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Distribution, seasonality, and fluxes of dissolved organic matter in the Pearl River (Zhujiang) estuary, China

Yang Li et al.

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Supplementary material

Table S1. Coordinates of sampling stations, sampling times, and water depths at the sampling stations.

Transect	Station	Lat. (°N)	Long. (°E)	Water depth (m)	Sampling date and time			
					May	August	November	January
Main transect	M01	23.033	113.517	12.0	12 (13:30)	11 (11:04)	19 (12:14)	14 (11:57)
	M02	22.967	113.540	5.5	12 (12:10)	11 (10:15)	19 (11:20)	14 (11:12)
	M03	22.790	113.623	18.6	12 (8:20)	11 (8:13)	19 (8:46)	13 (14:27)
	M04	22.710	113.682	17.9	11 (15:50)	7 (8:25)	16 (9:00)	10 (8:45)
	M05	22.585	113.691	4.9	11 (12:50)	7 (10:00)	16 (10:38)	10 (10:20)
	M06	22.523	113.751	11.4	10 (12:40)	10 (13:28)	16 (11:28)	10 (11:20)
	M07	22.426	113.752	8.8	10 (10:20)	10 (10:30)	16 (13:30)	10 (13:15)
	M08	22.257	113.722	6.9	9 (9:52)	9 (10:55)	18 (10:38)	12 (10:21)
	M09	22.122	113.715	7.7	8 (10:10)	8 (9:15)	17 (10:15)	11 (10:23)
	M10	21.994	113.722	20.4	8 (13:00)	8 (12:40)	17 (14:35)	11 (14:48)
West transect	W01	22.411	113.684	4.8	9 (14:50)	7 (12:55)	16 (14:30)	13 (10:00)
	W02	22.318	113.632	6.0	10 (8:40)	7 (14:15)	16 (15:52)	10 (15:13)
	W03	22.214	113.618	4.5	9 (8:50)	9 (9:40)	18 (9:00)	12 (9:13)
	W04	22.065	113.590	6.3	8 (15:40)	8 (14:40)	17 (16:10)	11 (9:23)
East transect	E01	22.600	113.777	8.2	11(14:40)	10 (14:42)	18 (15:28)	13 (13:30)
	E02	22.358	113.864	6.7	9 (13:05)	9 (14:35)	18 (13:10)	12 (13:26)
	E03	22.238	113.814	21.2	9 (11:25)	9 (13:00)	18 (11:35)	12 (11:59)
	E04	22.040	113.825	16.2	Not sampled	8 (10:40)	17 (11:47)	11 (11:46)

Table S2. Absorption coefficients of CDOM at typical wavelengths and the spectral slope coefficient between 300 nm and 500 nm. S and B denote surface and bottom, respectively.

