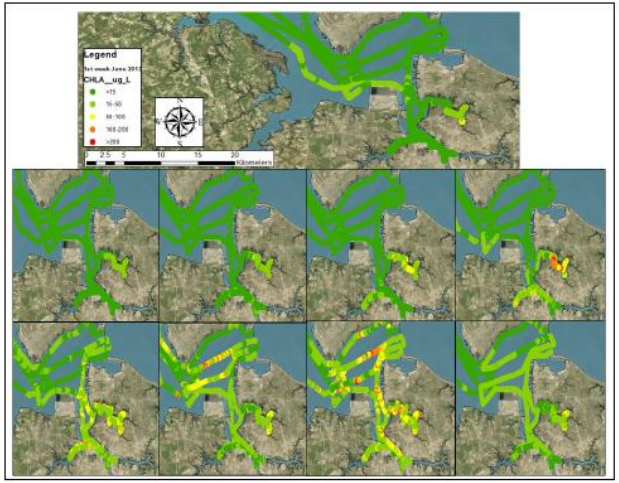

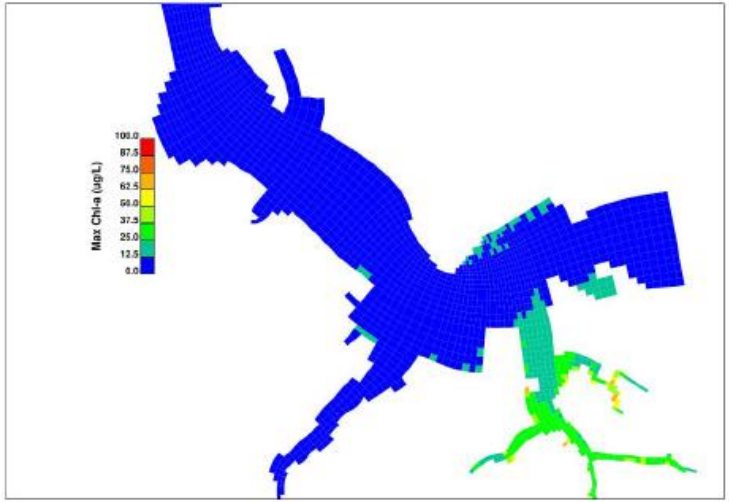

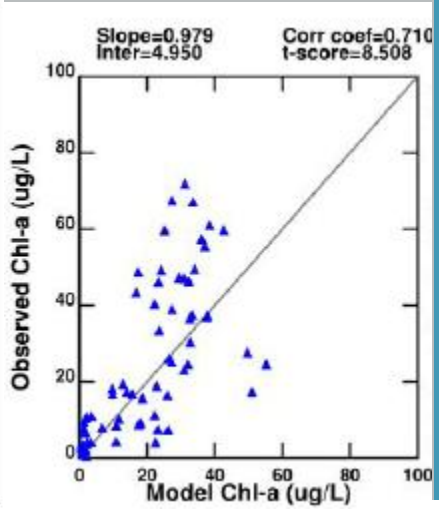

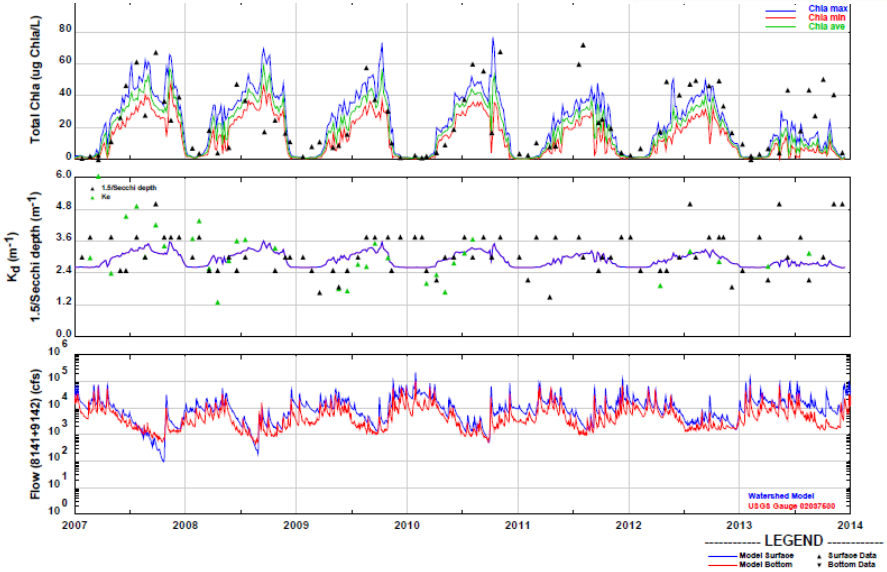

JAMES RIVER ESTUARY HAB CALIBRATION

Jim Fitzpatrick
Nataliya Kogan

© 2014 HDR, Inc., all rights reserved.

- Linkage to watershed and hydrodynamic models (Nik and Jian)
- Simulated freshwater diatoms, greens and *Microcystis* and marine diatoms, mixed group and *Cochlodinium*
- HABs – low growth rates, but vertical migration (buoyancy or swimming) to optimize exposure to light and access to nutrients and lower grazing pressure and temperature optima/ranges
- Sediment seeding versus upstream sources versus low background levels
- Acknowledge data and HAB discussions with Todd Egerton, Paul Bukaveckas, Hans Paerl, Margie Mulholland, and KC Fillipino and Iris Anderson for sediment flux data

