Supplement of

Measurement report: characterization and sources of the ambient secondary organic carbon in a Chinese megacity over five years from 2016 to 2020

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Table S1 The monthly average (± standard deviation) concentrations (in μg m^{-3}). of EC, OC, POC, SOC, and the OC/EC ratio

Month-Year	No. data points	EC	OC	POC	SOC	OC/EC
Jan-16	739	1.97 ± 1.80	7.79 ± 5.23	5.06 ± 4.63	2.73 ± 1.64	3.96
Feb-16	642	1.68 ± 1.08	6.60 ± 3.43	4.60 ± 2.93	2.00 ±1.19	3.92
Mar-16	724	1.71 ± 1.14	5.62 ± 3.10	1.40 ± 0.94	4.22 ± 2.42	3.29
Apr-16	691	1.60 ± 1.80	4.75 ± 2.45	2.71 ± 1.76	2.04 ± 1.21	2.97
May-16	735	1.42 ± 0.83	4.58 ± 2.34	2.83 ± 1.65	1.75 ± 1.22	3.22
Jun-16	683	1.31 ± 0.77	5.44 ± 3.30	3.78 ± 2.22	1.66 ± 1.74	4.15
Jul-16	672	1.37± 0.87	5.93 ± 3.46	2.48 ± 1.58	3.46 ± 2.52	4.34
Aug-16	721	0.86 ± 0.48	4.18 ± 2.11	1.99 ± 1.12	2.19 ± 1.41	4.86
Sep-16	710	1.09 ± 0.65	5.14 ± 2.47	2.85 ± 1.70	2.28 ± 1.41	4.73
Oct-16	677	1.00 ± 0.59	4.48 ± 1.91	2.22 ± 1.32	2.27 ± 1.28	4.51
Nov-16	678	1.95 ± 1.50	8.96 ± 5.64	5.83 ± 4.49	3.13 ± 2.81	4.60
Dec-16	712	2.00 ± 1.72	9.00 ± 5.89	6.45 ± 5.51	2.55 ± 1.50	4.48
Jan-17	727	1.32 ± 0.86	6.47 ± 3.17	4.27 ± 2.78	2.20 ± 1.11	4.91
Feb-17	667	1.30 ± 0.91	6.63 ± 3.25	3.08 ± 2.15	3.55 ± 1.77	5.08
Mar-17	740	1.20 ± 0.68	5.63 ± 2.11	2.39 ± 1.35	3.24 ± 1.20	4.69
Apr-17	651	1.13 ± 0.69	6.07 ± 2.86	3.92 ± 2.40	2.15 ± 1.19	5.39
May-17	625	0.99 ± 0.64	6.29 ± 3.38	4.00 ± 2.61	2.29 ± 1.54	6.38
Jun-17	704	1.11 ± 0.66	6.42 ± 3.27	4.12 ± 2.46	2.30 ± 1.65	5.79
Jul-17	549	1.34 ± 0.72	8.13 ± 3.34	1.72 ± 0.92	6.41 ± 2.97	6.05
Aug-17	722	1.08 ± 0.68	5.87 ± 3.06	2.85 ± 1.79	3.02 ± 2.12	5.43
Sep-17	704	0.88 ± 0.62	4.38 ± 3.11	2.54 ± 1.78	1.83 ± 1.91	4.97
Oct-17	582	0.55 ± 0.43	3.39 ± 2.35	2.07 ± 1.59	1.32 ± 1.43	6.09
Nov-17	710	1.54 ± 1.18	7.27 ± 4.10	4.28 ± 3.28	2.98 ± 2.01	4.72
Dec-17	658	2.21 ± 1.24	9.00 ± 4.78	4.61 ± 2.57	4.39 ± 3.04	4.06
Jan-18	720	1.48 ±1.24	7.82 ± 4.97	5.19 ± 4.33	2.63 ± 1.59	5.27
Feb-18	669	1.18 ± 0.92	7.99 ± 3.18	3.60 ± 2.79	4.39 ± 1.50	6.75
Mar-18	682	1.16 ± 0.68	6.15 ± 2.48	3.16 ± 1.78	2.99 ± 1.43	5.32
Apr-18	668	1.28 ± 0.81	6.83 ± 3.76	4.55 ± 2.86	2.28 ± 1.61	5.33
May-18	709	1.61 ± 0.90	6.04 ± 3.28	3.93 ± 2.19	2.11 ± 1.85	3.77
Jun-18	690	1.24 ± 0.71	5.96 ± 3.59	4.39 ± 2.52	1.56 ± 1.78	4.80
Jul-18	711	0.96 ± 0.56	3.76 ± 2.82	2.22 ± 1.36	1.42 ± 1.89	3.89
Aug-18	734	0.98 ± 0.41	3.63 ± 2.00	2.33 ± 0.99	1.30 ± 1.33	3.72
Sep-18	710	1.31 ± 0.75	4.83 ± 2.85	3.33 ± 1.92	1.49 ± 1.50	3.69
Oct-18	530	1.39 ± 0.89	5.19 ± 2.77	3.27 ± 2.11	1.92 ± 1.16	3.75
Nov-18	712	1.46 ± 1.06	4.97 ±3.11	3.37 ± 2.44	1.61 ± 1.07	3.40
Dec-18	717	1.59 ± 1.28	5.09 ± 3.80	3.67 ± 2.96	1.41 ± 1.26	3.20
Jan-19	726	1.79 ± 1.20	5.64 ± 3.31	4.00 ± 2.69	1.64 ± 1.16	3.16
Feb-19	659	1.16 ± 0.68	4.46 ± 2.43	2.87 ± 2.13	1.59 ± 0.79	3.85

