(1) Evaluation of Chl a algorithms for SeaWiFS

The Evaluation data set

Expected characteristics of the Evaluation data set :

1) it should contain Remote-sensing reflectances (Rrs) and Normalized Water-leaving radiances (Lwn) at or close to the SeaWiFS visible wavelengths (a prerequisite for the semi-analytical algorithms);

2) it should have the *in situ* chlorophyll *a* concentrations associated with the stations from which Rrs were derived;

3) it should encompass the widest possible chlorophyll a concentration range;

4) it should not contain data used for the development of the algorithms under evaluation;

5) it should be the same for all algorithms under evaluation.

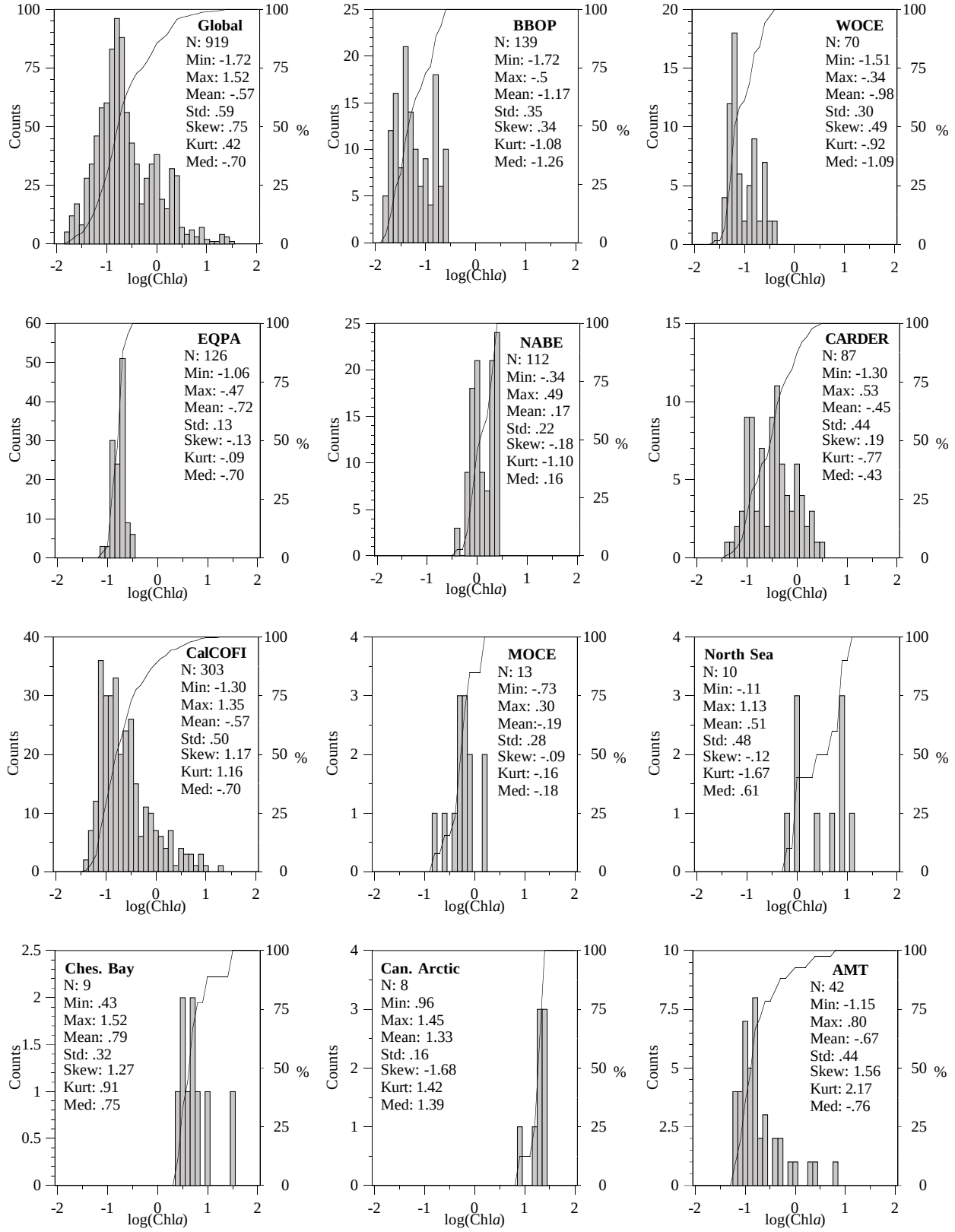
(2) Data sets in the global SeaBAM data set

