

Supplement of

The first consistent global gap-free daily 4 km dataset of particulate organic carbon, particulate organic nitrogen and their ratio (1998–2023)

Yu Zhang et al.

Correspondence to: Huizeng Liu (huizeng.liu@szu.edu.cn)

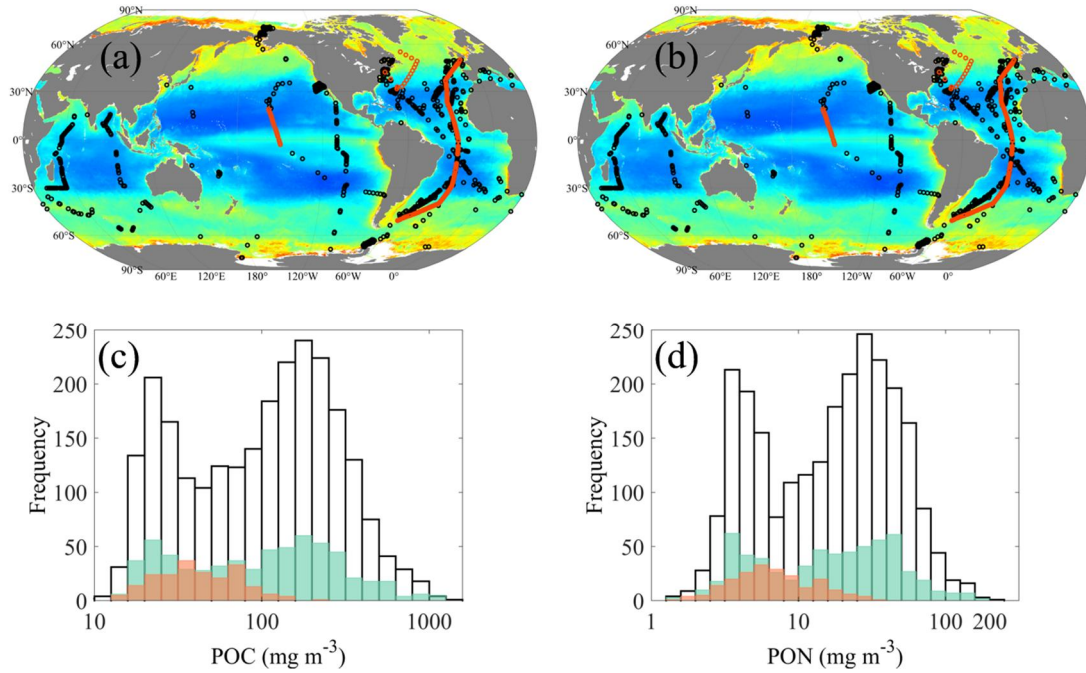


Figure S1. Geographical distributions of synchronous matchups between in-situ POC and PON measurements and OCCI satellite data (a-b); distribution histograms of the matched in-situ POC and PON concentrations (c-d).

Table S1 Statistical Summary of POC and PON Concentrations in the Matchup Dataset.

Parameters	Dataset	N	Min	Max	Mean	Median	Std.
POC	Whole	3110	9.36	1377.96	156.69	113.13	161.36
	Training	2488	9.36	1377.96	155.97	113.98	157.21
	Validation	622	13.42	1191.86	159.60	108.56	177.10
PON	Whole	3118	1.44	175.56	25.25	18.59	24.58
	Training	2494	1.44	202.26	25.25	18.94	24.15
	Validation	624	1.50	175.56	25.25	16.89	26.26

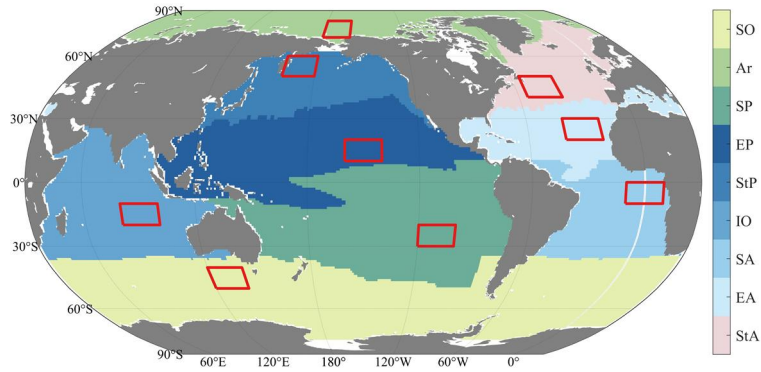


Figure S2. Map of RECCAP2-ocean regions, including the Southern Ocean (SO), Arctic (Ar), South Pacific (SP), equatorial Pacific (EP), subtropical Pacific (StP), Indian Ocean (IO), South Atlantic (SA), equatorial Atlantic (EA), and subtropical Atlantic (StA). The red diamond-shaped area indicates the randomly selected region for reconstruction method evaluation.