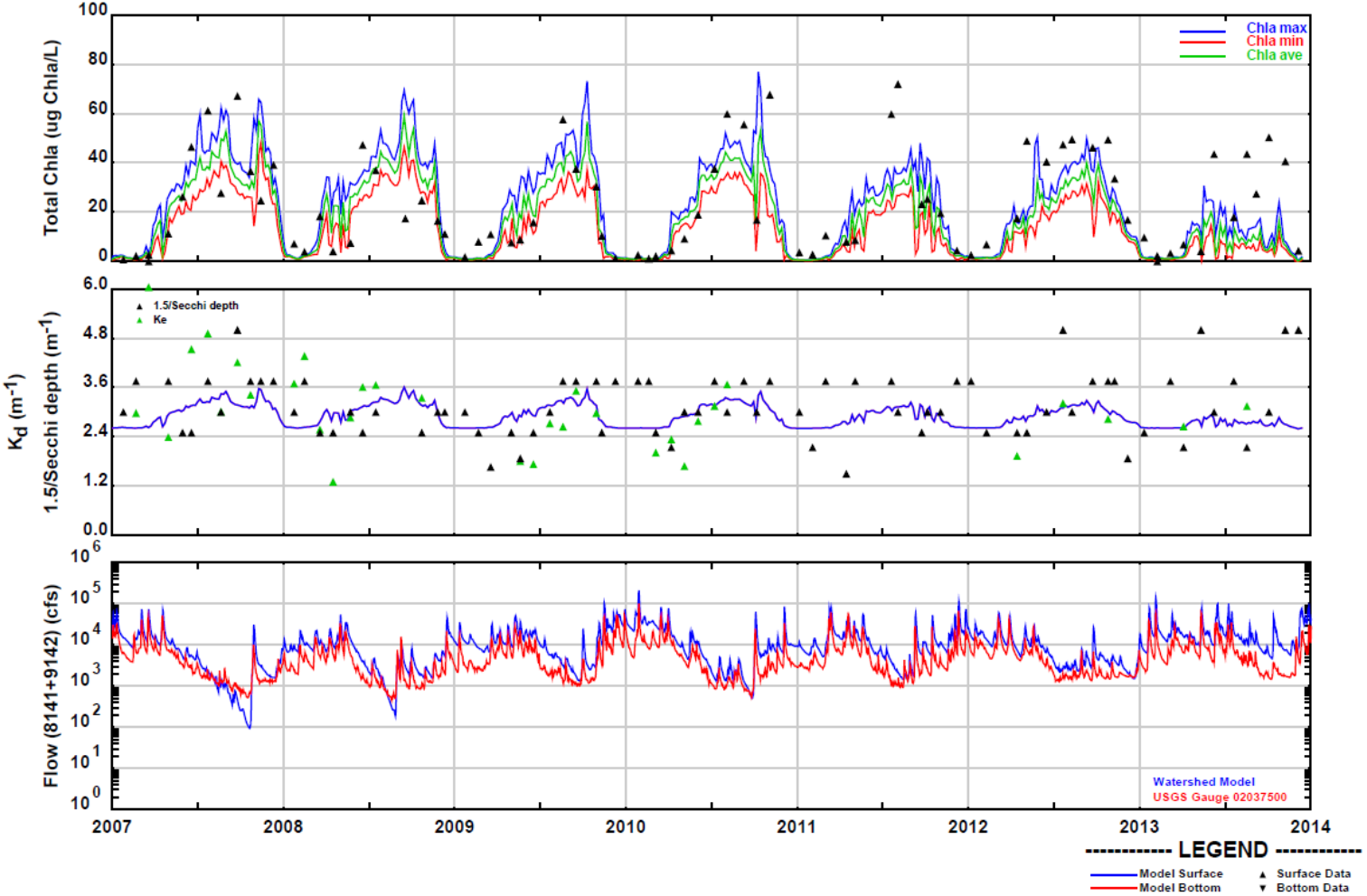

Figure 4-15b. Calibration results for station TF5.5

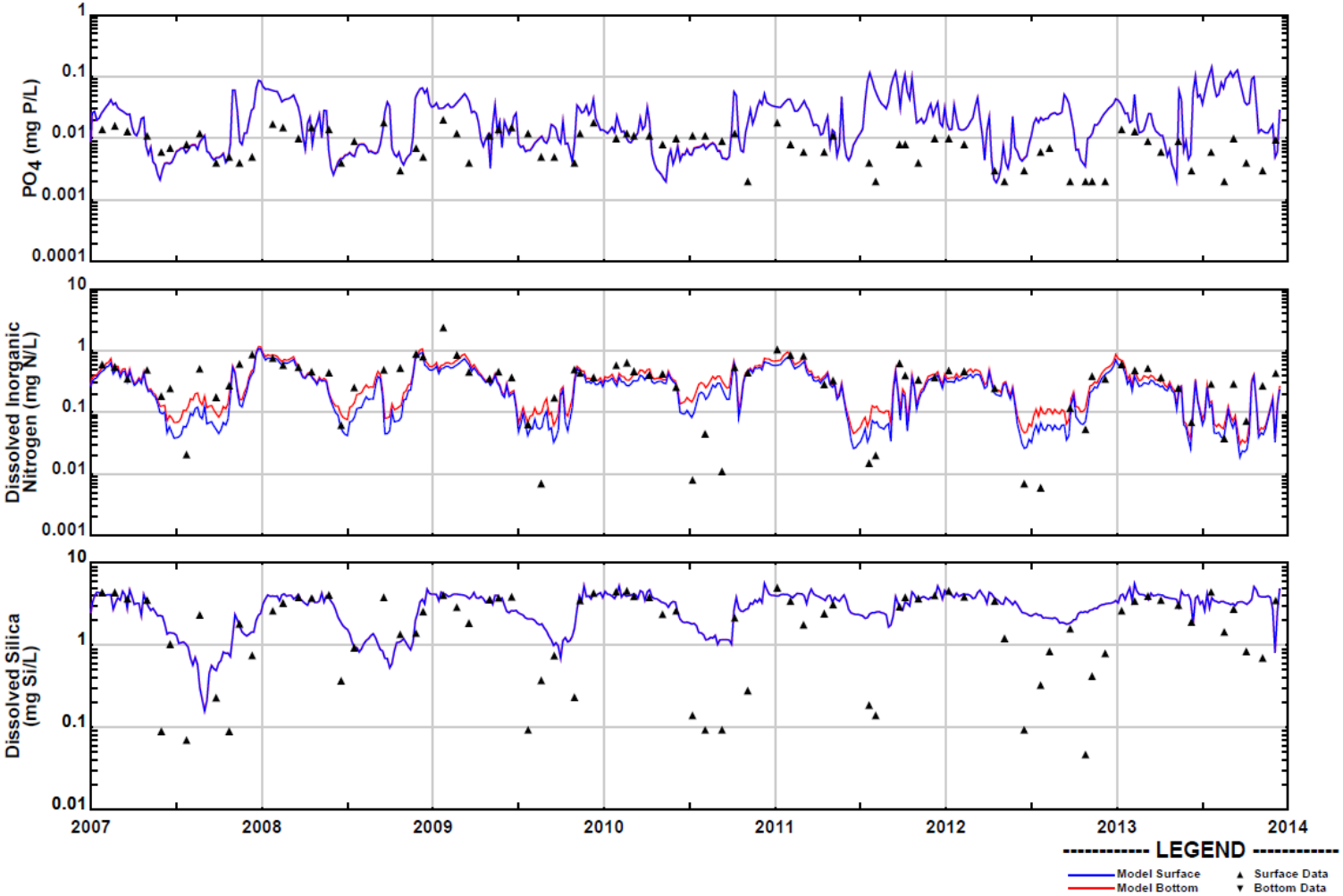

Figure 4-15c. Calibration results for station TF5.5

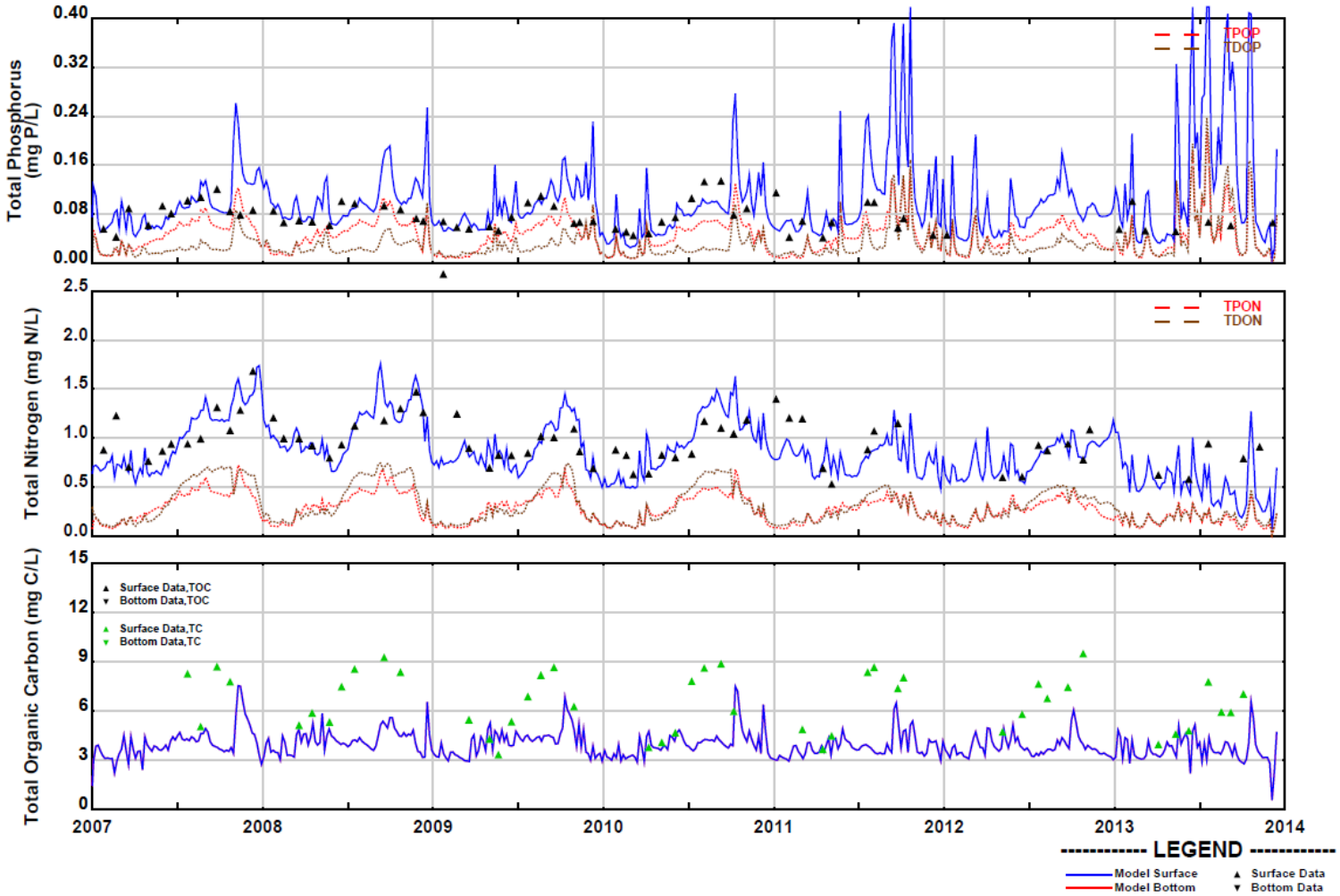

Figure 4-15d. Calibration results for station TF5.5

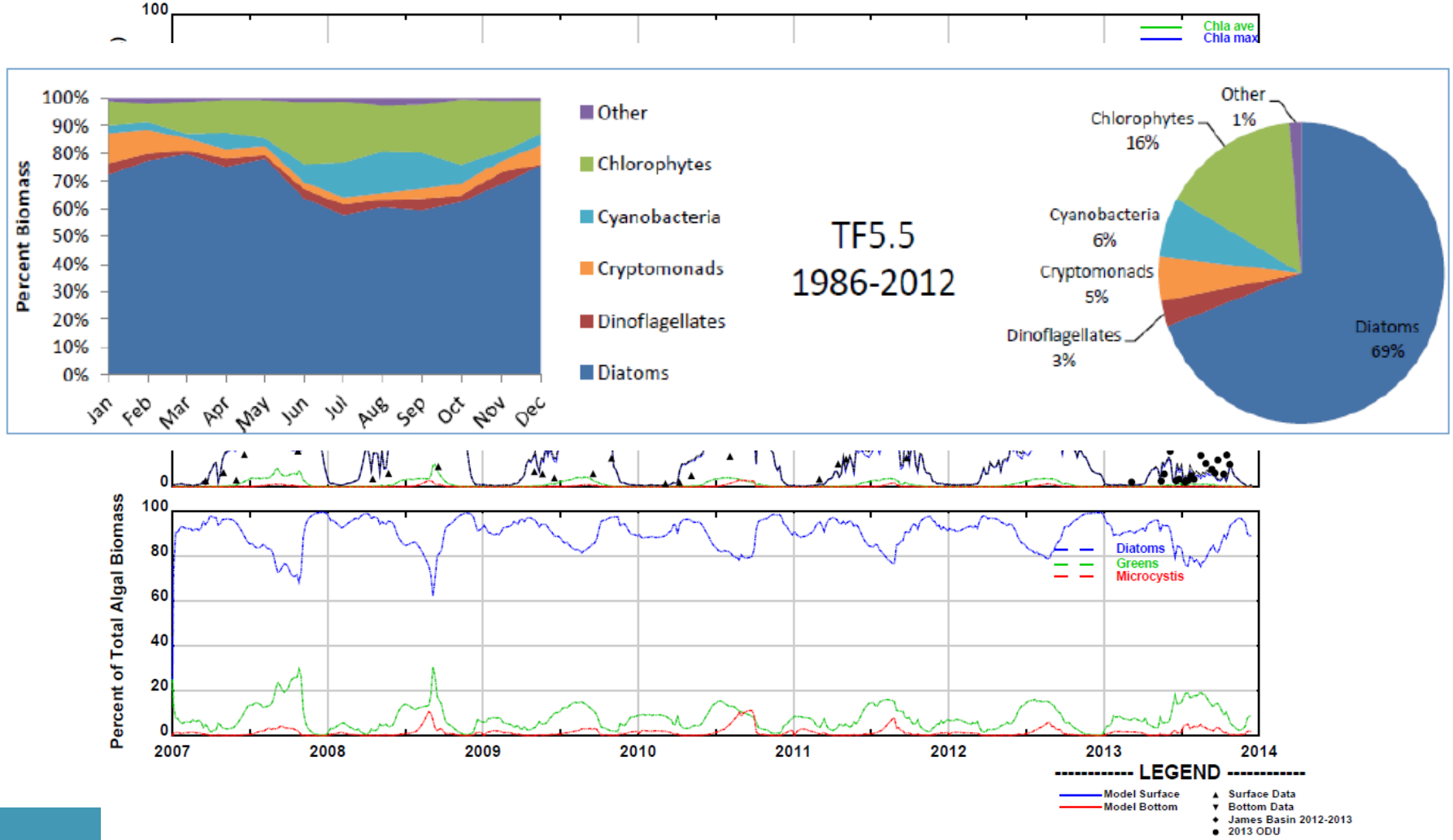

Figure 4-15g. Calibration results for station TF5.5