Mar-19	729	1.36 ± 0.69	5.20 ± 2.18	3.48 ± 1.75	1.72 ± 1.02	3.81
Apr-19	695	1.34 ± 0.81	5.45 ± 2.89	3.80 ± 2.29	1.65 ± 1.13	4.08
May-19	725	1.19 ± 0.75	5.60 ±3.22	3.99 ± 2.53	1.61 ± 1.31	4.70
Jun-19	557	0.92 ± 0.50	4.45 ± 2.23	3.00 ± 1.63	1.45 ± 1.06	4.82
Jul-19	-	-	-	-	-	-
Aug-19	-	-	-	-	-	-
Sep-19	-	-	-	-	-	-
Oct-19	701	1.33 ± 0.65	6.07 ±2.53	3.86 ± 1.86	2.20 ± 1.53	4.55
Nov-19	707	1.08 ± 0.67	4.53 ± 2.69	3.38 ± 2.09	1.15 ± 1.09	4.19
Dec-19	676	1.75 ± 1.29	7.47 ± 5.05	5.76 ± 4.25	1.70 ± 1.31	4.28
Jan-20	695	1.31 ± 0.84	5.92 ± 2.97	4.09 ± 2.62	1.83 ± 0.94	4.53
Feb-20	655	0.74 ± 0.48	4.22 ± 2.80	3.51 ± 2.27	0.72 ± 0.78	5.70
Mar-20	726	0.73 ±0.48	4.09 ± 2.36	3.04 ± 1.98	1.06 ± 0.74	5.60
Apr-20	710	0.99 ± .48	5.64 ± 2.49	3.56 ± 1.70	2.08 ± 1.43	5.67
May-20	725	1.07 ± 0.63	5.83 ± 3.32	4.01 ± 2.35	1.82 ± 1.58	5.45
Jun-20	632	1.00 ± 0.46	5.33 ± 2.70	3.86 ± 1.78	1.47 ± 1.54	5.34
Jul-20	726	1.04 ± 0.66	5.65 ± 3.84	3.97 ± 2.51	1.68 ± 2.06	5.45
Aug-20	731	0.85 ± 0.39	3.81 ± 2.10	1.75 ± 0.81	2.06 ± 1.65	4.50
Sep-20	702	0.99 ± 0.52	5.31 ± 2.89	3.84 ± 2.01	1.47 ± 1.51	5.36
Oct-20	733	0.85 ± 0.39	3.99 ± 1.57	2.45 ± 1.13	1.54 ± 0.90	4.71
Nov-20	710	1.30 ± 0.85	5.92 ± 4.07	5.09 ± 3.34	0.83 ± 1.11	4.55
Dec-20	686	1.39 ± 0.98	5.42 ± 3.66	4.34 ± 3.04	1.08 ± 0.95	3.90
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Jan.	3607	1.57 ± 1.27	6.76 ± 4.17	4.54 ± 3.58	2.22 ± 1.39	4.31
Feb.	3292	1.23 ± 0.93	6.08 ± 3.36	3.52 ± 2.56	2.55 ± 1.85	4.94
Mar.	3601	1.26 ± 0.84	5.39 ± 2.56	2.65 ± 1.76	2.74 ± 1.87	4.28
Apr.	3415	1.26 ± 0.81	5.70 ± 2.96	3.67 ± 2.28	2.04 ± 1.33	4.51
May	3519	1.27 ± 0.80	5.63 ± 3.16	3.72 ± 2.32	1.91 ± 1.53	4.44
Jun.	3266	1.13 ± 0.66	5.62 ± 3.17	3.85 ± 2.25	1.77 ±1.63	4.97
Jul.	2658	1.21 ± 0.75	5.90 ± 3.69	2.48 ± 1.73	3.43 ± 3.12	4.89
Aug.	2908	0.94 ± 0.52	4.47 ± 2.56	2.23 ± 1.34	2.25 ± 1.78	4.78
Sep.	2826	1.06 ± 0.66	4.90 ± 2.86	3.11 ± 1.91	1.79 ± 1.63	4.62
Oct.	3223	1.03 ± 0.67	4.66 ± 2.37	2.77 ± 1.74	1.88 ± 1.31	4.50
Nov.	3517	1.50 ± 1.17	6.44 ± 4.41	4.29 ± 3.38	2.14 ± 2.06	4.29
Dec.	3449	1.81 ± 1.36	7.27 ± 5.03	4.97 ± 3.97	2.30 ± 2.18	4.02

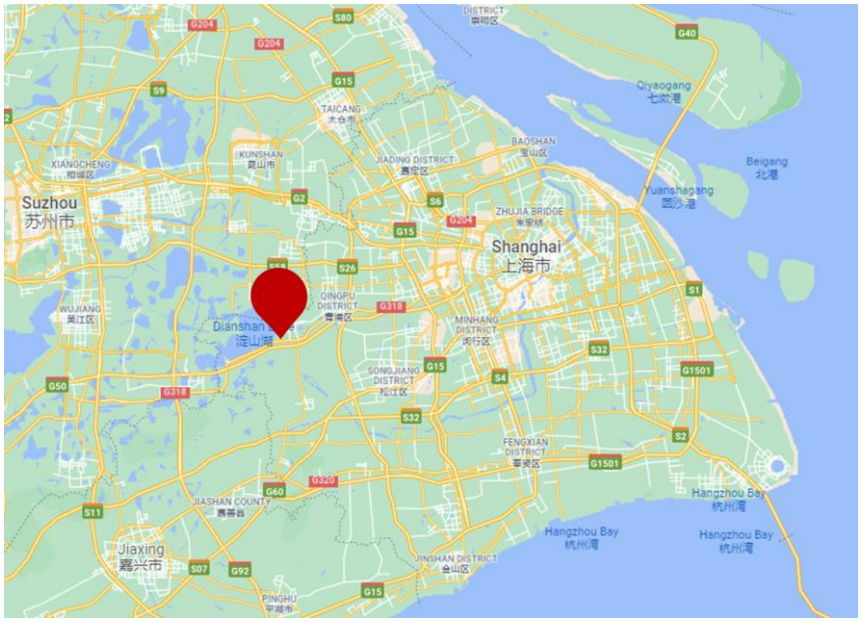

Figure S1 Location of the sampling site (Source: © Google Maps).