Data set	Provider/PI	Measurements	Data processing
BBOP	D. Siegel	in water	Rrs = Lu(z)/Ed(z) (z < 5 m)
WOCE	J. Marra	in water	Rrs = Lu(z)/Ed(z) (z < 5 m)
EQPAC	C. Davis	in water	Rrs = Lu(z)/Ed(z) (z < 5 m)
NABE	C. Davis - C. Trees	in water	Rrs = Lu(z)/Ed(z) (z < 5 m)
CARDER	K. Carder	above water	Lsky corrected Lu/Ed(0+)
CALCOFI	G. Mitchell	in water	Rrs = Lw/Ed(0-) (extrap.)
MOCE	D. Clark	in water	Rrs = Lw/Ed(0+) (extrap.)
NORTH SEA	R. Doerffer	above water	Lsky corrected Lu/Ed(0+) CaseII
CHESAP. BAY	L. Harding	in water	Rrs = Lw/Ed(0+) (extrap.) CaseII
CANADIAN ARCTIC	G. Cota	in water	Rrs = Lw/Ed(0+) (extrap.)
AMT	G. Moore	in water	Rrs = Lw/Ed(0+) (extrap.)

(3) Characteristics of the data in the final version of the SeaBAM global data set.

Data set	n	f_chla	f_phaeo	h_chla	h_phaeo	Wavelengths (nm)					
BBOP92-93	72	72	72	72		410	441	488	520	565	665
BBOP94-95	67	61	61	67		410	441	488	510	555	665
WOCE	70	70				410	441	488	520	565	665
EQPAC	126			126		410	441	488	520	550	683
NABE (CHORS)	72			72		412	441	488	521	550	-
NABE (NRL)	40			40		410	441	488	520	550	683
CARDER	87	87				412	443	490	510	555	670
CALCOFI	303	303	303			412	443	490	510	555	665
MOCE1	8	8	0	8		412	443	490	510	555	-
MOCE2	5	5	5	5		412	443	490	510	555	-
North Sea	10			10		412	443	490	510	555	670
Ches. Bay	9			9	9	412	443	490	510	555	671
Can. Arctic 96	8	8	7			412	443	490	509	555	665
AMT	42	42		33		412	443	490	510	555	-

TOTAL	919	656	448	442	9



(4) Frequency distribution, cumulative frequency and statistics associated with the concentration of Chl a in the SeaBAM global dataset (upper left panel) and in the 11 subsets.

