

Supplementary materials for

**‘Implications of nutrient enrichment and related environmental impacts in the Pearl River estuary, China: characterizing the seasonal influence of riverine input’**

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Table S1 Two end-member model results of nutrients in February in the Pearl River estuary

Site	Salinity		F <sub>2</sub>	F <sub>1</sub>	DIN		ΔDIN	DIP		ΔDIP	DSi		ΔDSi
P01	1.50	S <sub>1</sub>	-0.474	1.474	2.54	N <sub>1</sub>	-0.233	0.0116	P <sub>1</sub>	0.0270	3.22	Si <sub>1</sub>	-0.190
P02	22.62	10.40	0.651	0.349	1.246	1.68	-0.424	0.0263	0.029	-0.0100	1.36	2.24	-0.205
P03	2.02	S <sub>2</sub>	-0.446	1.446	2.275	N <sub>2</sub>	-0.005	0.0186	P <sub>2</sub>	0.0194	3.16	Si <sub>2</sub>	-0.176
P04	10.50	29.18	0.005	0.995	1.476	0.36	0.198	0.0394	0.009	-0.0103	2.04	0.573	0.191
P05	12.47		0.110	0.890	1.3247		0.211	0.0394		-0.0124	1.88		0.176
P06	13.28		0.153	0.847	1.225		0.254	0.0398		-0.0136	1.76		0.224
P07	17.10		0.356	0.644	0.9805		0.230	0.0283		-0.0062	1.37		0.276
P08	19.76		0.498	0.502	0.8787		0.144	0.0282		-0.0089	1.12		0.289
P09	1.600		-0.469	1.469	2.938		-0.638	0.0096		0.0289	3.36		-0.339
P10	2.02		-0.446	1.446	2.437		-0.166	0.0196		0.0184	2.70		0.284
P11	22.72		0.656	0.344	0.8522		-0.037	0.0310		-0.0148	1.74		-0.593
P12	14.44		0.215	0.785	1.0852		0.312	0.0351		-0.0102	0.842		1.039
P13	28.24		0.950	0.050	0.4844		-0.058	0.0143		-0.0039	0.767		-0.111
P14	28.72		0.976	0.024	0.4471		-0.055	0.0112		-0.0013	0.657		-0.043
P15	28.37		0.957	0.043	0.5759		-0.159	0.0105		-0.0002	0.797		-0.152
P16	23.27		0.685	0.315	1.354		-0.578	0.0178		-0.0022	1.32		-0.222
P17	8.25		-0.115	1.115	1.7541		0.078	0.0100		0.0215	1.29		1.141
P18	29.74		1.030	-0.030	0.2901		0.030	0.0274		-0.0186	0.560		-0.037