Station	Absorption coefficients (m^{-1})							$S_{300\sim500}$ (nm^{-1})
	a_{254}	a_{325}	a_{330}	a_{350}	a_{355}	a_{412}	a_{450}	
				August 2015				
M01-S	12.86	4.70	4.35	3.18	2.95	1.09	0.63	0.0162
M01-B	12.32	4.60	4.27	3.21	3.00	1.16	0.72	0.0153
M02-S	10.04	3.40	3.09	2.19	2.03	0.70	0.38	0.0179
M02-B	9.39	3.23	2.96	2.12	1.95	0.69	0.38	0.0176
M03-S	8.60	2.83	2.56	1.80	1.64	0.55	0.29	0.0187
M03-B	5.35	1.81	1.65	1.18	1.10	0.38	0.19	0.0174
M04-S	9.17	3.02	2.74	1.89	1.73	0.58	0.31	0.0189
M04-B	8.71	2.89	2.61	1.82	1.67	0.57	0.31	0.0187
M05-S	6.04	1.95	1.78	1.22	1.11	0.36	0.18	0.0193
M05-B	6.60	2.18	1.99	1.38	1.27	0.41	0.22	0.0188
M06-S	5.78	1.82	1.66	1.16	1.05	0.34	0.17	0.0192
M06-B	4.07	1.29	1.19	0.84	0.77	0.27	0.14	0.0181
M07-S	6.81	2.10	1.91	1.33	1.22	0.42	0.21	0.0189
M07-B	4.17	1.26	1.15	0.81	0.74	0.26	0.13	0.0185
M08-S	5.86	1.80	1.63	1.13	1.03	0.36	0.19	0.0191
M08-B	5.12	1.58	1.44	1.00	0.91	0.32	0.17	0.0188
M09-S	4.52	1.45	1.33	0.96	0.89	0.38	0.23	0.0161
M09-B	3.18	0.92	0.85	0.59	0.53	0.20	0.10	0.0181
M10-S	4.41	1.25	1.12	0.76	0.69	0.24	0.12	0.0200
M10-B	2.29	0.61	0.56	0.38	0.34	0.14	0.06	0.0188
W01-S	5.36	1.70	1.56	1.08	0.98	0.34	0.17	0.0191
W01-B	5.93	1.91	1.73	1.20	1.10	0.37	0.19	0.0191
W02-S	6.22	1.93	1.76	1.21	1.11	0.37	0.19	0.0192
W02-B	4.67	1.47	1.34	0.93	0.85	0.28	0.15	0.0190
W03-S	4.89	1.50	1.35	0.95	0.86	0.31	0.16	0.0186
W03-B	4.29	1.29	1.17	0.82	0.74	0.25	0.12	0.0192
W04-S	4.02	1.17	1.07	0.73	0.66	0.23	0.11	0.0200
W04-B	3.88	1.15	1.04	0.71	0.64	0.23	0.11	0.0196
E01-S	6.16	2.19	2.02	1.50	1.39	0.60	0.43	0.0152
E01-B	7.12	2.29	2.09	1.48	1.34	0.45	0.23	0.0187
E02-S	5.15	1.60	1.45	1.02	0.93	0.33	0.17	0.0186
E02-B	4.47	1.36	1.24	0.86	0.79	0.27	0.14	0.0189
E03-S	6.01	2.20	2.04	1.59	1.49	0.87	0.69	0.0120
E03-B	2.50	0.70	0.63	0.45	0.41	0.16	0.08	0.0178
E04-S	3.98	1.18	1.08	0.74	0.66	0.24	0.12	0.0191

E04-B	3.23	1.02	0.94	0.69	0.64	0.29	0.18	0.0153
				November 2015				
M01-S	8.00	2.93	2.68	1.96	1.82	0.73	0.43	0.0159
M01-B	NA	NA	NA	NA	NA	NA	NA	NA
M02-S	10.08	3.65	3.35	2.45	2.28	0.87	0.51	0.0164
M02-B	10.61	3.72	3.40	2.45	2.25	0.81	0.45	0.0174
M03-S	8.01	2.76	2.51	1.77	1.63	0.59	0.34	0.0179
M03-B	7.44	2.54	2.30	1.62	1.50	0.55	0.32	0.0178
M04-S	5.70	1.86	1.67	1.17	1.08	0.37	0.20	0.0187
M04-B	5.21	1.68	1.52	1.06	0.98	0.34	0.19	0.0188
M05-S	6.24	2.06	1.86	1.31	1.19	0.37	0.16	0.0195
M05-B	6.27	2.15	1.93	1.38	1.26	0.44	0.24	0.0179
M06-S	4.48	1.54	1.40	1.00	0.93	0.33	0.18	0.0177
M06-B	4.37	1.34	1.20	0.87	0.79	0.24	0.12	0.0192
M07-S	4.25	1.29	1.17	0.85	0.77	0.26	0.13	0.0187
M07-B	4.23	1.26	1.13	0.83	0.77	0.26	0.14	0.0180
M08-S	4.24	1.40	1.26	0.90	0.82	0.30	0.16	0.0180
M08-B	3.63	1.14	1.03	0.76	0.69	0.25	0.14	0.0176
M09-S	3.86	1.21	1.09	0.78	0.72	0.24	0.12	0.0188
M09-B	3.12	0.93	0.83	0.60	0.56	0.18	0.09	0.0186
M10-S	2.59	0.60	0.54	0.37	0.34	0.08	0.004	0.0233
M10-B	1.90	0.47	0.43	0.31	0.30	0.11	0.06	0.0165
W01-S	4.07	1.32	1.18	0.84	0.77	0.26	0.14	0.0187
W01-B	3.58	1.15	1.04	0.74	0.67	0.23	0.12	0.0188
W02-S	3.97	1.26	1.13	0.81	0.74	0.26	0.14	0.0186
W02-B	4.17	1.33	1.22	0.88	0.80	0.29	0.16	0.0178
W03-S	4.52	1.39	1.26	0.90	0.82	0.28	0.15	0.0188
W03-B	4.11	1.26	1.13	0.82	0.74	0.25	0.13	0.0189
W04-S	3.56	1.03	0.92	0.67	0.61	0.20	0.10	0.0191
W04-B	3.59	1.03	0.93	0.66	0.61	0.20	0.09	0.0190
E01-S	5.65	1.83	1.65	1.16	1.05	0.35	0.18	0.0192
E01-B	5.30	1.70	1.53	1.09	1.00	0.32	0.17	0.0190
E02-S	4.58	1.37	1.24	0.89	0.80	0.28	0.15	0.0188
E02-B	3.33	0.97	0.87	0.64	0.58	0.18	0.08	0.0192
E03-S	3.44	1.09	0.99	0.72	0.67	0.21	0.10	0.0185
E03-B	2.50	0.68	0.63	0.46	0.42	0.12	0.05	0.0192
E04-S	3.36	0.98	0.88	0.63	0.58	0.18	0.08	0.0192
E04-B	2.16	0.55	0.49	0.36	0.34	0.11	0.04	0.0186
				January 2016				
M01-S	12.61	4.34	3.98	2.86	2.64	1.00	0.57	0.0170
M01-B	13.13	4.49	4.11	2.96	2.72	1.02	0.59	0.0171
M02-S	10.83	3.64	3.33	2.40	2.20	0.81	0.46	0.0174