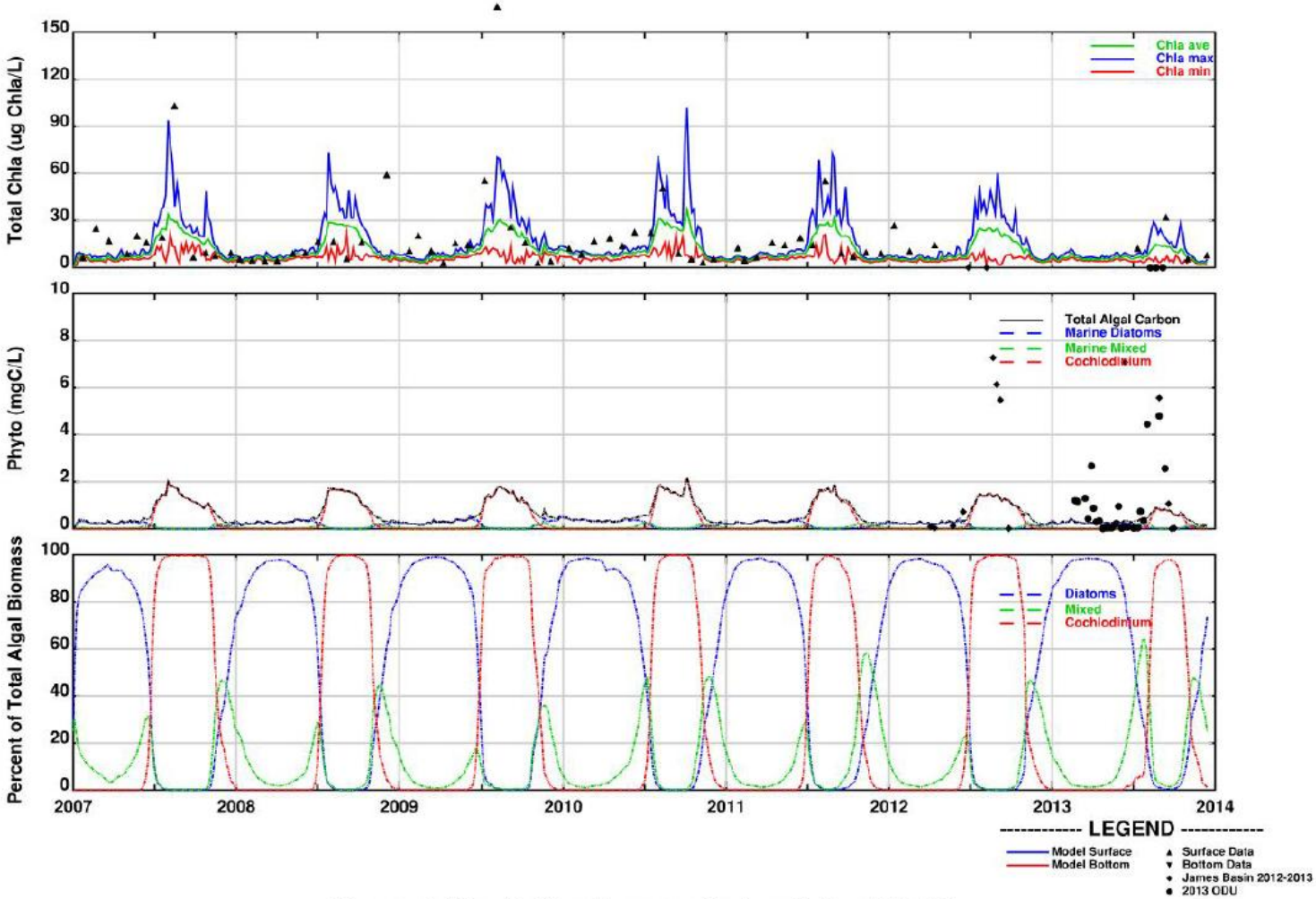

Figure 4-26g. Calibration results for station LFB01

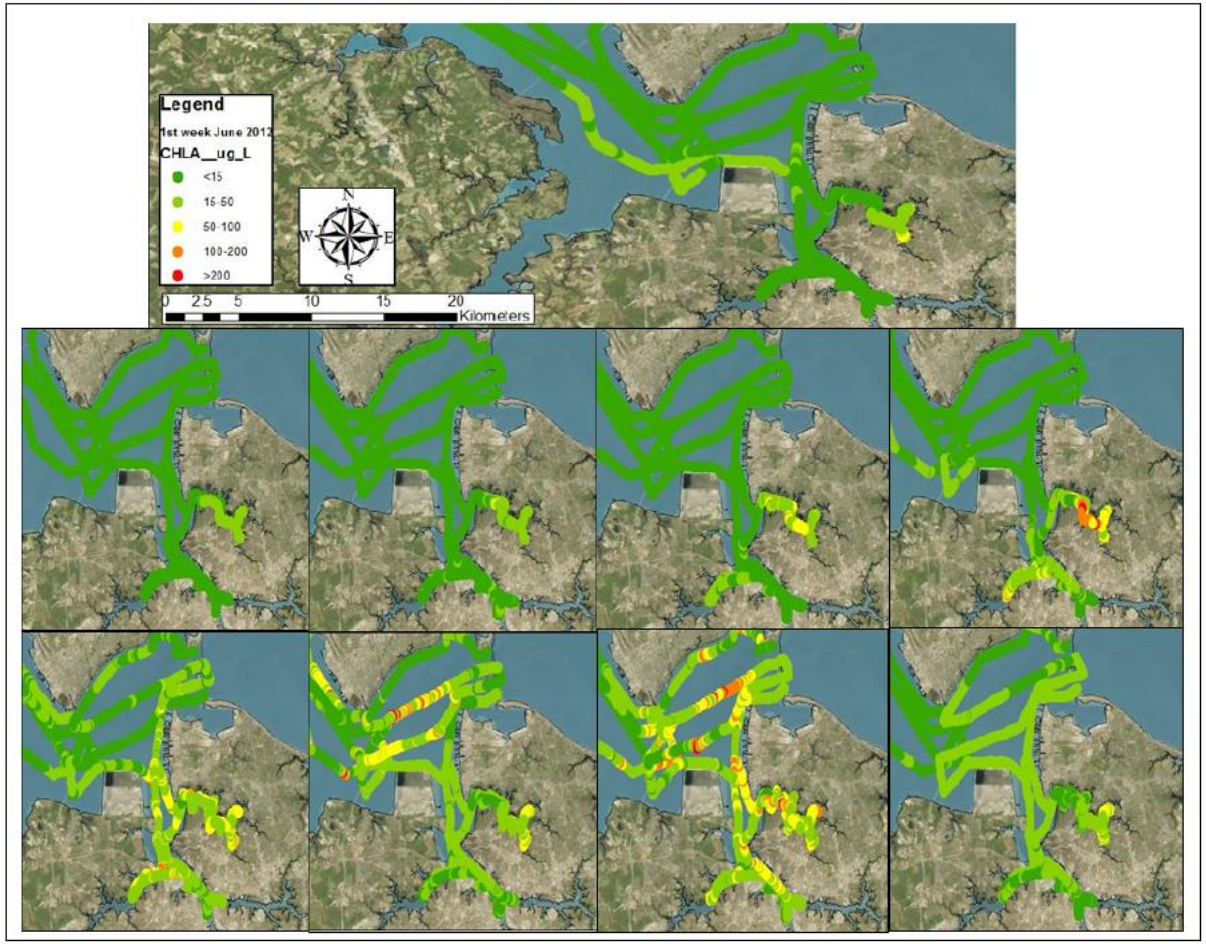

Figure 4-27. Development of a *C. polykrikoides* bloom during the summer of 2012 based on DataMon data (weekly cruises starting in the first week of June through the first week in August).

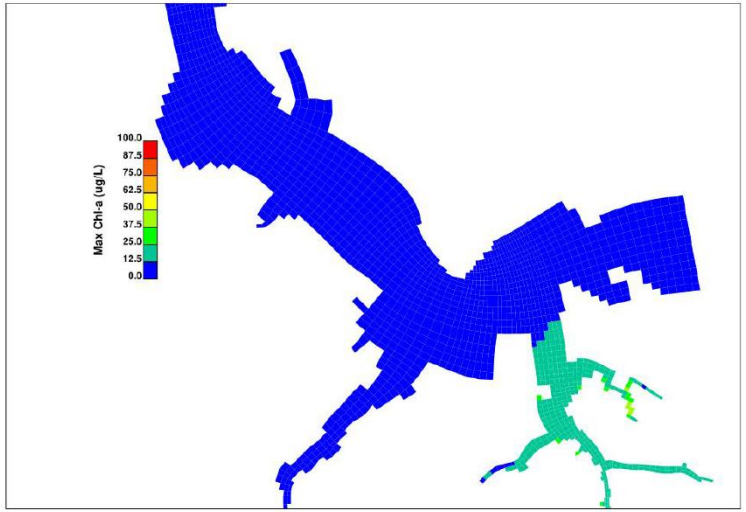