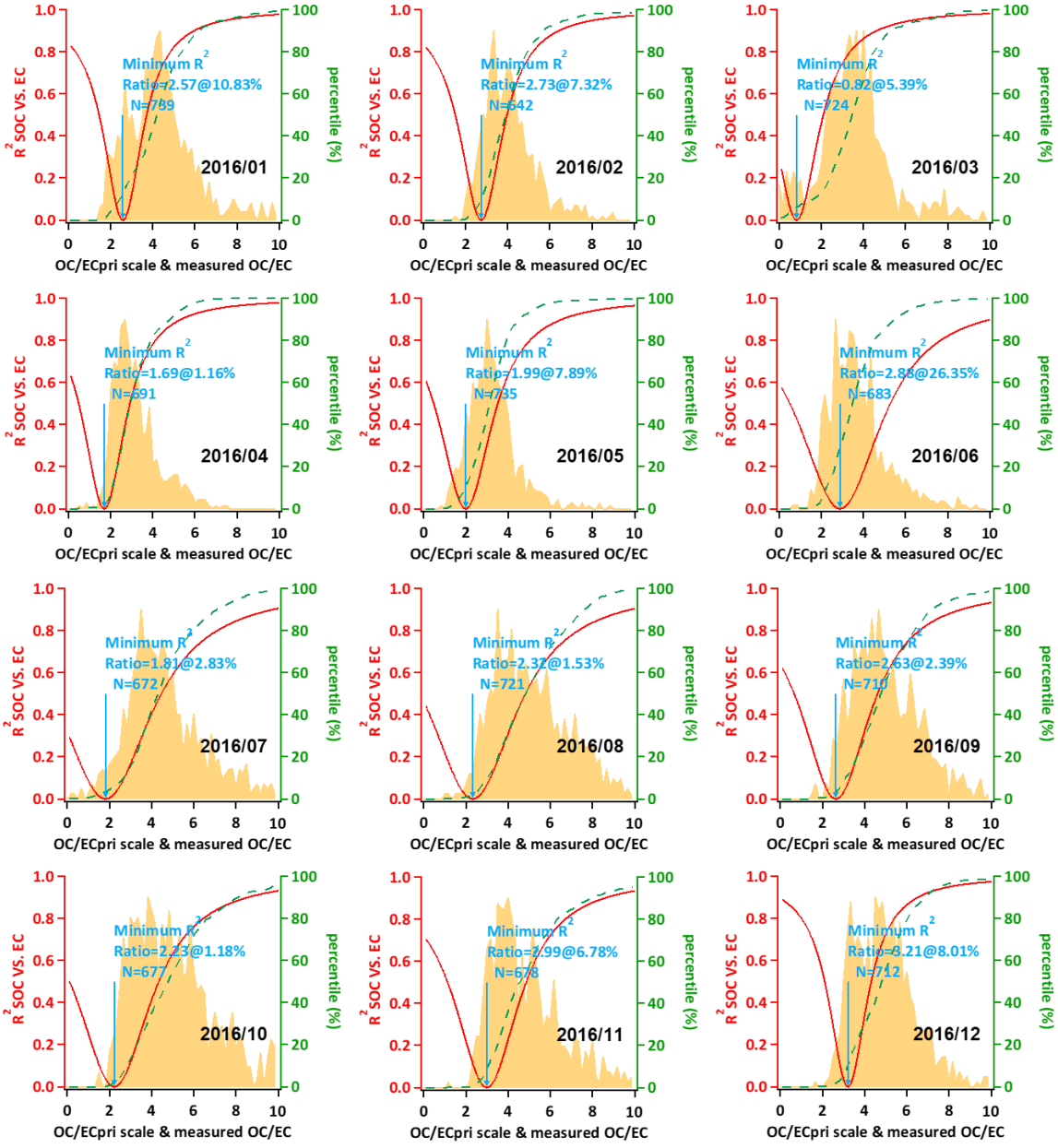

Figure S2 Illustration of $(OC/EC)_{pri}$ estimation for each month in 2016. The red curve is the correlation coefficient (R2) between SOC and EC as a function of assumed $(OC/EC)_{pri}$. The shaded area represents the frequency distribution of the OC/EC ratio for the entire OC and EC data set. The green dashed curve shows the cumulative frequency curve of OC/EC ratio.