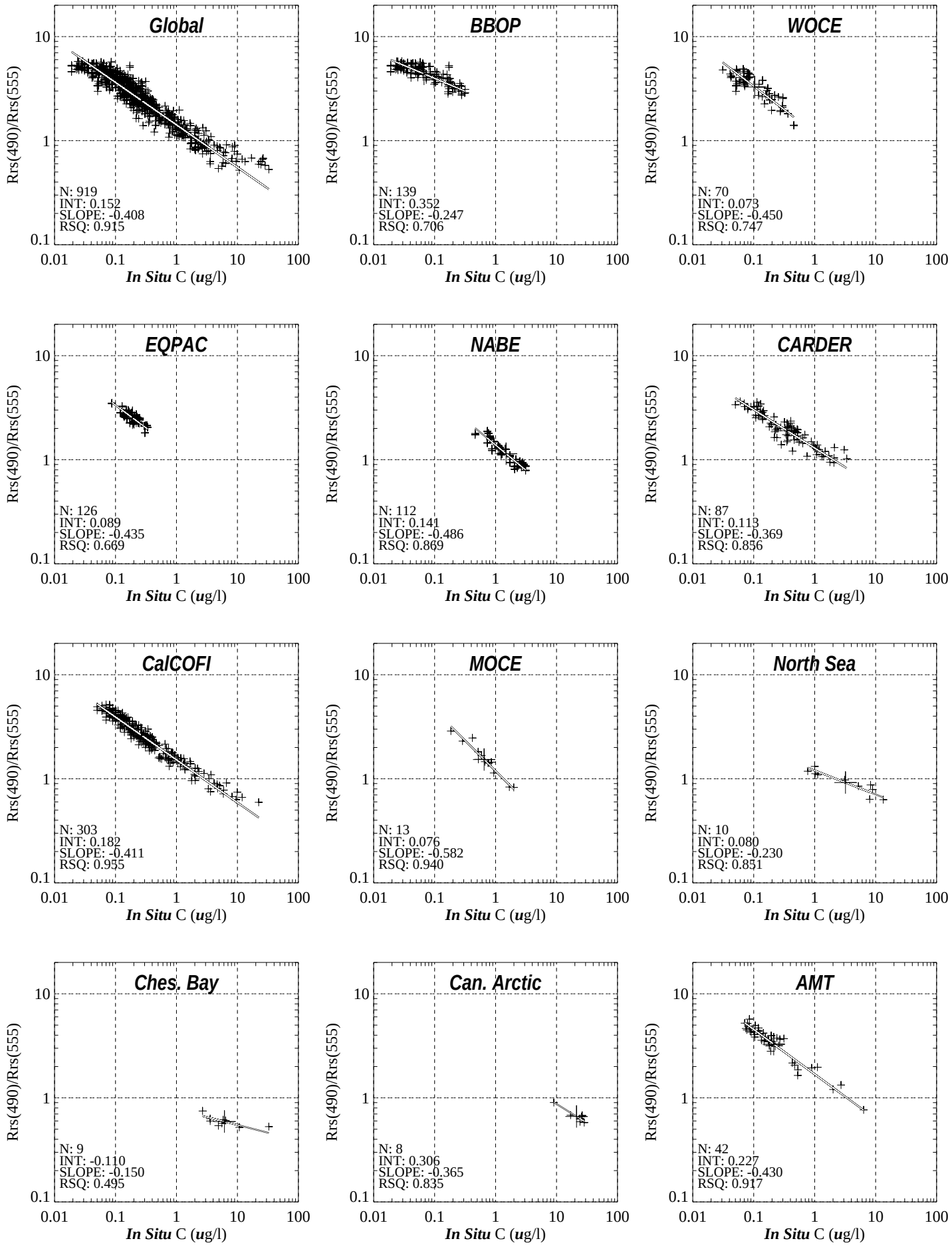


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FIGURE 5

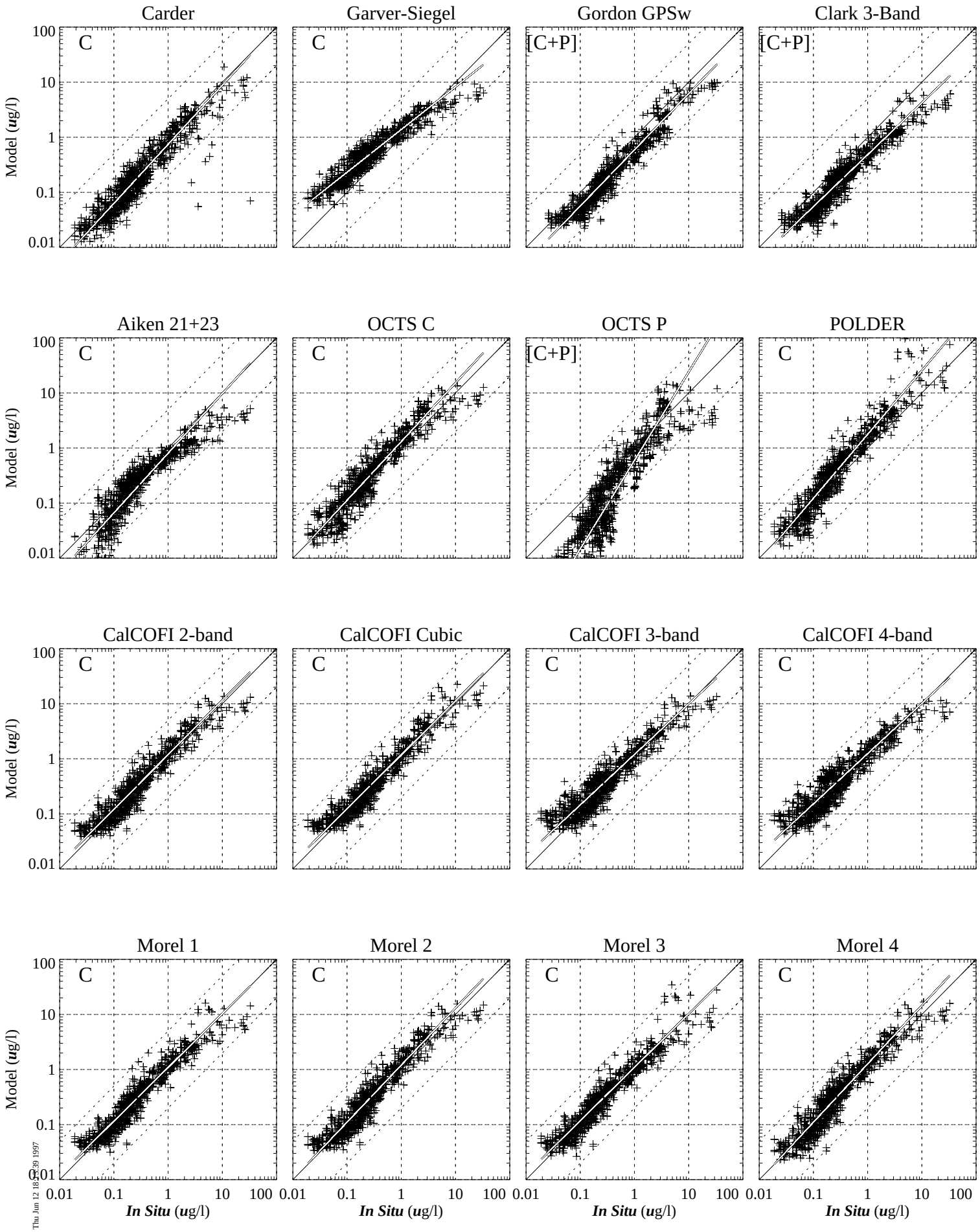
(6) Statistical and Graphical Criteria for Model Evaluation