P19	29.69		1.027	-0.027	0.2924		0.032	0.0134		-0.0045	0.547		-0.019
P20	29.80		1.033	-0.033	0.2142		0.103	0.0097		-0.0009	0.472		0.046
P21	30.24		1.056	-0.056	0.2102		0.075	0.0094		-0.0011	0.433		0.046
P22	29.36		1.010	-0.010	0.3221		0.025	0.0157		-0.0065	0.647		-0.090
P23	29.89		1.038	-0.038	0.2337		0.077	0.0081		0.0006	0.601		-0.091
P24	24.80		0.767	0.233	0.4073		0.261	0.0098		0.0042	0.774		0.187
P25	30.19		1.054	-0.054	0.1682		0.121	0.0064		0.0019	0.567		-0.084
P26	31.91		1.145	-0.145	0.076		0.092	0.0103		-0.0038	0.230		0.100
P27	31.90		1.145	-0.145	0.1448		0.024	0.0013		0.0052	0.346		-0.014
P28	31.36		1.116	-0.116	0.1325		0.075	0.0041		0.0030	0.356		0.024
P29	33.05		1.206	-0.206	0.1751		-0.087	0.0072		-0.0019	0.244		-0.014
P30	32.62		1.183	-0.183	0.2105		-0.092	0.0074		-0.0016	0.298		-0.030
P31	32.53		1.178	-0.178	0.2156		-0.091	0.0081		-0.0022	0.316		-0.040
P32	32.90		1.198	-0.198	0.0934		0.005	0.0049		0.0006	0.277		-0.034
P33	28.90		0.985	0.015	0.1989		0.181	0.0088		0.0009	0.912		-0.314
P34	25.64		0.812	0.188	0.4526		0.156	0.0115		0.0016	1.37		-0.483
P35	19.39		0.478	0.522	0.4599		0.589	0.0118		0.0079	1.73		-0.288
P36	21.87		0.611	0.389	1.2332		-0.360	0.0160		0.0011	0.352		0.870
P37	24.43		0.747	0.253	0.7673		-0.073	0.0146		-0.0002	1.02		-0.025
P38	21.29		0.580	0.420	1.1958		-0.281	0.0208		-0.0031	0.831		0.442
P39	27.73		0.923	0.077	0.4494		0.013	0.0075		0.0034	0.723		-0.021
P40	27.14		0.891	0.109	0.6644		-0.161	0.0168		-0.0053	0.881		-0.127
P41	28.84		0.982	0.018	0.5254		-0.141	0.0096		0.0002	0.716		-0.113
P42	32.01		1.151	-0.151	0.1203		0.041	0.0095		-0.0031	0.296		0.026
P43	34.20		1.267	-0.267	0.1134		-0.106	0.0131		-0.0090	0.086		0.042
P44	34.13		1.264	-0.264	0.1581		-0.146	0.0041		0.0001	0.098		0.035
P45	34.46		1.281	-0.281	0.0874		-0.098	0.0041		-0.0003	0.148		-0.043

