of Meteorology Naval Postgraduate School Monterey, CA 93940	1
5. Director Naval Oceanography Division Navy Observatory 34th & Massachusetts Avenue NW Washington, D.C. 20390	1
6. Commander Naval Oceanography Command NSTL Station Bay St. Louis, MS 39529	1
7. Commanding Officer Naval Oceanographic Office NSTL Station Bay St. Louis, MS 39529	1
8. Commanding Officer Fleet Numerical Oceanography Center Monterey, CA 93940	1
9. Commanding Officer Naval Ocean Research and Development Activity NSTL Station Bay St. Louis, MS 39529	1

- | | | |
|-----|--|---|
| 10. | Chairman, Oceanography Department
U.S. Naval Academy
Annapolis, MD 21402 | 1 |
| 11. | Office of Naval Research (Code 482)
Naval Ocean Research and Development
Activity
NSTL Station
Bay St. Louis, MS 39529 | 1 |
| 12. | Scientific Liaison Office
Office of Naval Research
Scripps Institution of Oceanography
La Jolla, CA 92037 | 1 |
| 13. | Library
Department of Oceanography
University of Washington
Seattle, WA 98105 | 1 |
| 14. | Library
CICESE
P.O. Box 4803
San Ysidro, CA 92073 | 1 |
| 15. | Library
School of Oceanography
Oregon State University
Corvallis, OR 97331 | 1 |
| 16. | Commander
Oceanographic Systems Pacific
Box 1390
Pearl Harbor, HI 96860 | 1 |
| 17. | Dr. E.D. Traganza, Code 68 Tg
Department of Oceanography
Naval Postgraduate School
Monterey, CA 93940 | 5 |
| 18. | Prof. J.B. Wickham, Code 68 Wk
Department of Oceanography
Naval Postgraduate School
Monterey, CA 93940 | 1 |
| 19. | Dr. R.H. Bourke, Code 68 Bf
Department of Oceanography
Naval Postgraduate School
Monterey, CA 93940 | 1 |

20. Mr. L.C. Breaker 1
National Environmental Satellite Service
660 Price Avenue
Redwood City, CA 94063
21. Mr. Ben Cagle 1
Office of Naval Research Branch Office
1030 East Green Street
Pasadena, CA 91106
22. Mr. Ronald Nagle 1
Naval Environment Prediction Research
Facility
Monterey, CA 93940
23. CDR M.L. Sneiderman, Code 54 Zz 1
Department of Administrative Sciences
Naval Postgraduate School
Monterey, CA 93940
24. Mr. Jerry Norton, Code 68 g 1
Department of Oceanography
Naval Postgraduate School
Monterey, CA 93940
25. Mr. Dana Austin, Code 68 g 1
Department of Oceanography
Naval Postgraduate School
Monterey, CA 93940
26. Ms. Bonita Hunter, Code 68 g 1
Department of Oceanography
Naval Postgraduate School
Monterey, CA 93940
27. Ms. Andrea McDonald, Code 61 g 1
Department of Chemistry
Naval Postgraduate School
Monterey, CA 93940
28. Captain W.W. Reynolds, Code 35 1
Department of Oceanography
Naval Postgraduate School
Monterey, CA 93940
29. Commander 1
Area ASW Forces Sixth Fleet
LCDR John W. Conrad
U.S. Naval Support Activity, Naples
FPO New York 09521

- | | | |
|-----|--|---|
| 30. | LT Carol Jori, Code 35
Department of Oceanography
Naval Postgraduate School
Monterey, CA 93940 | 1 |
| 31. | LT Sherman H. Bronsink
HELSUPPRON Three
Naval Air Station North Island
San Diego, CA 92135 | 1 |
| 32. | Commandant G-PTE-1
United States Coast Guard
Washington, D.C. 20590 | 2 |
| 33. | Commanding Officer
USCG Oceanographic Unit
Bldg. 159-E, Navy Yard Annex
Washington, D.C. 20593 | 1 |
| 34. | LT Walter E. Hanson
USCG Oceanographic Unit
Bldg. 159-E, Navy Yard Annex
Washington, D.C. 20593 | 3 |

DATE
FILMED
-8