Statistical	
Linear Regression Slope:	1 +- 0.01
Linear Regression Intercept:	0 +- 0.01
Bias:	0 +- 0.01
Coefficient of Determination (R^2):	>0.9
RMS:	<0.185
Negative estimates of C by model:	None
Graphical	
Scatter:	Linear distribution Few outliers (model:*in situ* >5:1 or <1:5) No curvature in tails of distribution
Quantile-Quantile:	Linear distribution Data overlap the 1:1 line No distributional discontinuities
Histogram Log (model/*in situ*):	Mode centered around 0 Symmetrical distribution Most ratios near 0 (=1:1) Low Standard Deviation (<0.185) Skewness near 0
Relative Frequency:	Congruency in overall distribution Coincident Modes

(7) Algorithms evaluated during the SeaBAM Workshop

	Algorithm	Type - Wavelengths
1	Carder	Semi-ana. - 412, 443, 490, 555
2	Siegel-Garver	Semi-ana. - all wavelengths
3	GPs*	Power - 443, 520, 550
4	Clark 3-B*	Power, 443, 520, 550
5	Aiken 21+23	Hyp.+Power - 490, 555
6	Aiken 22+24	Hyp.+Power - 490, 555
7	OCTS_C*	Power - 520, 565, 490
8	OCTS_CP*	Quad. - 443, 490, 520
9	Polder*	Cubic - 443, 565
10	CalCOFI 2-B L	Power - 490, 555
11	CalCOFI 2-B C	Cubic - 490, 555
12	CalCOFI 3-B*	Quad. - 490, 510, 555
13	CalCOFI 4-B*	Quad. - 412, 443, 510, 555
14	Morel 1	Power - 443, 555
15	Morel 2	Power - 490, 555
16	Morel 3	Cubic - 443, 555
17	Morel 3	Cubic - 490, 555

Power Power law
Cubic 3rd order Polynomial
Quad. 2nd order Polynomial
Hyp. Hyperbolic function
Semi-ana. Semi-analytical