Table S2 Two end-member model results of nutrients in May in the Pearl River estuary

Site	Salinity		F2	F1	DIN		$\Delta$ DIN	DIP		$\Delta$ DIP	DSi		$\Delta$ DSi
P01	0.520	S1	-0.013	1.013	2.358	N1	-0.452	0.022	P1	0.002	4.300	Si1	-0.451
P02	0.600	0.896	-0.010	1.010	1.842	1.883	0.059	0.016	0.024	0.008	3.910	3.802	-0.071
P03	0.800	S2	-0.003	1.003	2.058	N2	-0.169	0.021	P2	0.003	4.320	Si2	-0.506
P04	0.700	29.296	-0.007	1.007	1.897	0.116	-0.002	0.039	0.008	-0.015	4.110	0.246	-0.283
P05	0.600		-0.010	1.010	1.830		0.071	0.023		0.001	3.820		0.019
P06	2.158		0.044	0.956	1.313		0.492	0.021		0.002	2.350		1.294
P07	3.797		0.102	0.898	1.763		-0.060	0.079		-0.056	3.320		0.119
P08	4.874		0.140	0.860	0.870		0.766	0.009		0.012	1.720		1.584
P09	1.500		0.021	0.979	1.620		0.225	0.011		0.013	3.060		0.666
P10	0.850		-0.002	1.002	1.664		0.222	0.014		0.010	3.210		0.598
P11	6.741		0.206	0.794	0.789		0.730	0.015		0.006	1.710		1.360
P12	9.623		0.307	0.693	1.005		0.335	0.026		-0.007	1.840		0.869
P13	13.348		0.438	0.562	0.721		0.388	0.017		0.000	1.080		1.163
P14	12.112		0.395	0.605	0.920		0.265	0.021		-0.004	1.460		0.938
P15	14.812		0.490	0.510	0.903		0.114	0.019		-0.003	1.530		0.530
P16	11.879		0.387	0.613	0.660		0.540	0.015		0.003	1.380		1.047
P17	12.694		0.415	0.585	1.365		-0.216	0.120		-0.103	2.980		-0.655
P18	21.417		0.723	0.277	0.427		0.179	0.007		0.006	0.705		0.528
P19	22.594		0.764	0.236	0.321		0.212	0.005		0.007	0.458		0.627
P20	22.335		0.755	0.245	0.452		0.097	0.004		0.008	0.693		0.425
P21	28.747		0.981	0.019	0.120		0.030	0.006		0.002	0.172		0.143
P22	20.437		0.688	0.312	0.415		0.252	0.006		0.007	0.664		0.691
P23	32.219		1.103	-0.103	0.013		0.080	0.007		-0.001	0.082		-0.201
P24	31.475		1.077	-0.077	0.031		0.050	0.014		-0.008	0.164		-0.191
P25	32.818		1.124	-0.124	0.022		0.120	0.009		-0.003	0.107		-0.302
P26	33.762		1.157	-0.157	0.015		0.180	0.009		-0.004	0.101		-0.414
P27	33.578		1.151	-0.151	0.013		0.160	0.010		-0.004	0.089		-0.379
P28	33.284		1.140	-0.140	0.016		0.150	0.013		-0.007	0.133		-0.386
P29	34.746		1.192	-0.192	0.012		0.230	0.002		0.003	0.031		-0.468
P30	33.507		1.148	-0.148	0.019		0.170	0.013		-0.007	0.147		-0.428
P31	34.581		1.186	-0.186	0.018		0.230	0.005		0.000	0.062		-0.477
P32	33.386		1.144	-0.144	0.014		0.150	0.010		-0.004	0.104		-0.370
P33	32.296		1.106	-0.106	0.019		0.090	0.006		0.000	0.087		-0.216
P34	31.745		1.086	-0.086	0.024		0.060	0.008		-0.001	0.063		-0.124
P35	29.784		1.017	-0.017	0.075		0.010	0.009		-0.001	0.083		0.101
P36	9.844		0.315	0.685	0.356		0.970	0.003		0.016	0.648		2.034
P37	14.810		0.490	0.510	0.852		0.165	0.005		0.011	1.570		0.490
P38	12.319		0.402	0.598	0.502		0.671	0.002		0.016	0.845		1.527
P39	24.992		0.848	0.152	0.288		0.096	0.018		-0.008	0.413		0.372
P40	25.076		0.851	0.149	0.150		0.228	0.003		0.008	0.119		0.655
P41	26.719		0.909	0.091	0.161		0.116	0.003		0.006	0.091		0.478
P42	31.885		1.091	-0.091	0.013		0.060	0.006		0.001	0.087		-0.165
P43	32.954		1.129	-0.129	0.019		0.130	0.006		0.000	0.249		-0.461
P44	34.136		1.170	-0.170	0.014		0.200	0.010		-0.005	0.278		-0.638
P45	33.889		1.162	-0.162	0.013		0.180	0.011		-0.005	0.111		-0.440