Figure 4-28a. Chlorophyll Biomass for June 03, 2012 (Calibration)

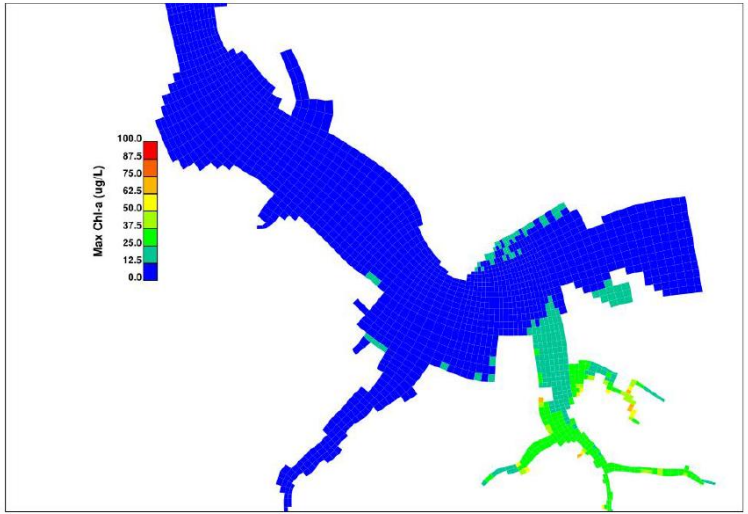

Figure 4-28b. Chlorophyll Biomass for June 13, 2012 (Calibration)

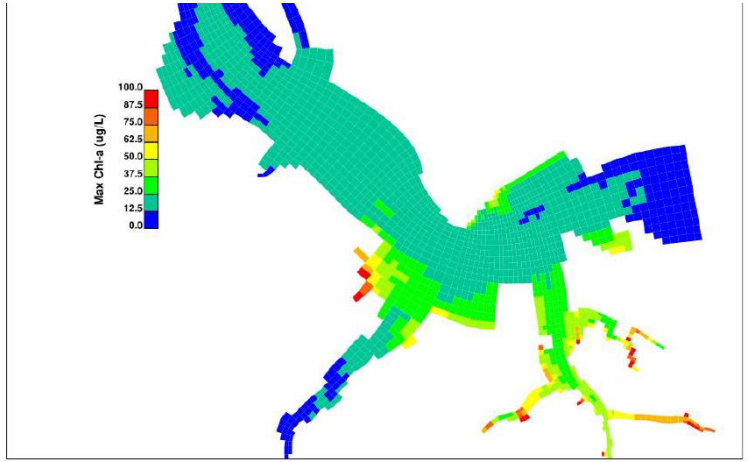

Figure 4-28c. Chlorophyll Biomass for June 23, 2012 (Calibration)

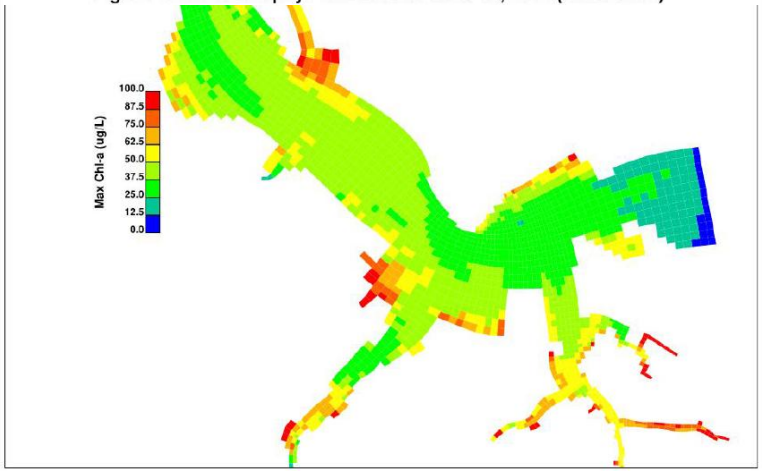

Figure 4-28g. Chlorophyll Biomass for August 02, 2012 (Calibration)