Carder
Garver-Siegel
Gordon GPSw
Clark 3-Band
Aiken 21+23
OCTS C
OCTS P
POLDER
CalCOFI 2-band
CalCOFI Cubic
CalCOFI 3-band
CalCOFI 4-band
Morel 1
Morel 2
Morel 3
Morel 4
C
[C+P]
Model (ug/l)
In Situ (ug/l)
0.01
0.1
1
10
100
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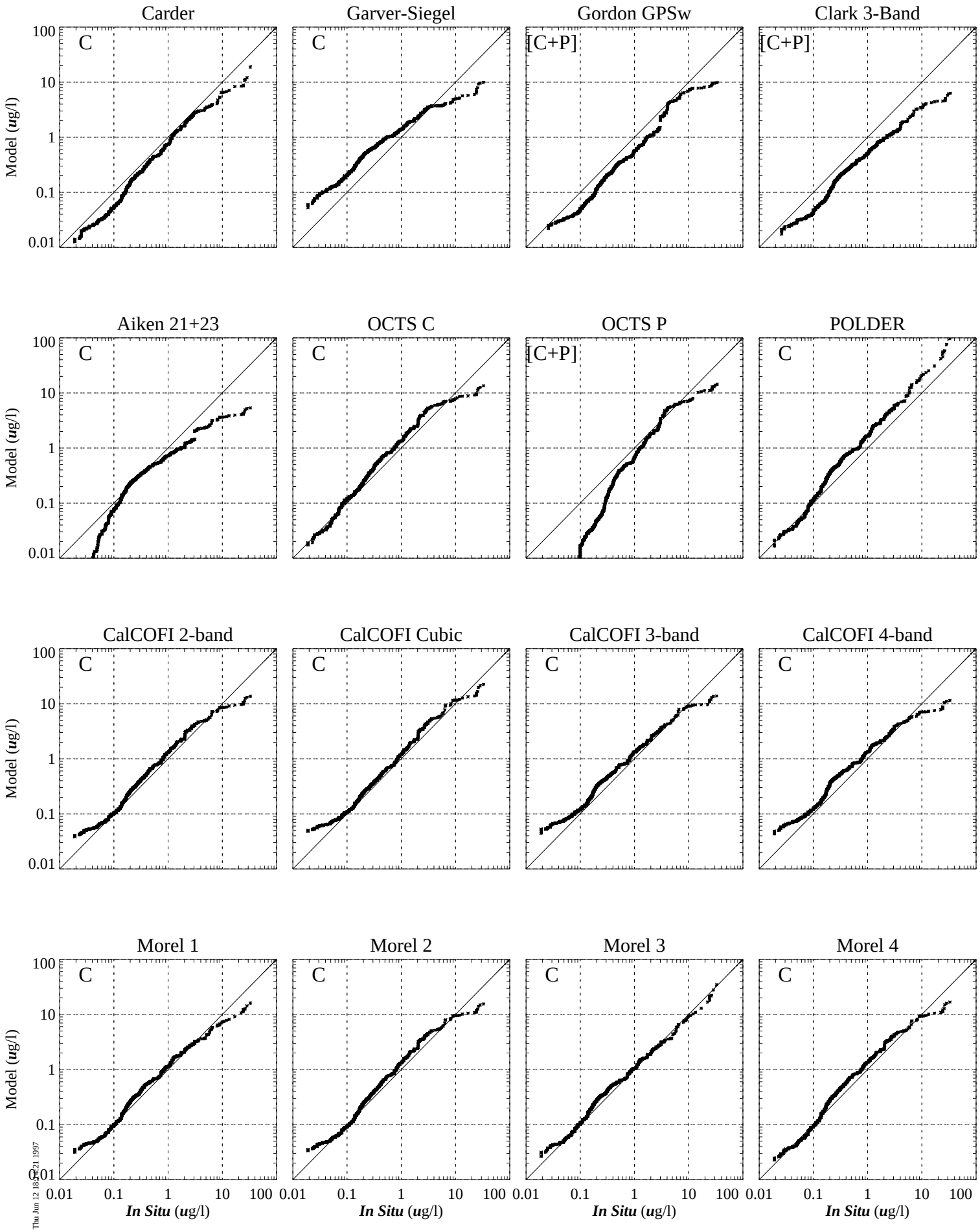
Carder
Garver-Siegel
Gordon GPSw
Clark 3-Band
Aiken 21+23
OCTS C
OCTS P
POLDER
CalCOFI 2-band
CalCOFI Cubic
CalCOFI 3-band
CalCOFI 4-band
Morel 1
Morel 2
Morel 3
Morel 4
C
[C+P]
Model (ug/l)
In Situ (ug/l)
0.01
0.1
1
10
100
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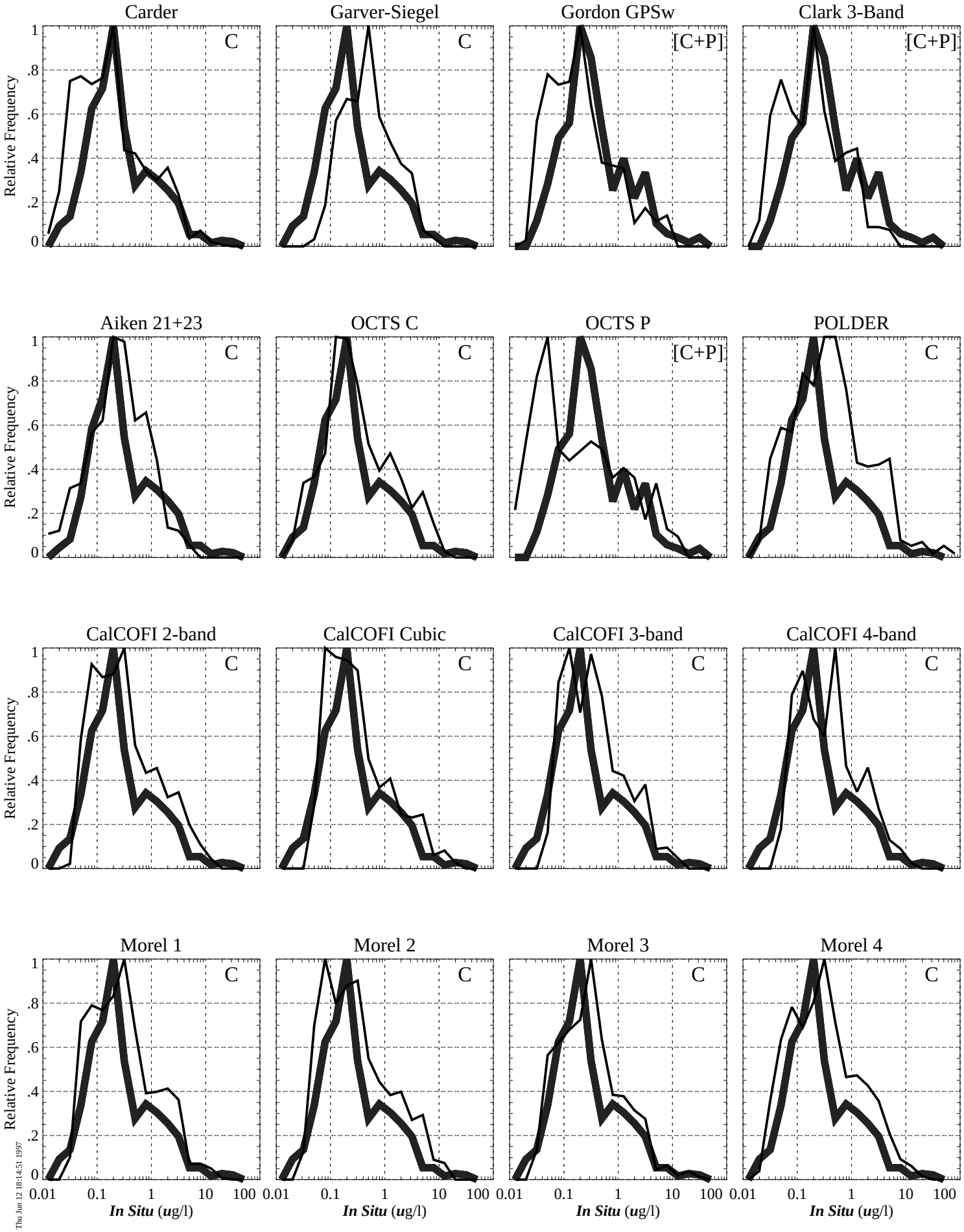
Carder
Garver-Siegel
Gordon GPSw
Clark 3-Band
Aiken 21+23
OCTS C
OCTS P
POLDER
CalCOFI 2-band
CalCOFI Cubic
CalCOFI 3-band
CalCOFI 4-band
Morel 1
Morel 2
Morel 3
Morel 4
C
[C+P]
Relative Frequency
0
.2
.4
.6
.8
1
0.01
0.1
1
10
100
In Situ (ug/l)
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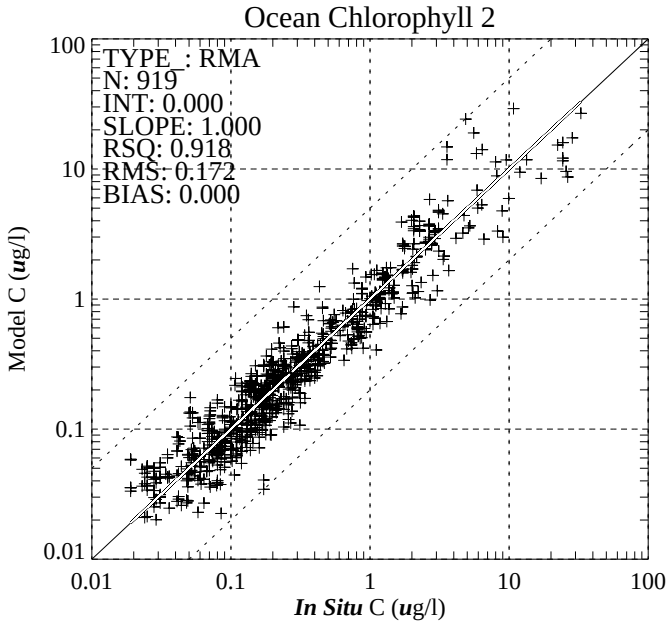