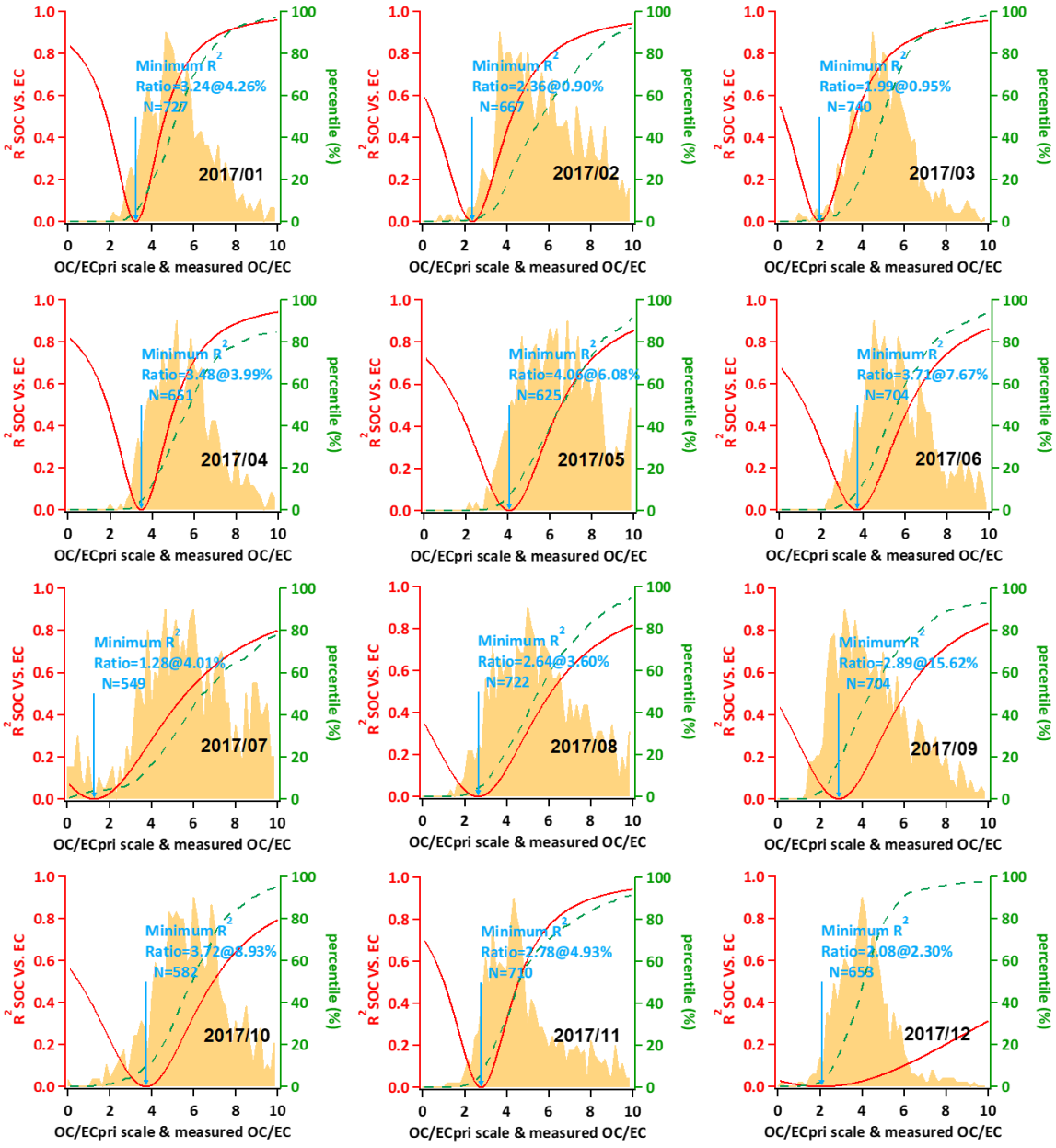

Figure S3 Illustration of $(OC/EC)_{pri}$ estimation for each month in **2017**. The red curve is the correlation coefficient (R^2) between SOC and EC as a function of assumed $(OC/EC)_{pri}$. The shaded area represents the frequency distribution of the OC/EC ratio for the entire OC and EC data set. The green dashed curve shows the cumulative frequency curve of OC/EC ratio.