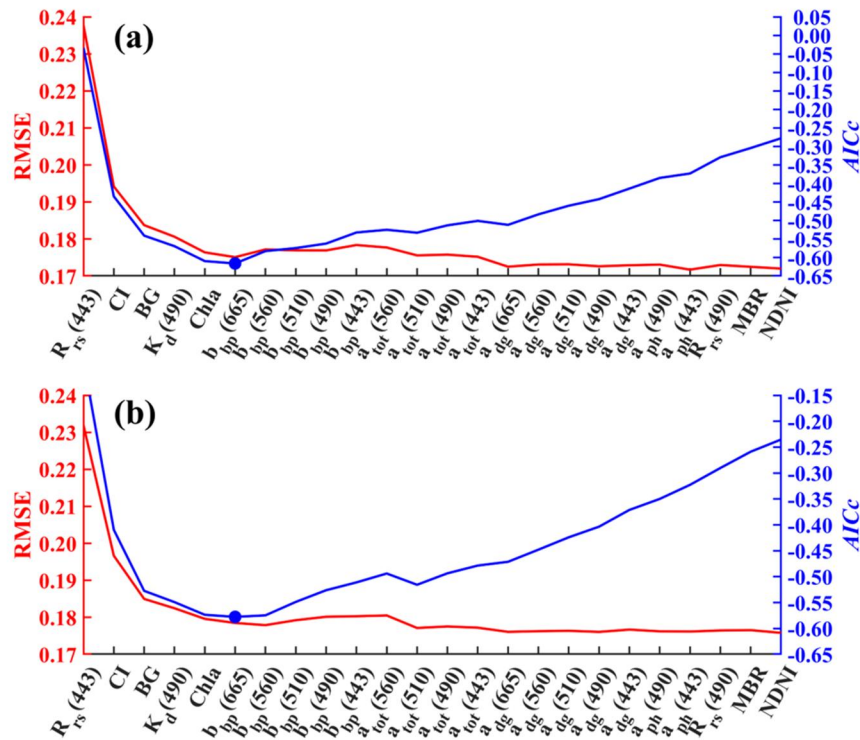


Figure S3. Variations in the RMSE and $AICc$ with the number of selected features in GPR POC (a) and PON (b) modeling. The features are ranked based on their importance.

Table S2 Statistical descriptions of DCT-PLS, DINEOF, and DINCAE performance for reconstructing POC and PON in the nine selected regions across the global ocean.