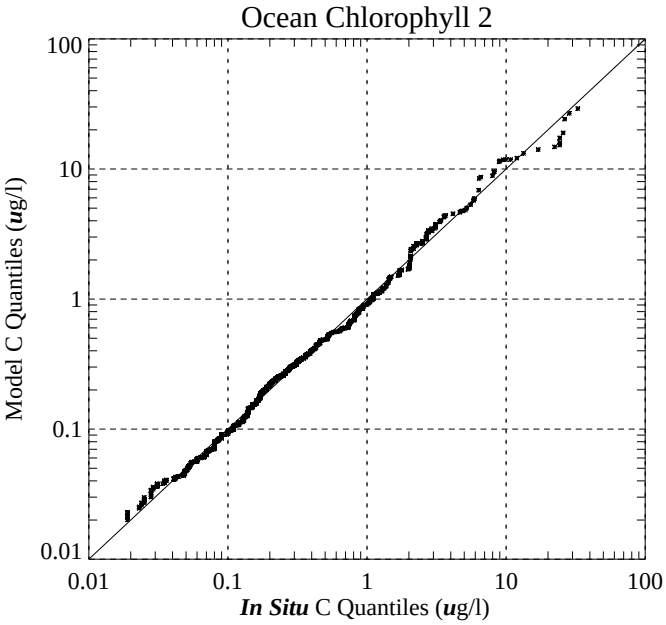
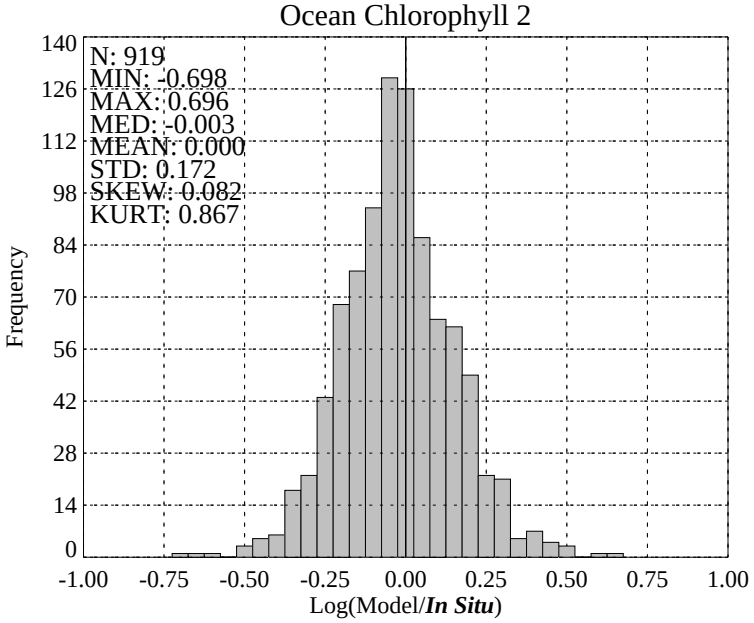
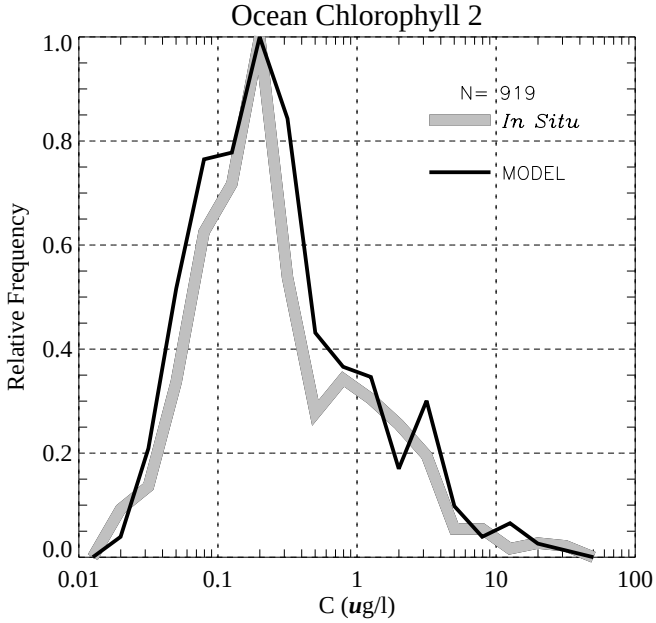
(11) General statistical results and ranks of the evaluated algorithms																	
Rank	**Algorithm**	**Type - Wavelengths**	**N**	**Intercept**	**Slope**	**Rsq**	**RMS1**	**Bias**		int	slope	rsq	rms	bias	sum	non-lin.	Discont.
1	Morel 1	Power - 443, 555	919	0.038	0.975	0.917	0.179	0.052		1	4	5	1	2	13	*	
2	Morel 3	Cubic - 443, 555	919	0.04	0.97	0.915	0.183	0.058		2	5	6	2	3	18		
3	CalCOFI 2-B C	Cubic - 490, 555	919	0.072	0.98	0.918	0.19	0.083		5	3	4	3	7	22		
3	OCTS_C*	Power - 520, 565, 490	919	0.054	1.148	0.933	0.19	-0.03		3	14	1	3	1	22	*	
5	Morel 2	Power - 490, 555	919	0.081	1.037	0.915	0.19	0.06		8	6	6	3	4	27		
5	CalCOFI 2-B L	Power - 490, 555	919	0.074	0.991	0.915	0.192	0.079		7	2	6	6	6	27	*	
7	CalCOFI 3-B*	Quad. - 490, 510, 555	919	0.062	0.939	0.908	0.205	0.097		4	8	10	8	8	38		