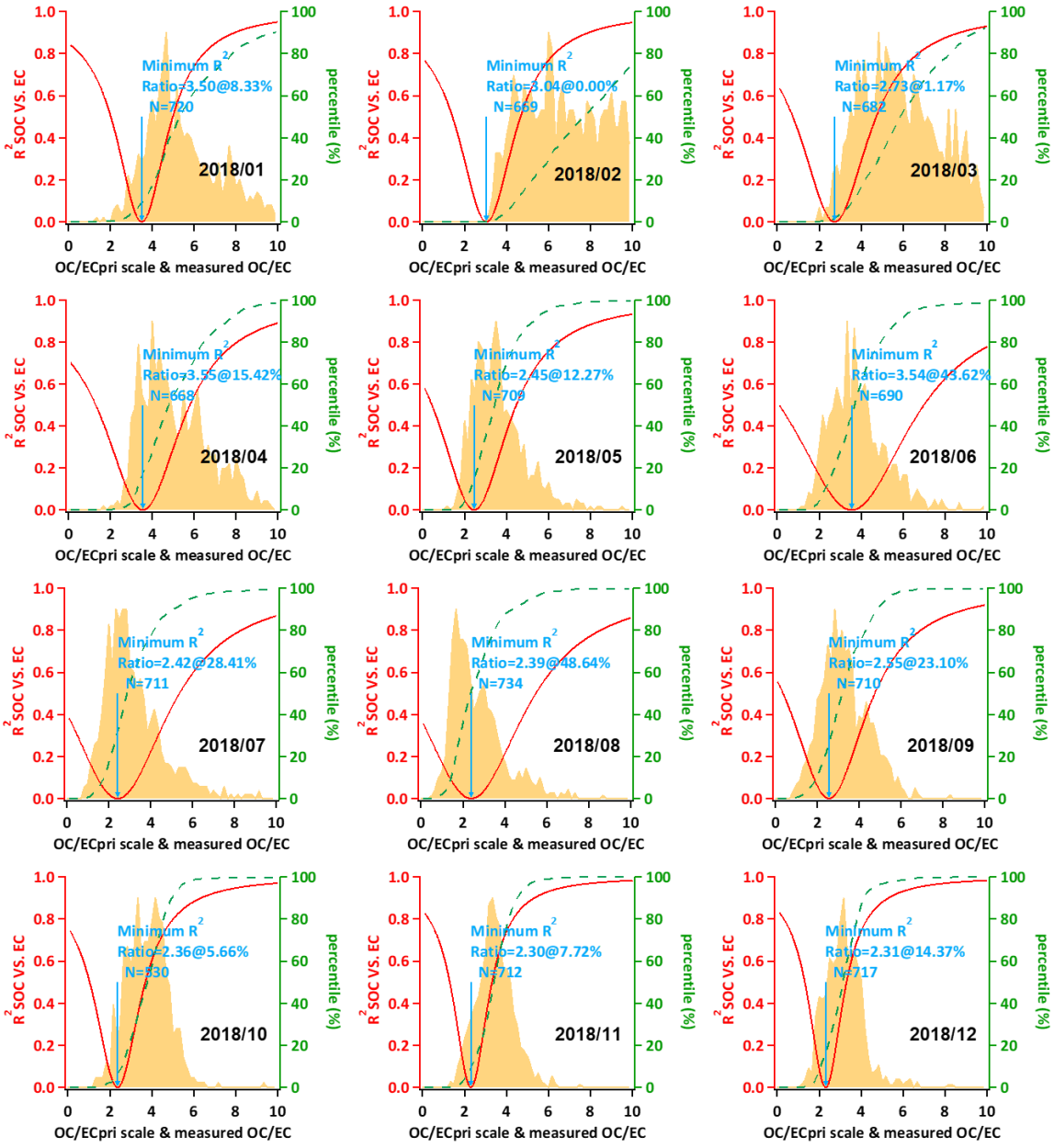

Figure S4 Illustration of $(OC/EC)_{pri}$ estimation for each month in **2018**. The red curve is the correlation coefficient (R^2) between SOC and EC as a function of assumed $(OC/EC)_{pri}$. The shaded area represents the frequency distribution of the OC/EC ratio for the entire OC and EC data set. The green dashed curve shows the cumulative frequency curve of OC/EC ratio.

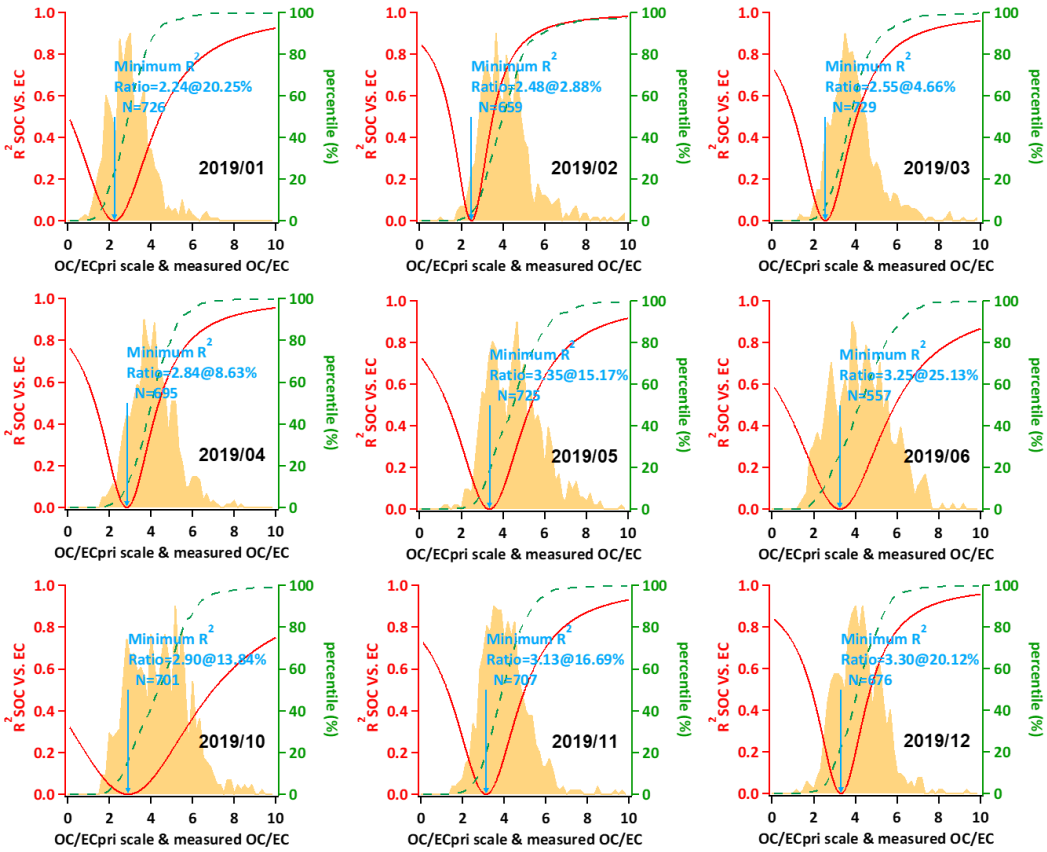

Figure S5 Illustration of $(OC/EC)_{pri}$ estimation for each month in **2019**. The red curve is the correlation coefficient (R^2) between SOC and EC as a function of assumed $(OC/EC)_{pri}$. The shaded area represents the frequency distribution of the OC/EC ratio for the entire OC and EC data set. The green dashed curve shows the cumulative frequency curve of OC/EC ratio.