M02-B	12.24	4.18	3.82	2.77	2.56	0.97	0.57	0.0168
M03-S	6.66	2.17	1.95	1.40	1.30	0.42	0.23	0.0185
M03-B	6.22	1.98	1.80	1.31	1.20	0.39	0.21	0.0187
M04-S	5.59	1.77	1.61	1.15	1.07	0.36	0.20	0.0185
M04-B	4.97	1.56	1.41	1.01	0.93	0.31	0.17	0.0188
M05-S	4.40	1.38	1.25	0.88	0.81	0.29	0.17	0.0184
M05-B	4.94	1.47	1.32	0.93	0.85	0.28	0.15	0.0195
M06-S	3.65	1.26	1.15	0.89	0.83	0.40	0.29	0.0136
M06-B	3.80	1.09	0.98	0.69	0.62	0.20	0.09	0.0200
M07-S	3.24	0.84	0.77	0.51	0.46	0.11	0.02	0.0230
M07-B	3.04	0.83	0.75	0.52	0.48	0.15	0.08	0.0198
M08-S	3.07	0.85	0.77	0.52	0.48	0.12	0.05	0.0211
M08-B	3.25	0.91	0.82	0.56	0.51	0.14	0.07	0.0205
M09-S	2.19	0.54	0.47	0.32	0.29	0.05	0.01	0.0232
M09-B	2.46	0.62	0.56	0.39	0.36	0.11	0.06	0.0193
M10-S	1.63	0.32	0.29	0.19	0.18	0.05	0.01	0.0229
M10-B	1.88	0.36	0.33	0.20	0.19	0.01	0.003	0.0265
W01-S	6.52	2.21	2.03	1.45	1.33	0.55	0.36	0.0163
W01-B	4.08	1.36	1.24	0.90	0.83	0.32	0.19	0.0173
W02-S	4.18	1.28	1.16	0.82	0.74	0.26	0.14	0.0189
W02-B	4.25	1.36	1.24	0.89	0.82	0.32	0.19	0.0173
W03-S	4.54	1.34	1.20	0.83	0.75	0.26	0.14	0.0194
W03-B	4.30	1.27	1.14	0.80	0.72	0.24	0.13	0.0194
W04-S	2.73	0.75	0.68	0.47	0.42	0.09	0.03	0.0215
W04-B	2.91	0.78	0.71	0.51	0.48	0.15	0.08	0.0185
E01-S	5.29	1.59	1.43	1.02	0.94	0.30	0.17	0.0191
E01-B	6.16	1.84	1.67	1.19	1.10	0.36	0.19	0.0190
E02-S	3.28	0.81	0.74	0.52	0.46	0.17	0.09	0.0190
E02-B	2.54	0.51	0.45	0.26	0.23	0.04	0.005	0.0308
E03-S	2.16	0.49	0.47	0.29	0.25	0.03	0.01	0.0250
E03-B	2.48	0.66	0.61	0.43	0.40	0.13	0.07	0.0179
E04-S	1.69	0.35	0.31	0.22	0.20	0.05	0.02	0.0211
E04-B	1.68	0.35	0.33	0.23	0.21	0.05	0.02	0.0209