8	Morel 4	Cubic - 490, 555	919	0.102	1.059	0.907	0.204	0.069		10	7	11	7	5	40		
9	GPs*	Power - 443, 520, 550	919	-0.239	1.004	0.923	0.292	-0.241		15	1	2	12	14	44		*
10	CalCOFI 4-B*	Quad. - 412, 443, 510, 555	919	0.073	0.934	0.9	0.218	0.11		6	9	13	9	10	47		
11	Polder*	Cubic - 443, 565	919	0.215	1.19	0.921	0.241	0.107		14	15	3	10	9	51		
12	Carder	Semi-ana. - 412, 443, 490, 555	919	-0.128	1.073	0.872	0.284	-0.169		12	10	15	11	13	61		
13	Aiken 21+23	Hyp.+Power - 490, 555	877	-0.094	1.083	0.774	0.33	-0.139		9	11	17	14	11	62	*	*
14	Aiken 22+24	Hyp.+Power - 490, 555	877	-0.12	1.118	0.787	0.339	-0.168		11	13	16	15	12	67	*	*
15	Clark 3-B*	Power, 443, 520, 550	919	-0.306	0.913	0.905	0.323	-0.267		16	12	12	13	15	68		
16	Siegel-Garver	Semi-ana. - all wavelengths	919	0.141	0.776	0.896	0.345	0.269		13	16	14	16	16	75		
17	OCTS_CP*	Quad. - 443, 490, 520	919	-0.345	1.75	0.913	0.842	-0.68		17	17	9	17	17	77	*	