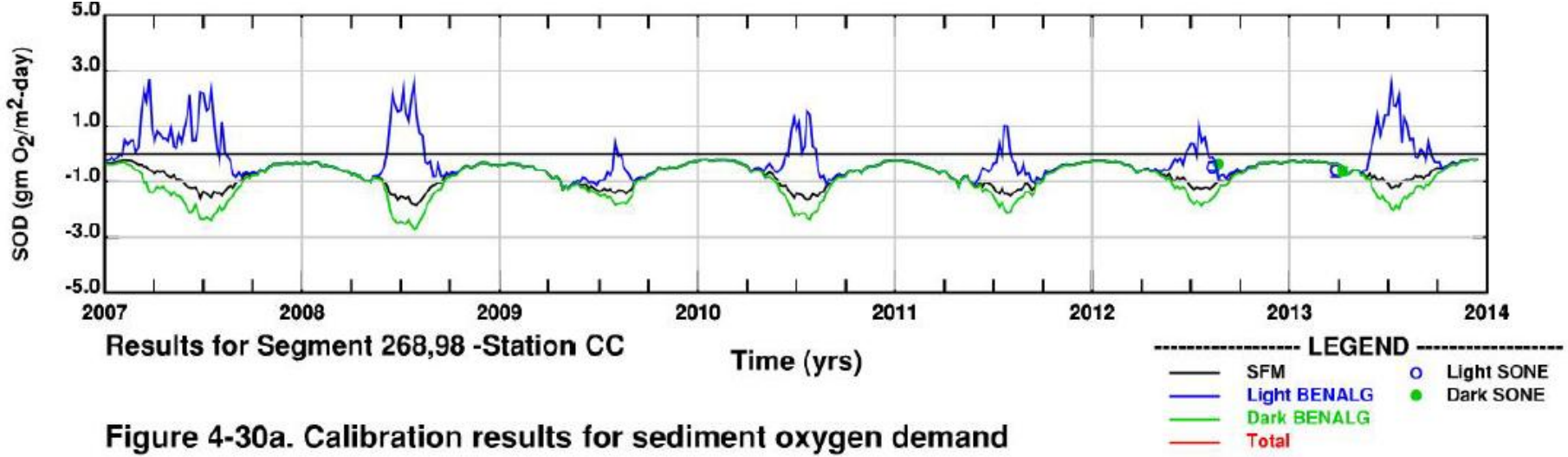

Figure 4-30a. Calibration results for sediment oxygen demand

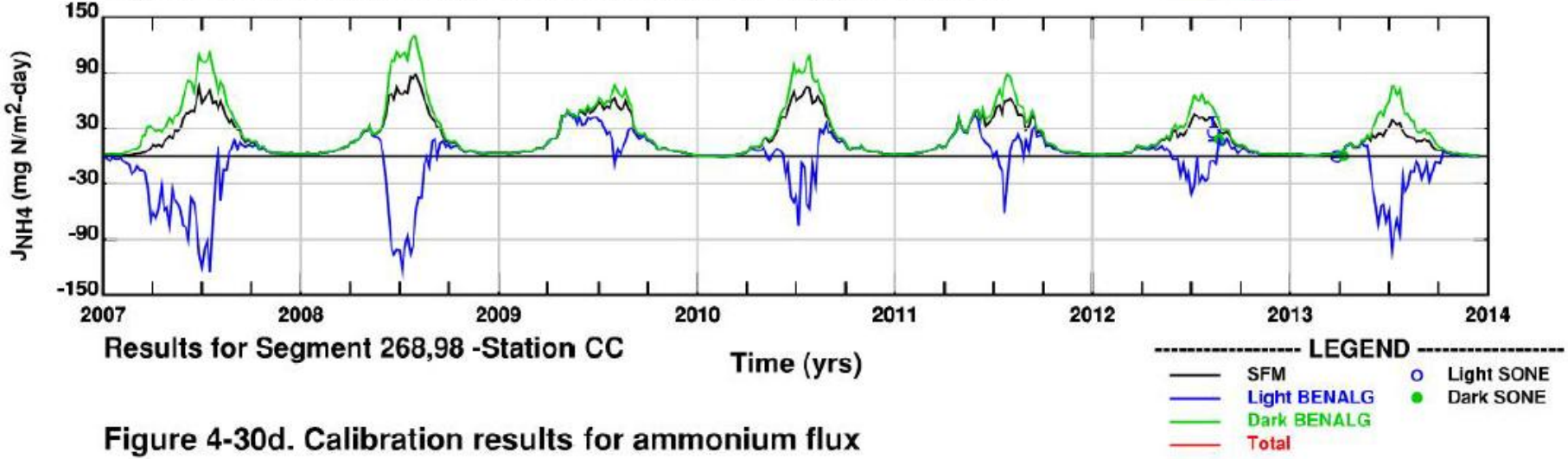

Figure 4-30d. Calibration results for ammonium flux

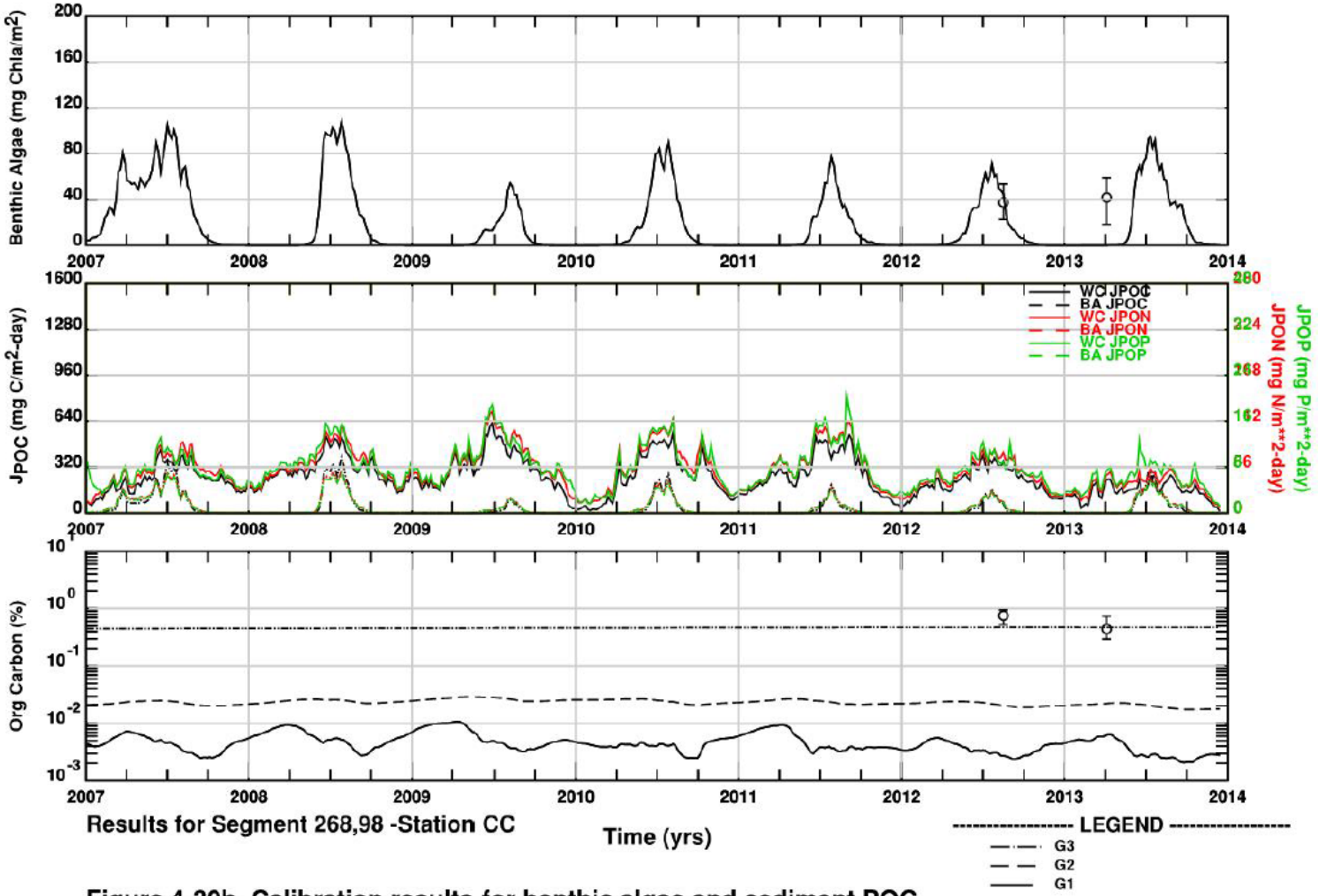

Figure 4-30b. Calibration results for benthic algae and sediment POC