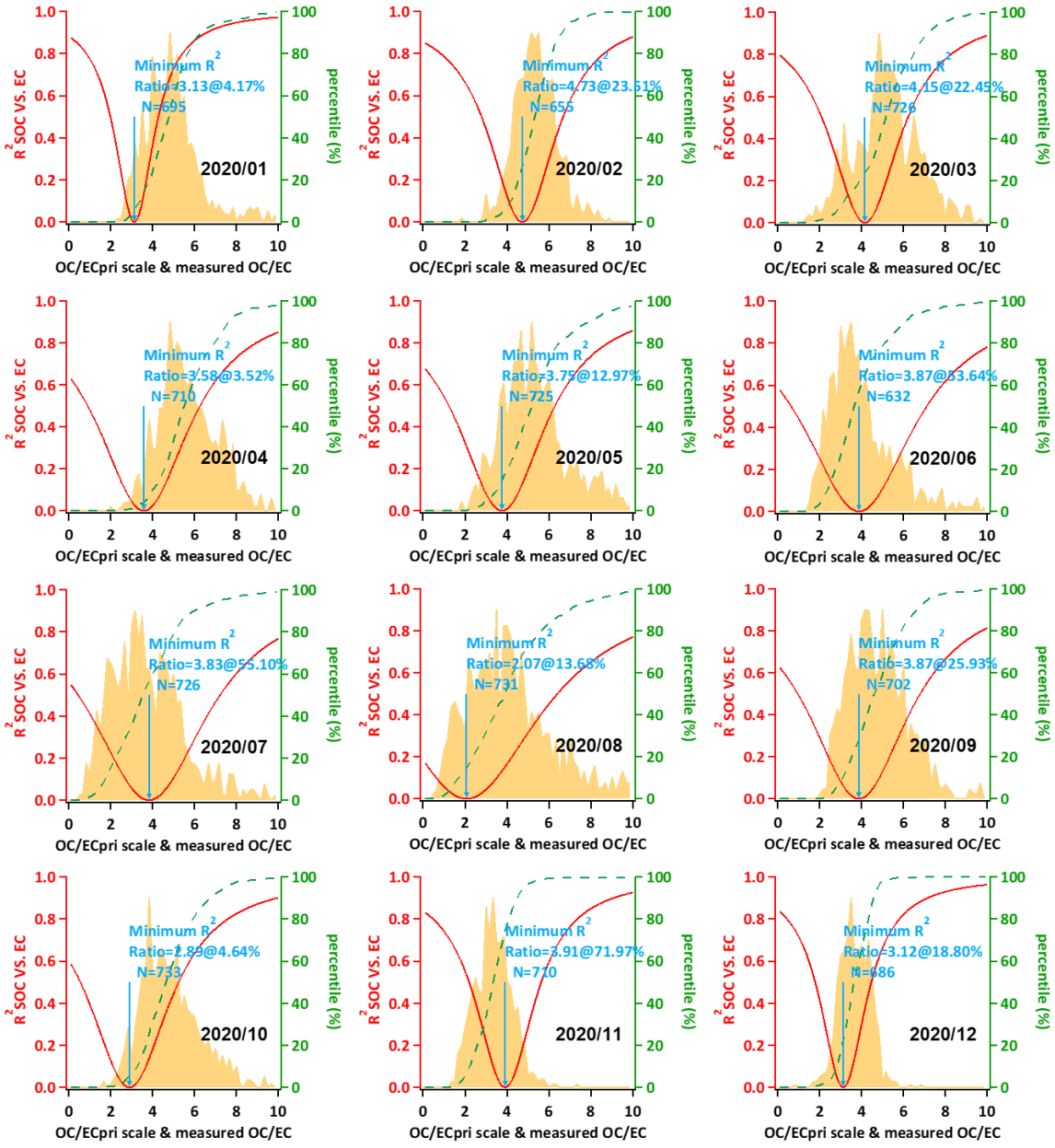

Figure S6 Illustration of $(OC/EC)_{pri}$ estimation for each month in **2020**. The red curve is the correlation coefficient (R^2) between SOC and EC as a function of assumed $(OC/EC)_{pri}$. The shaded area represents the frequency distribution of the OC/EC ratio for the entire OC and EC data set. The green dashed curve shows the cumulative frequency curve of OC/EC ratio.

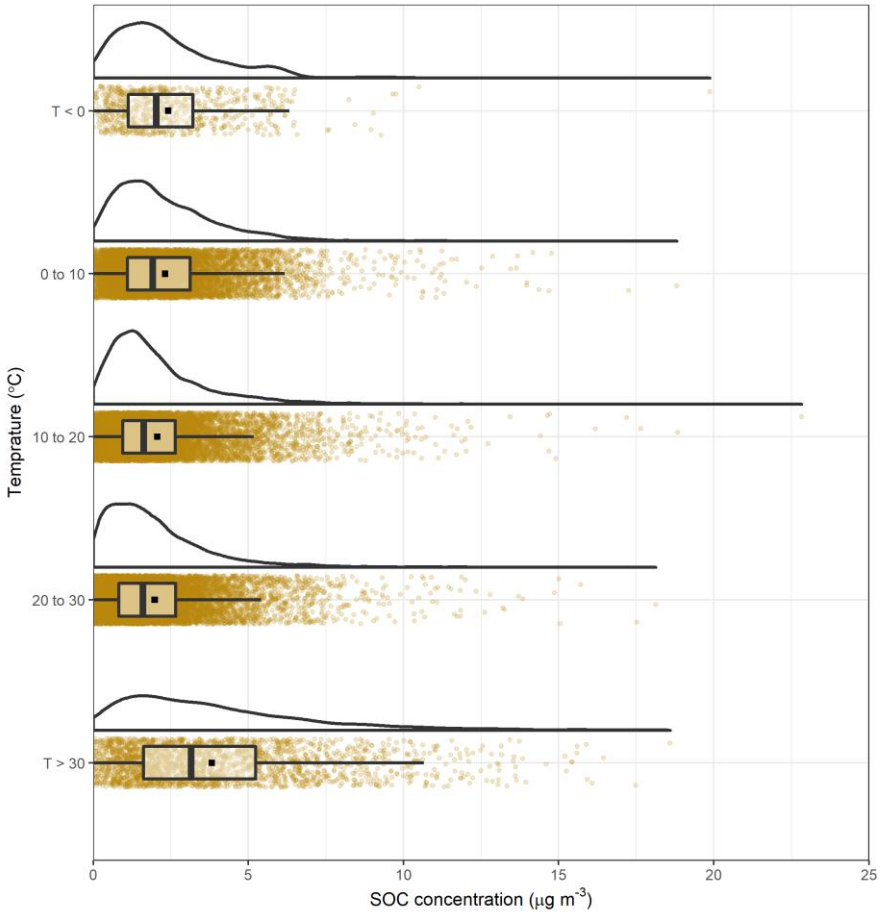

Figure S7 The statistical summary of SOC concentration in different temperature groups in Dianshan Lake. The markers represent raw data points, the curves represent probably density functions, the boxes represent 25th to 75th percentiles, the vertical lines represent the median, the points present average, and the whisker presents 1.5 inter-quarter ranges.