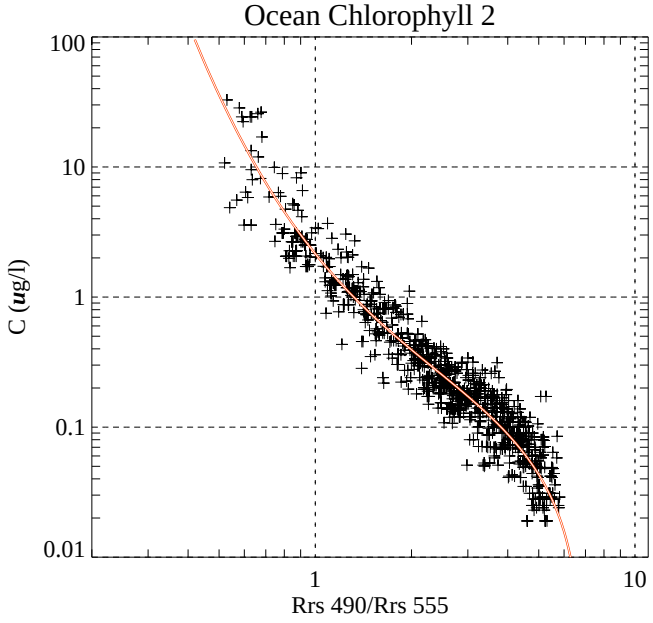
	Power	Power law
	Cubic	3rd order Polynomial
	Quad.	2nd order Polynomial
	Hyp.	Hyperbolic function
	Semi-ana.	Semi-analytical
	MPC	Modified Cubic Polynomial











Ocean Chlorophyll 2 (OC2)

$R = \mathrm{Log}_{10}(Rrs490/Rrs555)$

a = [0.341 -3.001 2.811 -2.041 -0.040]

$Chl\ a = 10^{(a_0+a_1R+a_2R^2+a_3R^3)} + a_4$

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Thu Apr 24 14:34:25 1997