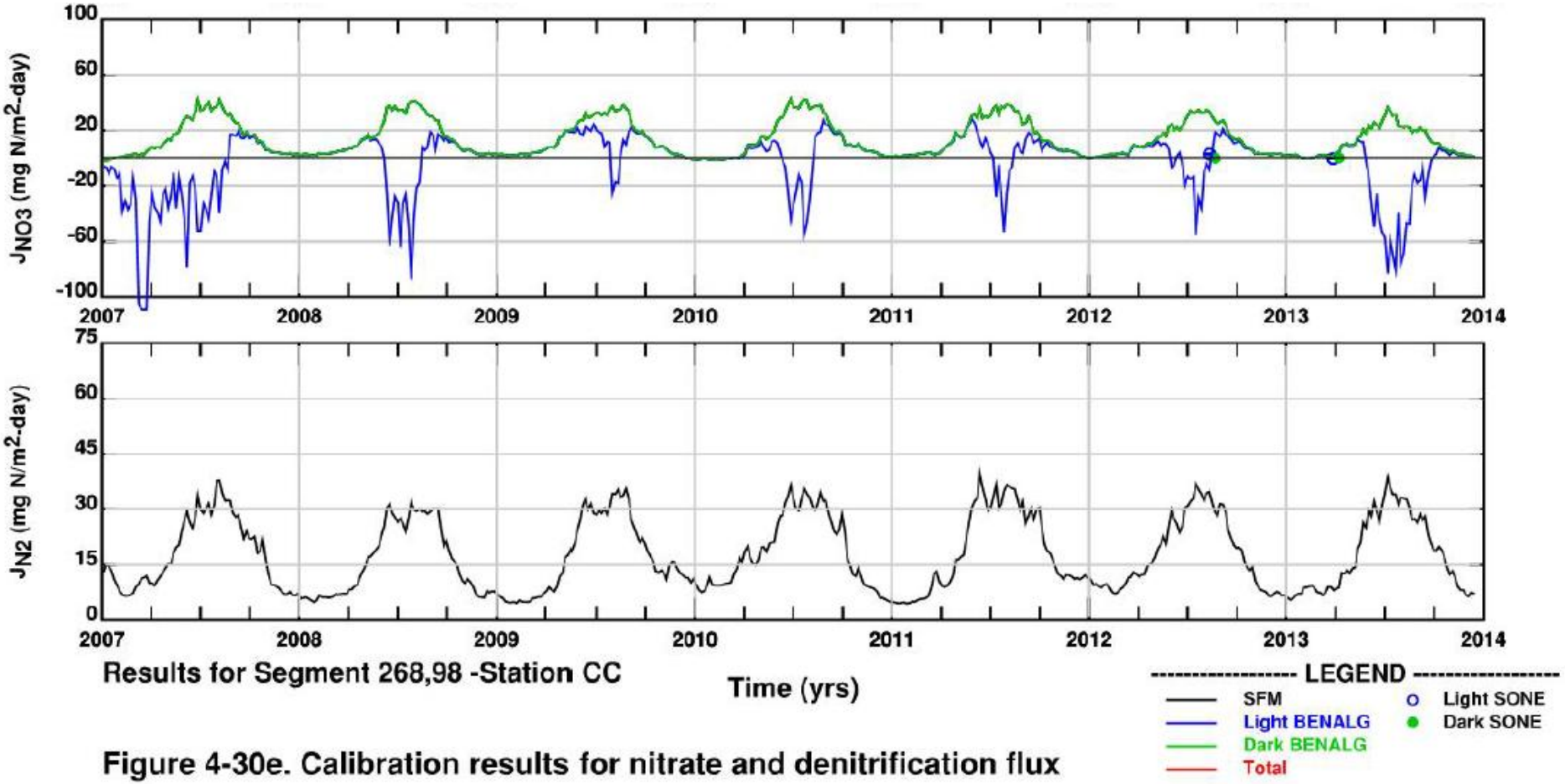

Figure 4-30e. Calibration results for nitrate and denitrification flux

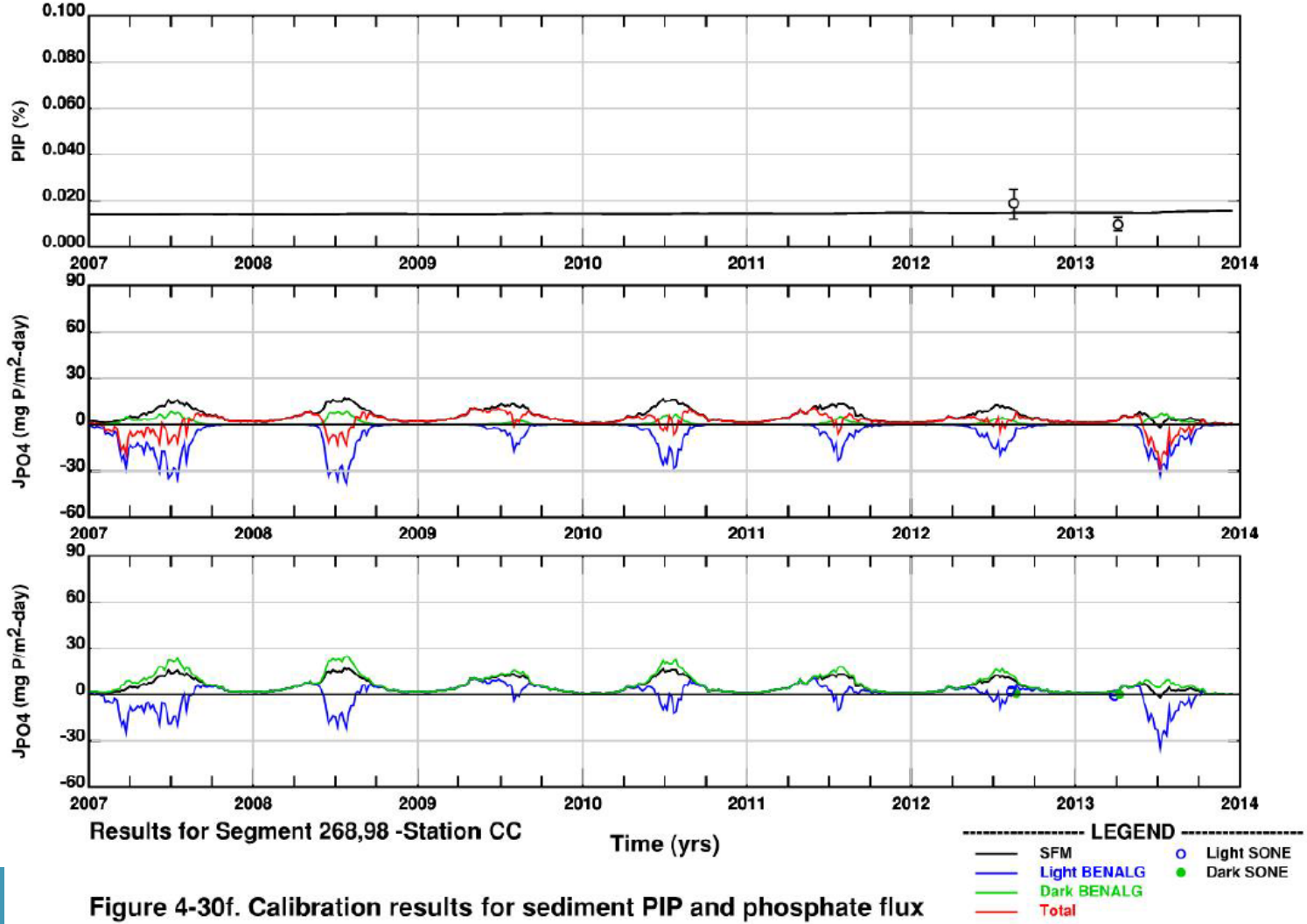

Figure 4-30f. Calibration results for sediment PIP and phosphate flux

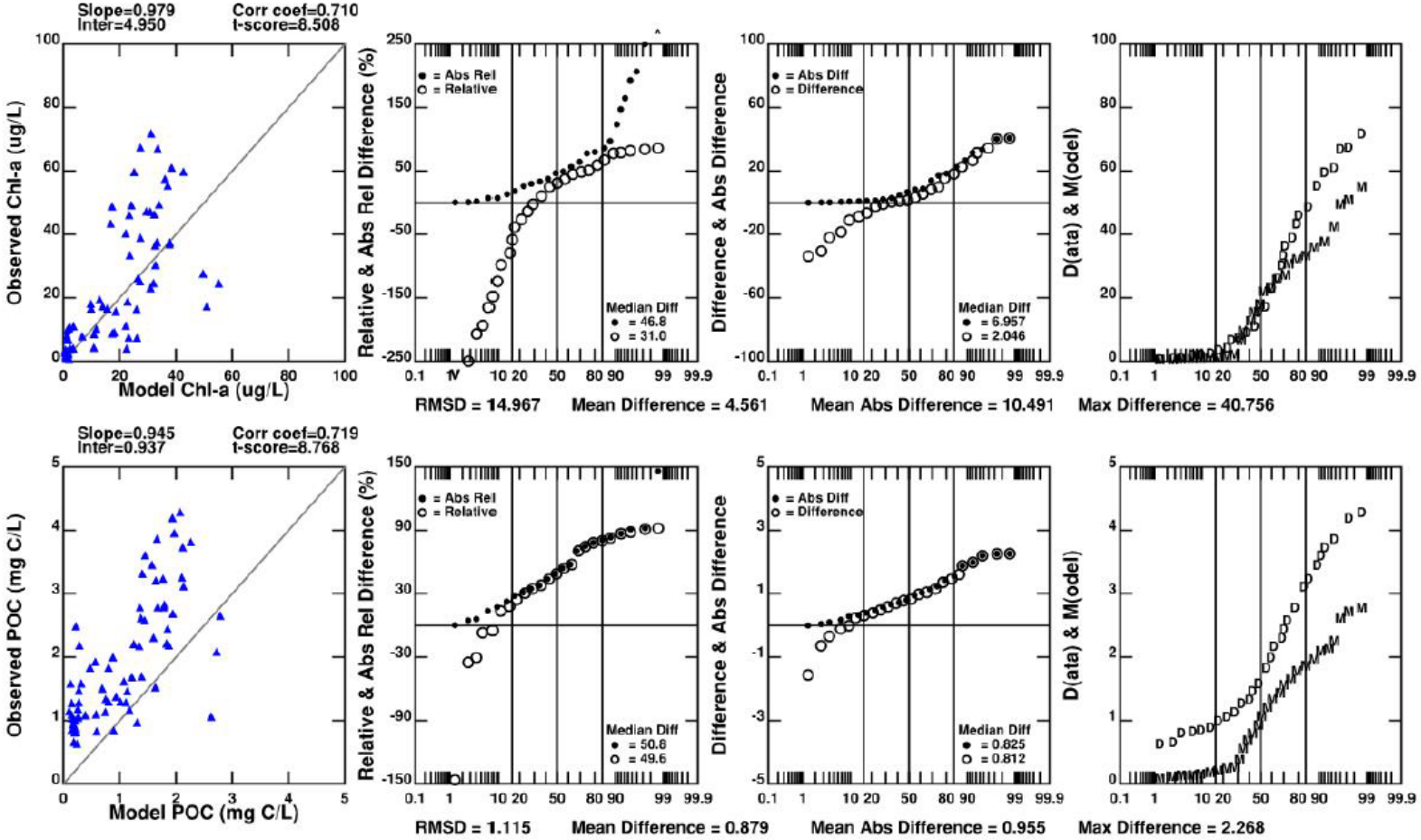