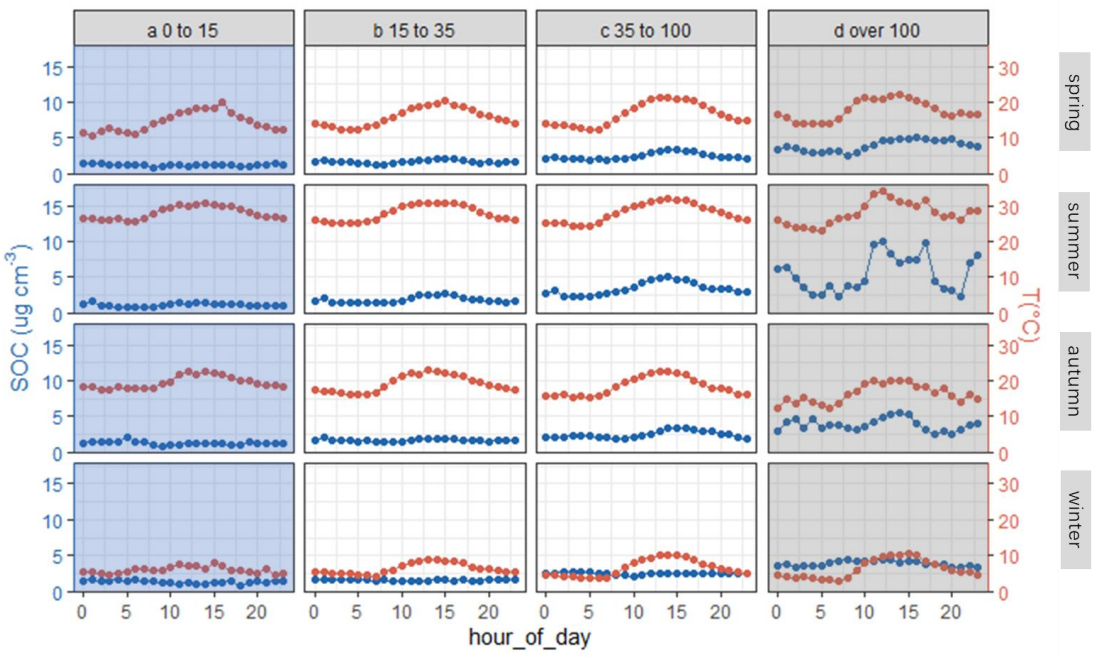

Figure S8 Diurnal variations of SOC concentrations and temperature in four different $PM_{2.5}$ groups for each season during 2016-2020.

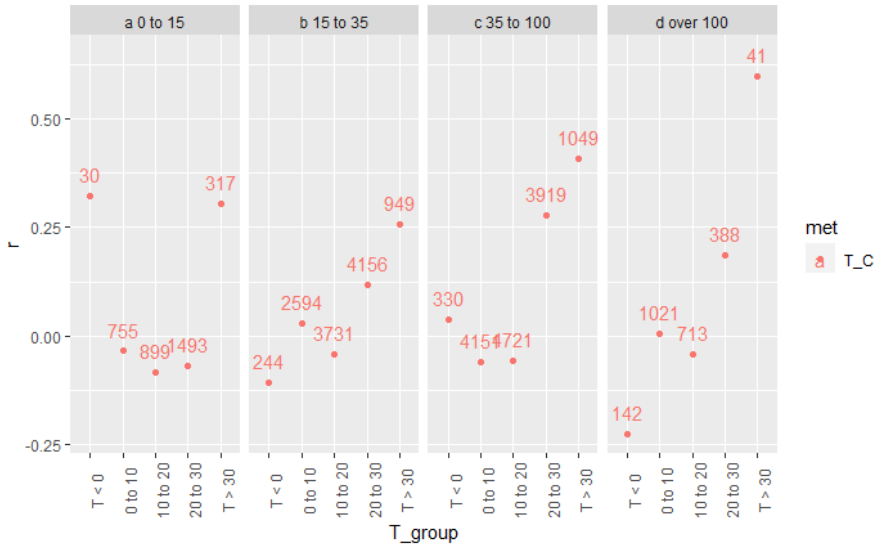

Figure S9 The Pearson correlation coefficient distribution of SOC concentration and different temperature gradients in four different $PM_{2.5}$ groups for each season during 2016-2020. (The data near the point represents the amount of data in that temperature interval)