Region	Method	Parameter	January 1st						July 1st					
			N	R^2	RMSE	MAPE	Slope	Intercept	N	R^2	RMSE	MAPE	Slope	Intercept
StP	DCT-PLS	POC	121	0.52	1.24	3.42%	0.78	0.42	869	0.99	1.06	0.69%	0.97	0.07
		PON	121	0.55	1.25	6.22%	0.79	0.24	869	0.98	1.06	1.08%	0.98	0.03
	DINEOF	POC	61	0.002	1.49	6.88%	1.09	-0.20	865	0.79	1.25	2.74%	0.85	0.33
		PON	56	0.10	1.47	10.74%	1.02	-0.08	864	0.79	1.23	3.97%	0.89	0.16
	DINCAE	POC	15	0.08	1.52	6.83%	0.76	0.43	850	0.85	1.21	2.48%	0.82	0.40
		PON	20	0.06	1.53	12.72%	0.90	0.08	851	0.87	1.18	3.36%	0.86	0.20
EP	DCT-PLS	POC	3942	0.96	1.01	0.32%	0.97	0.04	5746	0.97	1.01	0.29%	0.96	0.05
		PON	3942	0.95	1.02	1.03%	0.97	0.01	5746	0.97	1.02	1.05%	0.97	0.02
	DINEOF	POC	3942	0.59	1.05	1.19%	0.91	0.13	5746	0.51	1.06	1.50%	0.90	0.13
		PON	3942	0.63	1.05	3.28%	0.98	0.01	5746	0.60	1.07	4.35%	0.97	0.02
	DINCAE	POC	3942	0.64	1.05	1.13%	0.69	0.42	5746	0.57	1.06	1.42%	0.66	0.47
		PON	3942	0.62	1.05	3.28%	0.78	0.12	5746	0.79	1.05	3.00%	0.83	0.09
SP	DCT-PLS	POC	5115	0.96	1.03	0.72%	0.99	0.02	2895	0.91	1.02	0.36%	0.95	0.07
		PON	5115	0.97	1.03	1.95%	0.99	0.004	2895	0.91	1.02	1.12%	0.95	0.03
	DINEOF	POC	5115	0.87	1.07	1.62%	0.97	0.04	2895	0.44	1.04	1.08%	0.99	0.01
		PON	5115	0.88	1.07	4.48%	0.99	0.0005	2895	0.42	1.06	3.43%	0.87	0.08
	DINCAE	POC	5115	0.90	1.06	1.42%	0.90	0.13	2895	0.46	1.04	0.99%	0.85	0.20
		PON	5115	0.87	1.07	4.74%	0.87	0.06	2895	0.54	1.05	2.99%	0.82	0.10
IO	DCT-PLS	POC	5082	0.96	1.02	0.45%	0.97	0.05	2794	0.93	1.04	0.60%	0.96	0.06
		PON	5082	0.96	1.03	1.25%	0.97	0.01	2794	0.93	1.03	1.42%	0.98	0.01
	DINEOF	POC	5082	0.67	1.07	1.64%	0.96	0.06	2794	0.56	1.10	2.06%	0.95	0.07
		PON	5082	0.69	1.08	4.24%	0.97	0.01	2794	0.57	1.08	4.05%	0.98	0.01
	DINCAE	POC	5082	0.78	1.06	1.35%	0.70	0.42	2794	0.83	1.06	1.29%	0.75	0.35
		PON	5082	0.83	1.06	3.12%	0.81	0.10	2793	0.63	1.08	3.80%	0.68	0.20
StA	DCT-PLS	POC	1475	0.91	1.11	1.68%	0.93	0.14	2286	0.99	1.06	0.92%	0.99	0.02
		PON	1475	0.89	1.11	2.74%	0.91	0.10	2286	0.98	1.06	1.77%	0.99	0.01