Table S3. Results of linear regression (Y = a*X + b) of DOM quantitative variables against salinity. SE denotes standard error.

	a±SE	b±SE	R^2	*p*
		DOC		
August	−1.31±0.16	121.3±2.4	0.72	<0.0001
January	−1.11±0.21	123.0±4.5	0.57	<0.0001
		a_{330}		
August	−0.042±0.006	1.97±0.09	0.67	<0.0001
November	−0.029±0.003	1.47±0.05	0.80	<0.0001
January	−0.048±0.003	1.93±0.07	0.88	<0.0001
		C_p		
August	−0.023±0.004	0.94±0.06	0.62	<0.0001
November	−0.035±0.005	1.43±0.10	0.67	<0.0001
January	−0.043±0.004	1.61±0.08	0.82	<0.0001
		C_h		
August	−0.023±0.002	0.94±0.04	0.81	<0.0001
November	−0.023±0.002	0.86±0.03	0.82	<0.0001
January	−0.023±0.001	0.85±0.03	0.89	<0.0001

Table S4. Percent decrease of each quantitative DOM variable per unit of salinity increase across the saltier zone calculated from the linear regression equations listed in Table S3. To be consistent for this calculation, the salinity range for the saltier zone was assumed a fixed span from 1 to 33, though the real range could vary depending on variable and season (Figures 5 and 6). N/A: not applicable.

	Percent decrease per unit of salinity increase			
Month	DOC	a_{330}	C_h	C_p
Aug.	1.1	2.2	2.5	2.5
Nov.	N/A	2.0	2.7	2.5
Jan.	0.9	2.6	2.7	2.7

Table S5. Results of linear regression (Y = a*X + b) of [DOC] against a_{330} and FDOM components. SE denotes standard error.

	a±SE	b±SE	R^2	*p*
		a_{330}		
August	22.5±1.4	72.5±2.9	0.89	<0.0001
November	18.8±2.2	61.8±3.3	0.68	<0.0001
January	32.0±2.0	71.4±3.3	0.90	<0.0001
		C_p		
August	43.5±2.1	76.2±2.0	0.93	<0.0001
November	16.3±1.9	66.5±2.5	0.68	<0.0001
January	40.7±2.3	72.6±3.0	0.91	<0.0001
		C_h		
August	67.4±6.9	61.4±5.6	0.75	<0.0001
November	35.4±6.1	63.6±4.0	0.50	<0.0001
January	96.1±7.4	66.5±4.4	0.85	<0.0001