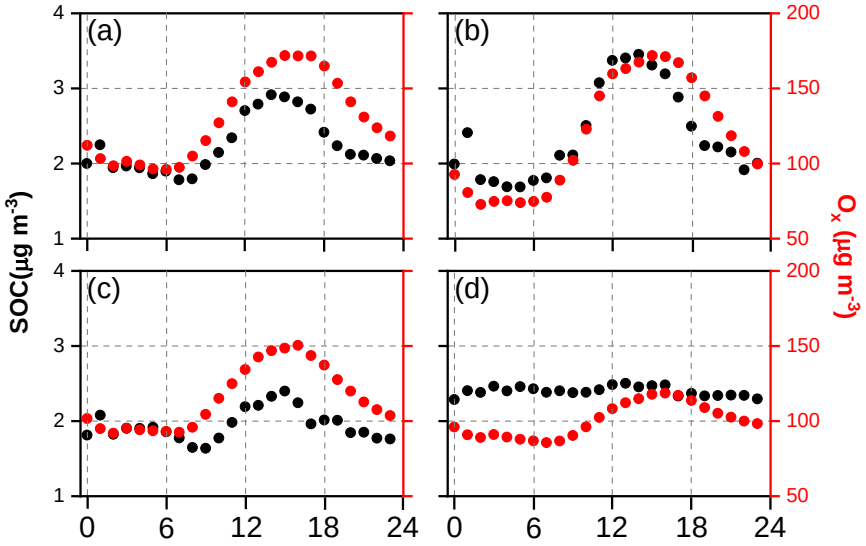

Figure S10 Diurnal variations of SOC concentrations and O_x in four seasons (a) spring; (b) summer; (c) autumn and (d) winter during 2016-2020.

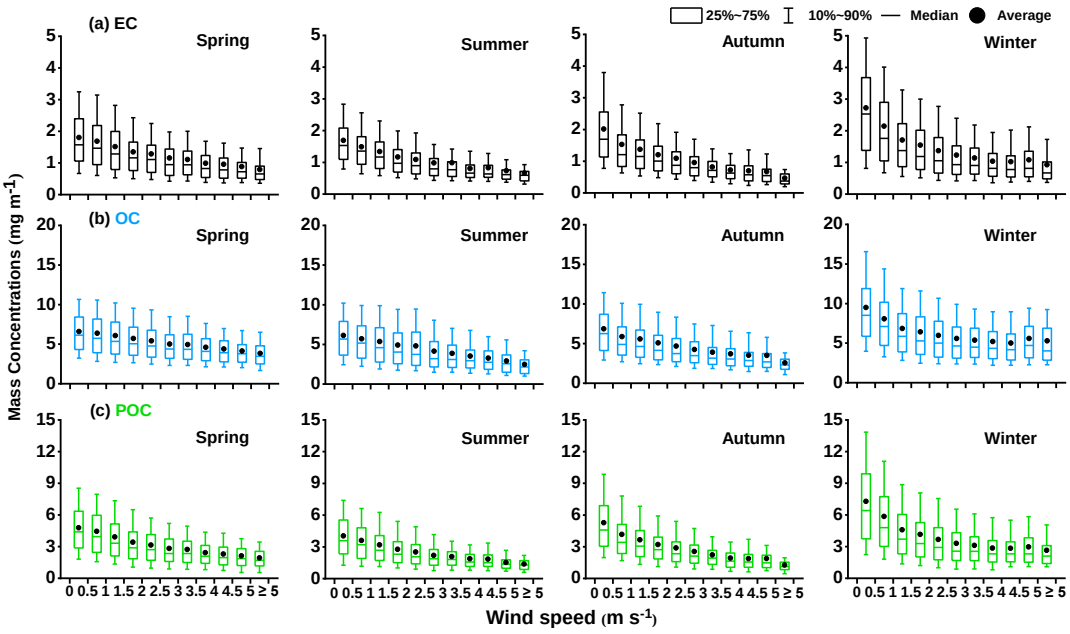

Figure S11 Box plots of (a) EC, (b) OC, and (c) POC mass concentrations as a function of wind speed sectors between 2016 to 2020 in Dianshan Lake.

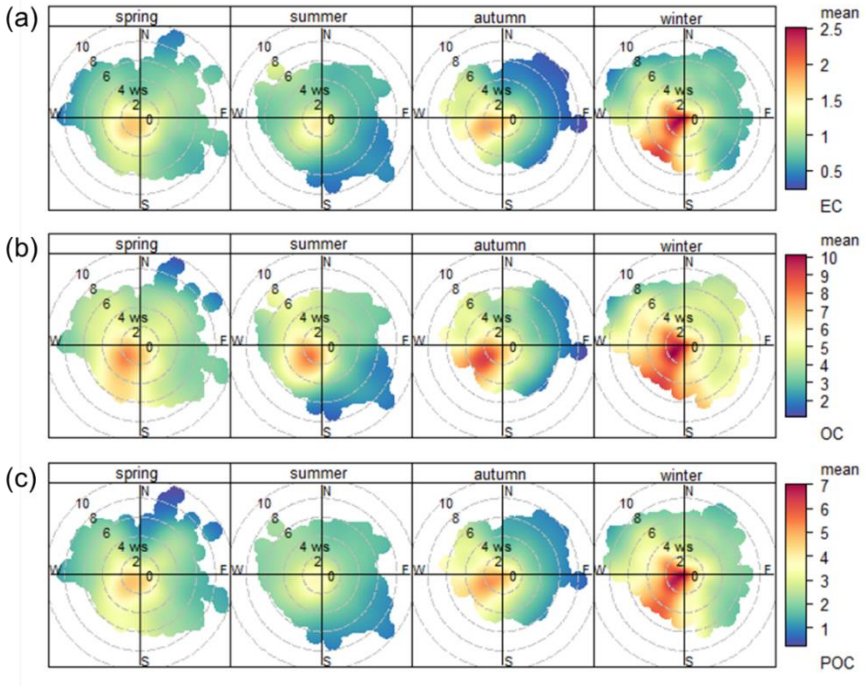

Figure S12 (a) Box plots of (a) EC, (b) OC, and (c) POC mass concentrations (μg m^{-3}) as a function of wind speed sectors between 2016 to 2020; (b) Bivariate polar plots of seasonal SOC concentrations between 2016 to 2020 in Dianshan Lake.