Figure 4-31a. Model skill assessment for Chlorophyll and POC for station TF5.5

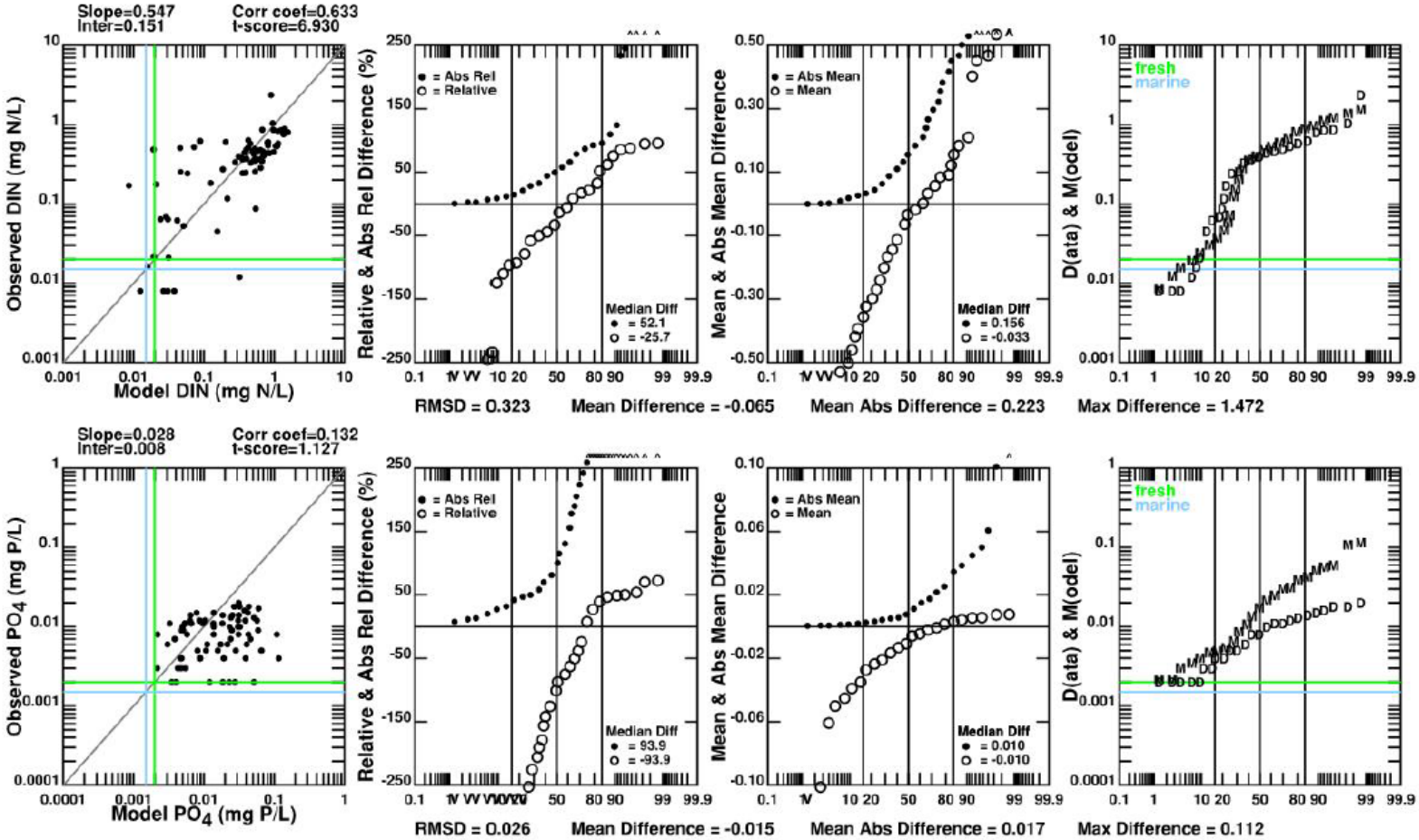

Figure 4-31c. Model skill assessment for DIN and PO_4 for station TF5.5

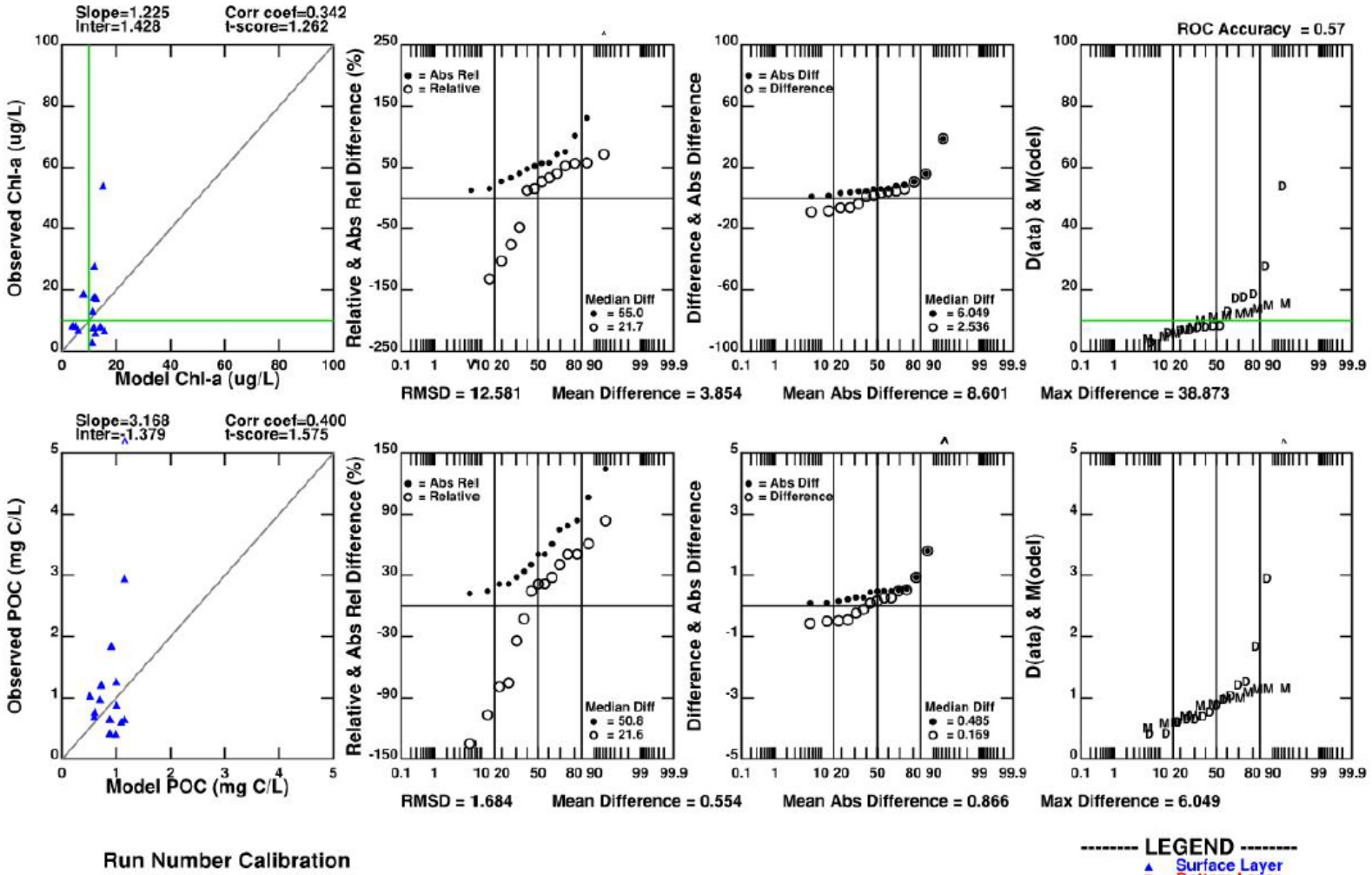

Figure 4-39a. Summer model skill assessment for Chlorophyll and POC for station LE5.4