Table S3 Two end-member model results of nutrients in August in the Pearl River estuary

Site	Salinity	F2	F1	DIN	$\Delta$ DIN	DIP	$\Delta$ DIP	DSi	$\Delta$ DSi				
P01	0.600	S1	-0.054	1.054	2.364	N1	0.019	0.070	P1	-0.003	4.890	Si1	-0.792
P02	0.800	1.714	-0.045	1.045	2.246	2.293	0.121	0.062	0.064	0.004	4.080	3.940	-0.010
P03	2.626	S2	0.044	0.956	2.113	N2	0.106	0.067	P2	-0.005	4.180	Si2	-0.370
P04	1.800	22.225	0.004	0.996	2.487	0.636	-0.201	0.064	0.016	0.000	3.660	1.023	0.268
P05	2.959		0.061	0.939	2.224		-0.032	0.062		-0.001	3.150		0.613
P06	1.500		-0.010	1.010	2.322		-0.012	0.060		0.005	3.680		0.290
P07	3.885		0.106	0.894	2.141		-0.023	0.071		-0.012	3.330		0.301
P08	3.537		0.089	0.911	2.172		-0.026	0.066		-0.006	3.430		0.251
P09	1.600		-0.006	1.006	1.770		0.532	0.034		0.030	2.660		1.296
P10	1.200		-0.025	1.025	1.900		0.435	0.033		0.033	3.130		0.883
P11	4.681		0.145	0.855	2.013		0.040	0.057		0.000	3.400		0.118
P12	5.658		0.192	0.808	2.152		-0.178	0.093		-0.038	3.580		-0.201
P13	10.400		0.423	0.577	1.781		-0.190	0.070		-0.026	3.060		-0.355
P14	12.065		0.505	0.495	1.753		-0.296	0.073		-0.034	2.910		-0.442
P15	4.952		0.158	0.842	1.879		0.153	0.054		0.002	3.360		0.120
P16	13.406		0.570	0.430	0.964		0.385	0.218		-0.181	3.030		-0.752
P17	11.287		0.467	0.533	1.075		0.445	0.232		-0.190	3.140		-0.561
P18	7.732		0.293	0.707	0.960		0.847	0.039		0.011	1.720		1.364
P19	6.343		0.226	0.774	1.672		0.248	0.043		0.010	2.940		0.342
P20	7.966		0.305	0.695	1.645		0.143	0.030		0.019	3.010		0.041
P21	12.492		0.525	0.475	1.533		-0.110	0.051		-0.012	2.760		-0.352
P22	6.071		0.212	0.788	1.546		0.395	0.033		0.021	2.920		0.401
P23	12.353		0.519	0.481	1.553		-0.120	0.044		-0.005	2.710		-0.283
P24	11.601		0.482	0.518	1.496		-0.002	0.027		0.014	2.630		-0.096
P25	18.279		0.807	0.193	0.838		0.117	0.006		0.019	1.150		0.435
P26	28.559		1.308	-0.308	0.248		-0.123	0.005		-0.004	0.083		0.040
P27	31.907		1.472	-0.472	0.077		-0.222	0.004		-0.011	0.121		-0.474
P28	30.606		1.408	-0.408	0.109		-0.150	0.005		-0.009	0.102		-0.270
P29	32.184		1.485	-0.485	0.026		-0.194	0.007		-0.014	0.051		-0.443
P30	32.614		1.506	-0.506	0.024		-0.227	0.003		-0.011	0.034		-0.487
P31	33.676		1.558	-0.558	0.027		-0.316	0.006		-0.017	0.039		-0.643
P32	31.102		1.432	-0.432	0.038		-0.119	0.007		-0.012	0.092		-0.331
P33	33.062		1.528	-0.528	0.106		-0.345	0.005		-0.014	0.342		-0.859
P34	7.652		0.289	0.711	1.431		0.382	0.037		0.013	2.540		0.556
P35	6.587		0.238	0.762	1.466		0.433	0.033		0.020	2.680		0.567
P36	10.332		0.420	0.580	1.425		0.172	0.041		0.003	1.960		0.755
P37	16.753		0.733	0.267	1.043		0.035	0.034		-0.006	1.500		0.302
P38	18.498		0.818	0.182	0.881		0.057	0.021		0.004	1.460		0.094
P39	10.452		0.426	0.574	1.270		0.317	0.031		0.012	2.190		0.508
P40	19.582		0.871	0.129	0.586		0.264	0.008		0.014	0.830		0.569
P41	17.810		0.785	0.215	0.624		0.369	0.007		0.020	0.649		1.003
P42	28.396		1.301	-0.301	0.196		-0.058	0.007		-0.006	0.261		-0.115
P43	12.643		0.533	0.467	1.118		0.292	0.018		0.020	1.950		0.436
P44	33.005		1.525	-0.525	0.024		-0.258	0.004		-0.013	0.077		-0.586
P45	33.529		1.551	-0.551	0.024		-0.300	0.004		-0.015	0.069		-0.652

Table S4 Two end-member model results of nutrients in November in the Pearl River estuary