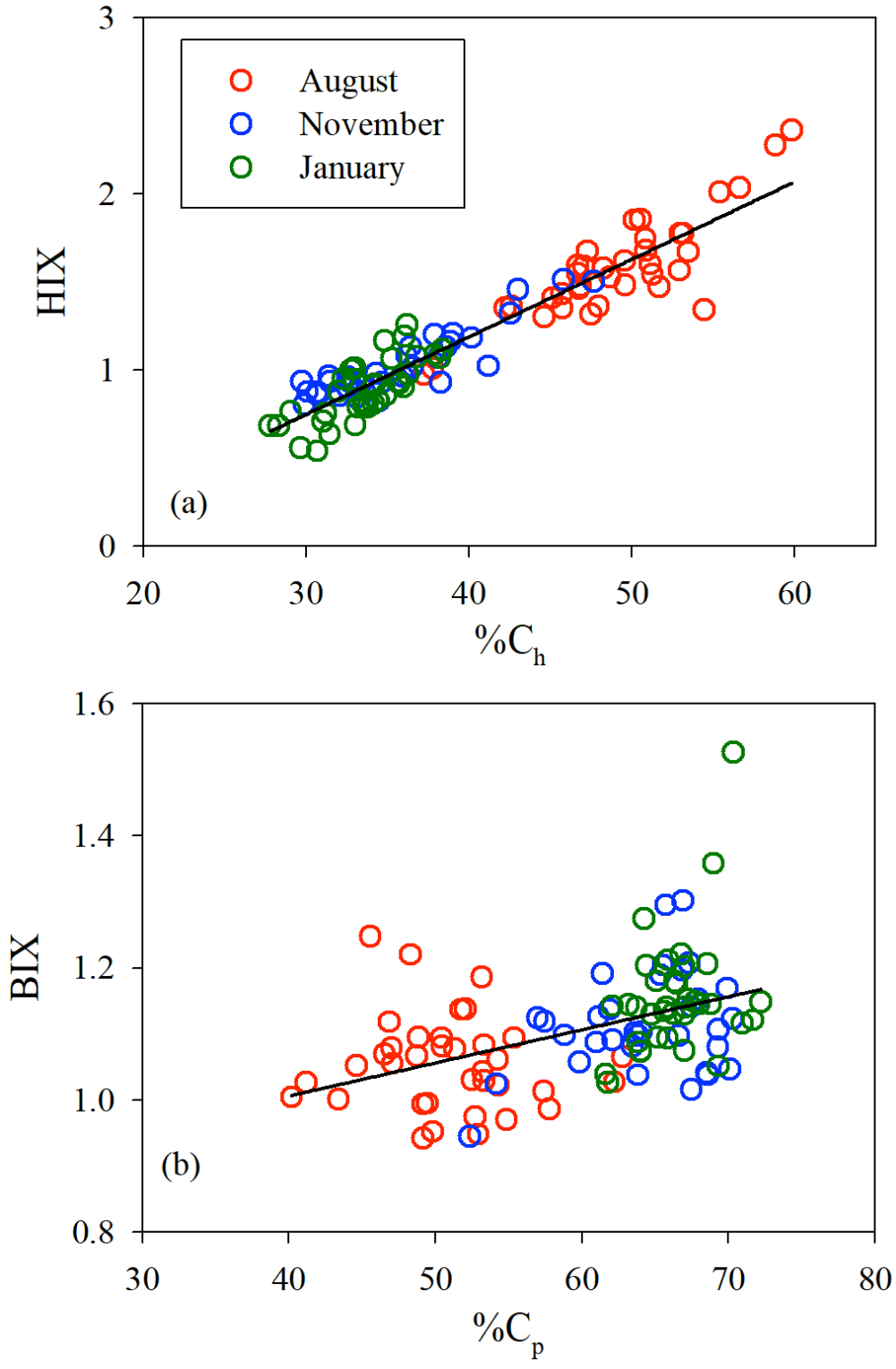

Figure S1. HIX vs. $\%C_h$ (a) and BIX vs. $\%C_p$ (b). Solid lines in panels a and b denote linear fits of data for three cruises combined.

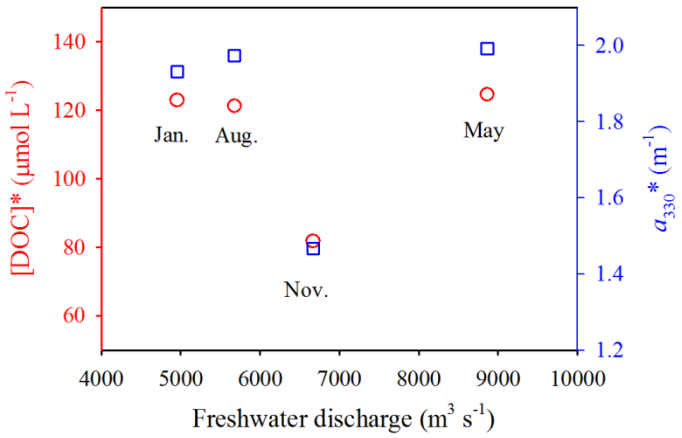

Figure S2. The effective [DOC] and a_{330} versus freshwater discharge rate in the Pearl River estuary.