		POC	1307	0.47	1.31	4.51%	0.91	0.19	2285	0.92	1.15	2.66%	0.99	0.03
	DINEOF	PON	1294	0.38	1.31	7.74%	0.88	0.15	2285	0.90	1.16	4.96%	1.01	0.002
		POC	860	0.60	1.27	4.19%	1.07	-0.12	2282	0.92	1.14	2.55%	0.95	0.09
	DINCAE	PON	885	0.42	1.32	8.07%	1.02	0.01	2281	0.91	1.15	4.98%	0.93	0.08
		POC	4023	0.96	1.03	0.54%	0.97	0.04	3693	0.97	1.04	0.46%	0.98	0.03
	DCT-PLS	PON	4023	0.95	1.05	1.57%	0.98	0.02	3693	0.97	1.03	1.03%	0.99	0.01
		POC	4023	0.74	1.09	1.56%	0.98	0.03	3691	0.83	1.09	1.68%	0.95	0.07
EA	DINEOF	PON	4023	0.69	1.12	4.40%	1.04	-0.03	3693	0.80	1.09	3.78%	0.91	0.05
		POC	4023	0.74	1.09	1.61%	1.01	-0.005	3681	0.77	1.11	2.06%	1.03	-0.04
	DINCAE	PON	4023	0.76	1.10	3.90%	0.99	0.01	3686	0.73	1.10	4.36%	0.98	0.01
		POC	4701	0.96	1.07	1.00%	0.98	0.03	6567	0.99	1.06	0.90%	0.99	0.03
	DCT-PLS	PON	4701	0.96	1.07	2.05%	0.98	0.02	6567	0.99	1.06	1.43%	0.99	0.01
		POC	4698	0.76	1.18	2.74%	0.93	0.11	6567	0.85	1.25	3.44%	0.95	0.08
SA	DINEOF	PON	4699	0.76	1.18	5.60%	0.89	0.10	6567	0.87	1.22	5.41%	0.98	0.02
		POC	4695	0.88	1.13	2.17%	0.89	0.18	6557	0.95	1.15	2.30%	0.92	0.15
	DINCAE	PON	4699	0.88	1.13	4.35%	0.87	0.10	6561	0.95	1.14	3.71%	0.93	0.07
		POC	2090	0.97	1.07	0.96%	0.97	0.06	106	0.80	1.09	1.50%	0.89	0.20
	DCT-PLS	PON	2090	0.97	1.07	1.41%	0.98	0.03	106	0.75	1.11	2.99%	0.84	0.18
		POC	2090	0.83	1.18	2.67%	0.87	0.26	101	0.21	1.20	3.35%	0.63	0.66
SO	DINEOF	PON	2090	0.85	1.17	3.90%	0.89	0.14	102	0.13	1.25	6.32%	0.88	0.14
		POC	2090	0.86	1.16	2.37%	0.92	0.17	71	0.30	1.18	2.92%	0.64	0.64
	DINCAE	PON	2090	0.86	1.16	3.60%	0.92	0.12	106	0.01	3.84	51.84%	0.22	0.29
		POC	\	\	\	\	\	\	810	0.97	1.08	0.73%	0.97	0.07
	DCT-PLS	PON	\	\	\	\	\	\	810	0.97	1.08	1.16%	0.97	0.05
		POC	\	\	\	\	\	\	805	0.64	1.30	3.42%	0.82	0.39
Ar	DINEOF	PON	\	\	\	\	\	\	807	0.66	1.32	5.36%	0.77	0.33
		POC	\	\	\	\	\	\	787	0.79	1.23	2.68%	0.80	0.43
	DINCAE	PON	\	\	\	\	\	\	784	0.80	1.23	3.93%	0.80	0.28

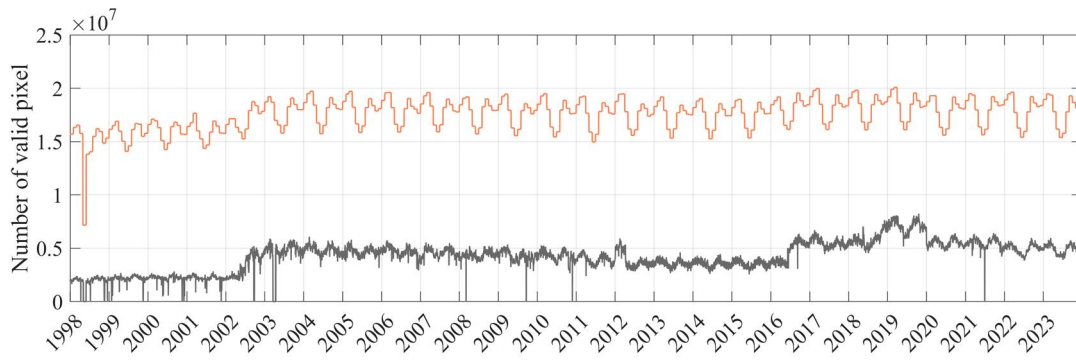


Figure S4. Comparison of the number of valid pixels between the reconstructed and original POC and PON datasets for each day.

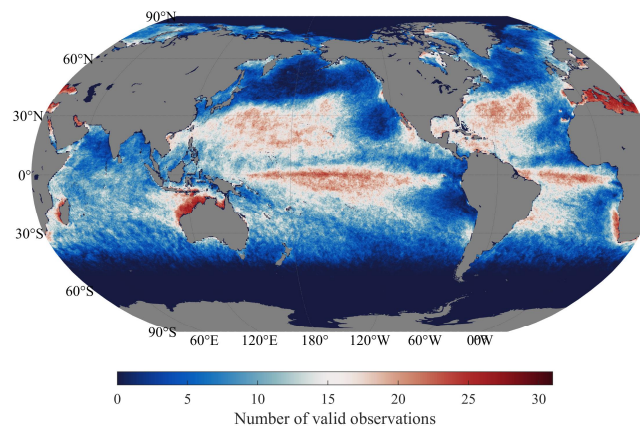


Figure S5. Spatial distribution of monthly mean number of valid observations for POC, PON, and POC:PON during July 2020.