Site	Salinity		F2	F1	DIN		$\Delta$ DIN	DIP		$\Delta$ DIP	DSi		$\Delta$ DSi
P01	0.900	S1	-0.500	1.500	2.166	N1	0.454	0.046	P1	0.028	3.230	Si1	0.649
P02	6.512	10.504	-0.208	1.208	2.240	1.838	-0.076	0.042	0.053	0.020	3.390	2.742	-0.176
P03	2.354	S2	-0.424	1.424	2.078	N2	0.424	0.042	P2	0.029	3.200	Si2	0.507
P04	14.150	29.697	0.190	0.810	1.676	0.283	-0.133	0.053	0.012	-0.008	2.450	0.468	-0.140
P05	16.068		0.290	0.710	1.617		-0.229	0.057		-0.015	2.500		-0.417
P06	23.042		0.653	0.347	1.253		-0.432	0.080		-0.054	1.680		-0.423
P07	25.290		0.770	0.230	0.869		-0.231	0.041		-0.019	1.250		-0.260
P08	24.970		0.754	0.246	0.823		-0.159	0.031		-0.009	1.210		-0.182
P09	1.600		-0.464	1.464	1.595		0.968	0.043		0.029	2.420		1.376
P10	0.900		-0.500	1.500	1.865		0.755	0.042		0.031	2.970		0.909
P11	27.386		0.879	0.121	0.604		-0.136	0.024		-0.007	0.789		-0.047
P12	27.593		0.890	0.110	0.601		-0.150	0.026		-0.009	0.775		-0.057
P13	30.681		1.051	-0.051	0.345		-0.145	0.020		-0.010	0.381		-0.029
P14	31.960		1.118	-0.118	0.232		-0.136	0.019		-0.012	0.273		-0.073
P15	32.473		1.144	-0.144	0.183		-0.128	0.015		-0.009	0.234		-0.094
P16	13.578		0.160	0.840	1.204		0.386	0.155		-0.109	2.380		-0.003
P17	11.588		0.057	0.943	1.244		0.508	0.225		-0.174	3.000		-0.387
P18	25.927		0.803	0.197	0.093		0.494	0.006		0.014	0.281		0.634
P19	30.672		1.051	-0.051	0.297		-0.096	0.008		0.002	0.398		-0.045
P20	32.648		1.154	-0.154	0.055		-0.015	0.005		0.000	0.256		-0.137
P21	32.280		1.134	-0.134	0.071		0.000	0.005		0.002	0.255		-0.093
P22	26.358		0.826	0.174	0.065		0.487	0.005		0.014	0.243		0.621
P23	33.283		1.187	-0.187	0.054		-0.065	0.005		0.000	0.255		-0.211
P24	29.482		0.989	0.011	0.144		0.153	0.006		0.007	0.189		0.305
P25	33.320		1.189	-0.189	0.049		-0.063	0.004		0.000	0.292		-0.253
P26	32.915		1.167	-0.167	0.043		-0.024	0.003		0.002	0.290		-0.203
P27	33.009		1.172	-0.172	0.061		-0.050	0.006		-0.001	0.354		-0.278
P28	33.060		1.175	-0.175	0.121		-0.114	0.011		-0.006	0.427		-0.357
P29	31.816		1.110	-0.110	0.101		0.007	0.009		-0.002	0.420		-0.203
P30	32.814		1.162	-0.162	0.076		-0.049	0.005		0.000	0.136		-0.037
P31	32.490		1.145	-0.145	0.079		-0.026	0.006		0.000	0.137		0.001
P32	32.305		1.136	-0.136	0.072		-0.003	0.005		0.002	0.137		0.022
P33	31.814		1.110	-0.110	0.094		0.014	0.007		0.001	0.165		0.053
P34	24.345		0.721	0.279	0.751		-0.036	0.023		0.001	1.040		0.062
P35	21.228		0.559	0.441	0.896		0.072	0.031		-0.001	1.320		0.151
P36	19.088		0.447	0.553	0.912		0.230	0.027		0.007	1.140		0.585
P37	24.742		0.742	0.258	0.649		0.034	0.022		0.000	0.823		0.232
P38	25.418		0.777	0.223	0.632		-0.004	0.022		0.000	0.909		0.066
P39	26.373		0.827	0.173	0.604		-0.054	0.019		0.001	0.826		0.036
P40	26.235		0.820	0.180	0.515		0.047	0.016		0.004	0.758		0.120
P41	30.141		1.023	-0.023	0.257		-0.013	0.017		-0.006	0.404		0.012
P42	32.445		1.143	-0.143	0.080		-0.023	0.005		0.001	0.159		-0.016
P43	31.933		1.116	-0.116	0.114		-0.016	0.007		0.000	0.199		0.005
P44	31.322		1.084	-0.084	0.169		-0.021	0.009		-0.001	0.276		0.000
P45	33.443		1.195	-0.195	0.043		-0.067	0.003		0.001	0.114		-0.089