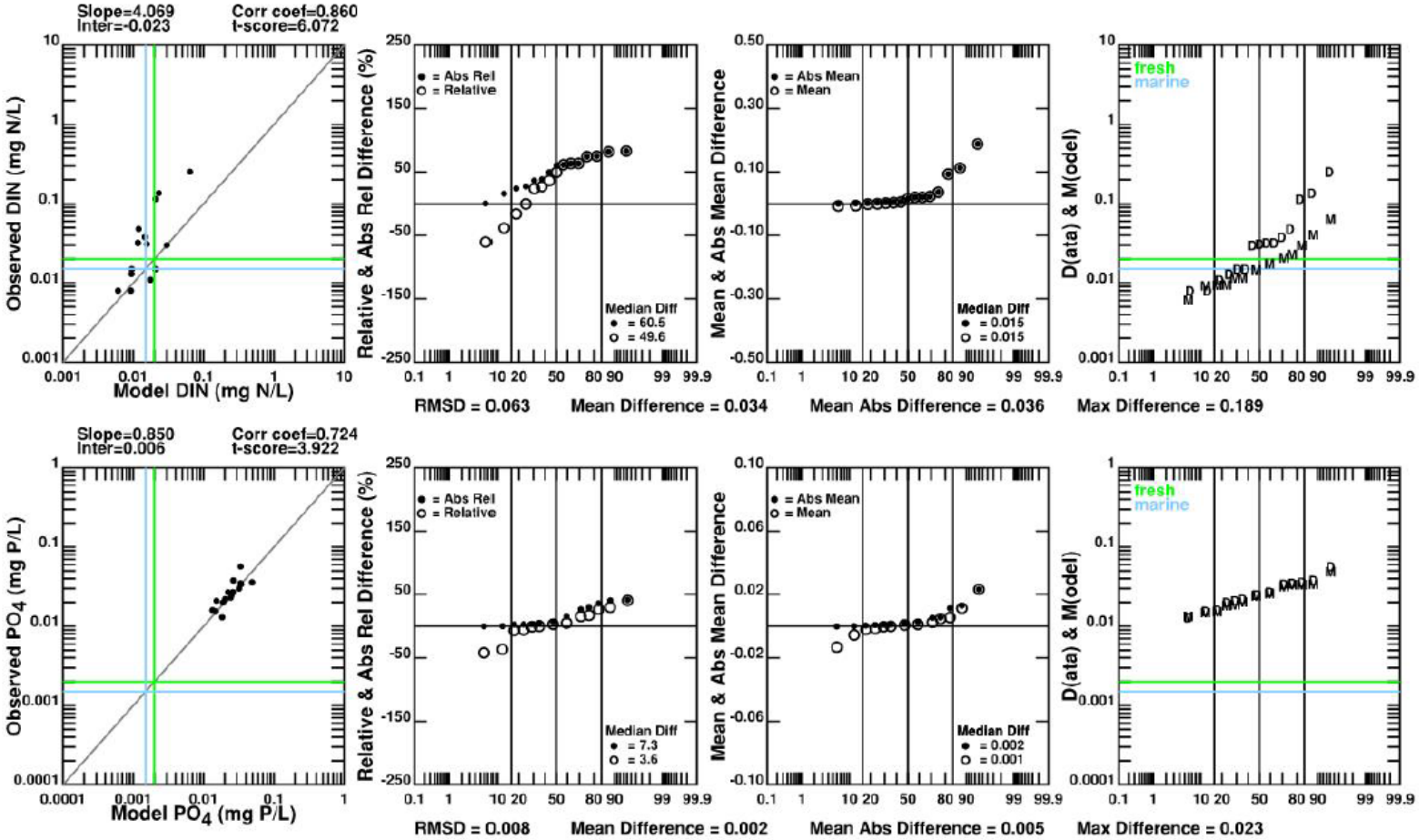

Figure 4-39b. Summer model skill assessment for DIN and PO_4 for station LE5.4

Table 4-6. Skill assessment for chlorophyll for calibration using all data

Station	Correl Coeff	Median Relative Difference (%)	Median Abs Rel Difference (%)	Median Difference (ug/L)	Mean Difference (ug/L)	Median Absolute Difference (ug/L)	Mean Absolute Difference (ug/L)	RMSD (ug/L)	Maximum Difference (ug/L)
TF5.2	0.07	0.8	53.7	0.0	1.2	0.5	1.8	4.4	25.3
TF5.2A	0.30	-130.3	130.3	-1.2	-4.3	1.9	7.7	14.1	46.4
TF5.3	0.67	-84.1	84.4	-1.2	-6.6	1.7	7.5	15.3	57.4
TF5.4	0.67	26.6	50.8	1.1	1.3	7.1	9.9	13.8	38.6
TF5.5	0.71	31.0	46.8	2.1	4.6	7.0	10.5	15.0	40.8
TF5.5A	0.52	21.9	59.6	1.6	2.8	9.2	10.9	14.4	45.5
TF5.6	0.15	-51.9	82.2	-2.8	-2.6	7.3	8.2	10.3	26.1
RET5.2	0.34	-14.5	49.9	-0.9	0.0	3.1	4.1	5.5	15.0
LE5.1	0.05	-0.1	40.2	0.0	2.6	2.4	6.4	20.9	161.1
LE5.2	0.13	-43.3	78.2	-2.1	5.6	4.8	12.2	30.2	184.8
LE5.3	0.14	0.1	48.5	0.0	1.5	3.8	7.2	13.0	73.7
LE5.4	0.24	44.7	55.4	3.6	3.7	4.7	6.0	8.4	38.9
LE5.5-W	0.25	47.6	56.3	4.6	5.3	4.6	6.2	10.6	68.9
LE5.6	0.33	16.6	40.3	1.8	0.7	4.2	6.0	8.2	26.7
LFA01	0.05	9.9	49.8	0.9	-0.9	5.1	6.8	9.6	39.6
LFB01	0.40	33.0	51.5	3.2	10.8	6.3	15.6	48.4	360.5
Average	0.31	-5.8	61.1	0.7	1.6	4.6	7.9	15.1	78.1

Table Add.4-2 (cont). Inter model comparisons

TF5.5							HDR	VIMS	VIMSHAB
Year	HDR Mean	VIMS Mean	Student T-Test	VIMSHAB Mean	Student T-Test	Data Mean	Student T-Test	Student T-Test	Student T-Test
2007	19.99	26.78	No	26.79	No	28.81	Yes	Yes	Yes
2008	20.90	22.70	Yes	22.70	Yes	17.70	Yes	Yes	Yes
2009	16.67	17.29	Yes	17.29	Yes	17.27	Yes	Yes	Yes
2010	18.85	18.53	Yes	18.53	Yes	25.06	Yes	Yes	Yes
2011	14.49	12.31	Yes	12.31	Yes	21.60	Yes	Yes	Yes
2012	16.00	17.43	Yes	17.43	Yes	32.61	No	No	No
2013	7.43	11.92	No	11.92	No	11.62	Yes	Yes	Yes
% Agree			71		71		86	86	86

TF5.5A							HDR	VIMS	VIMSHAB
Year	HDR Mean	VIMS Mean	Student T-Test	VIMSHAB Mean	Student T-Test	Data Mean	Student T-Test	Student T-Test	Student T-Test
2007	19.99	26.78	No	26.79	No	23.34	Yes	Yes	Yes
2008	20.90	22.70	Yes	22.70	Yes	17.75	Yes	Yes	Yes
2009	16.67	17.29	Yes	17.29	Yes	13.15	Yes	Yes	Yes
2010	18.85	18.53	Yes	18.53	Yes	19.48	Yes	Yes	Yes
2011	14.49	12.31	Yes	12.31	Yes	21.22	Yes	Yes	Yes
2012	16.00	17.43	Yes	17.43	Yes	27.07	Yes	Yes	Yes
2013	7.43	11.92	No	11.92	No	13.57	Yes	Yes	Yes
% Agree			71		71		100	100	100