

Supplementary Data

PARAFAC modeling

The mathematical separation of the fluorescence EEM spectrum was analyzed by PARAFAC. PARAFAC is an iterative 3D data decomposition algorithm based on the principle of alternating least squares, which transfers the 3D matrix into three loads, load A, B and C (Ying et al., 2015).

The basic principle and formula of PARAFAC are as follows (Stedmon and Bro, 2008):

$$X_{ijk} = \sum_{n=1}^N a_{in} b_{jn} c_{kn} + e_{ijk}$$

$i=1,2, \dots, I; j=1,2, \dots, J; k=1,2, \dots, K,$ (1)

In the formula, X_{ijk} is the component element of cubic matrix $X(I \times J \times K)$, which is a trilinear data matrix with component number or factor number N . The a_{in} , b_{jn} and c_{kn} represent the elements of the composition matrix A, B and C with clear physical significance of size $I \times N$, $J \times N$ and $K \times N$, respectively. e_{ijk} is the component element of the residual cubic matrix $E(I \times J \times K)$.

We used the DOM-Flour toolbox of the Matlab software package to perform PARAFAC analysis on the EEM data sets of all samples, according to the tutorial described by Stedmon and Bro (Stedmon and Bro, 2008). This DOM-Flour toolbox was specifically developed to perform PARAFAC analysis of DOM fluorescence, and contained all of the tools used to identify outliers as well as to perform split-half and residual error diagnostics.

Table S1 The longitude and latitude of sample sites

Sample site	Longitude	Latitude	Altitude (m)
1	104°57'2438"	34°43'5505"	/
2	105°19'0526"	34°45'2154"	1168.1
3	105°57'1563"	34°32'3741"	952.4
4	106°55'4407"	34°23'4150"	533.8
5	107°18'1614"	34°21'5629"	456.7
6	107°19'1513"	34°20'4717"	454.2
7	108°42'3160"	34°19'2663"	302.1
8	109°03'2797"	34°28'0690"	277.5
9	109°02'2904"	34°26'4777"	276.6
10	109°04'1998"	34°28'0976"	275.6
11	109°18'28"	34°32'50"	347
12	109°18'1059"	34°33'0681"	264.5
13	110°10'0609"	34°38'1413"	215.3
14	110°08'2047"	34°41'2771"	216.2
15	110°10'2218"	34°38'1568"	215.9

Table S2 The correlations of DOC and UV₂₅₄ of the surface water

		Type	UV ₂₅₄	DOC	
UV ₂₅₄	Pearson Correlation		1	0.953**	
	Sig. (2-tailed)			0.000	
	N		15	15	
	Bootstrap ^c	Bias		0	-0.017
		Std. Error		0	0.051
		95% Confidence Interval	Lower	1	0.820
			Upper	1	0.985
DOC	Pearson Correlation		0.953**	1	
	Sig. (2-tailed)		.000		
	N		15	15	
	Bootstrap ^c	Bias		-0.017	0
		Std. Error		0.051	0
		95% Confidence Interval	Lower	0.820	1
			Upper	0.985	1

Notes: **, Correlation is significant at the 0.01 level (2-tailed). c, Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

Table S3 The correlations of DOC and UV₂₅₄ of the sediment

		Type	UV ₂₅₄	DOC	
UV ₂₅₄	Pearson Correlation		1	0.742**	
	Sig. (2-tailed)			0.002	
	N		15	15	
	Bootstrap ^c	Bias		0	-0.025
		Std. Error		0	0.158
		95% Confidence Interval	Lower	1	0.306
			Upper	1	0.919
DOC	Pearson Correlation		0.742**	1	
	Sig. (2-tailed)		0.002		
	N		15	15	
	Bootstrap ^c	Bias		-0.025	0
		Std. Error		0.158	0
		95% Confidence Interval	Lower	0.306	1
			Upper	0.919	1

Notes: **, Correlation is significant at the 0.01 level (2-tailed). c, Unless otherwise noted, bootstrap results are based on 1000 bootstrap samples

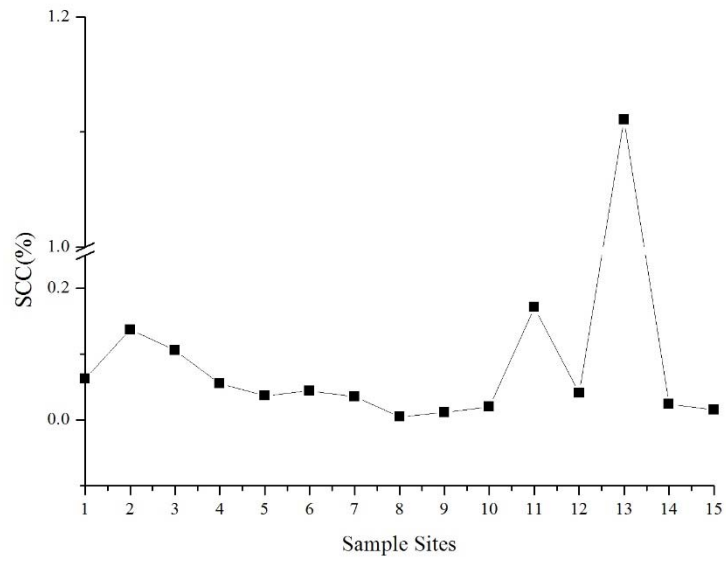


Fig. S1 Sand content of different sampling points in surface water

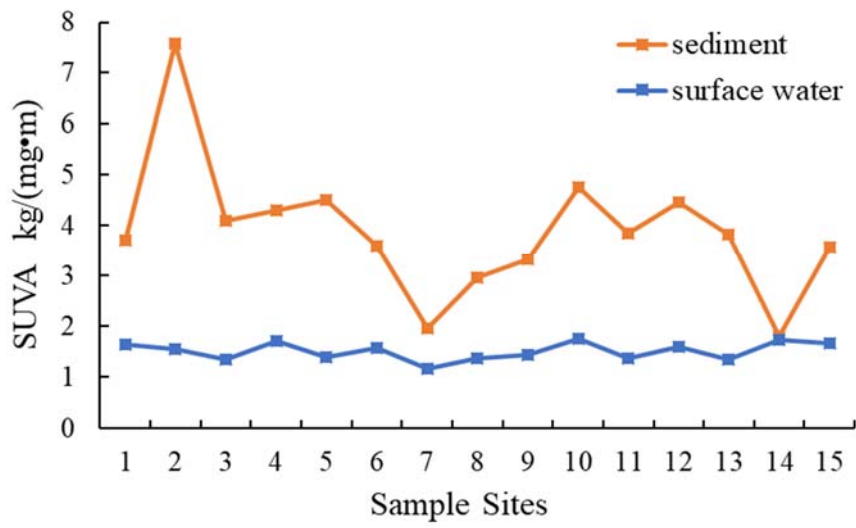


Fig. S2 SUVA of the surface water and sediment at different sample sites

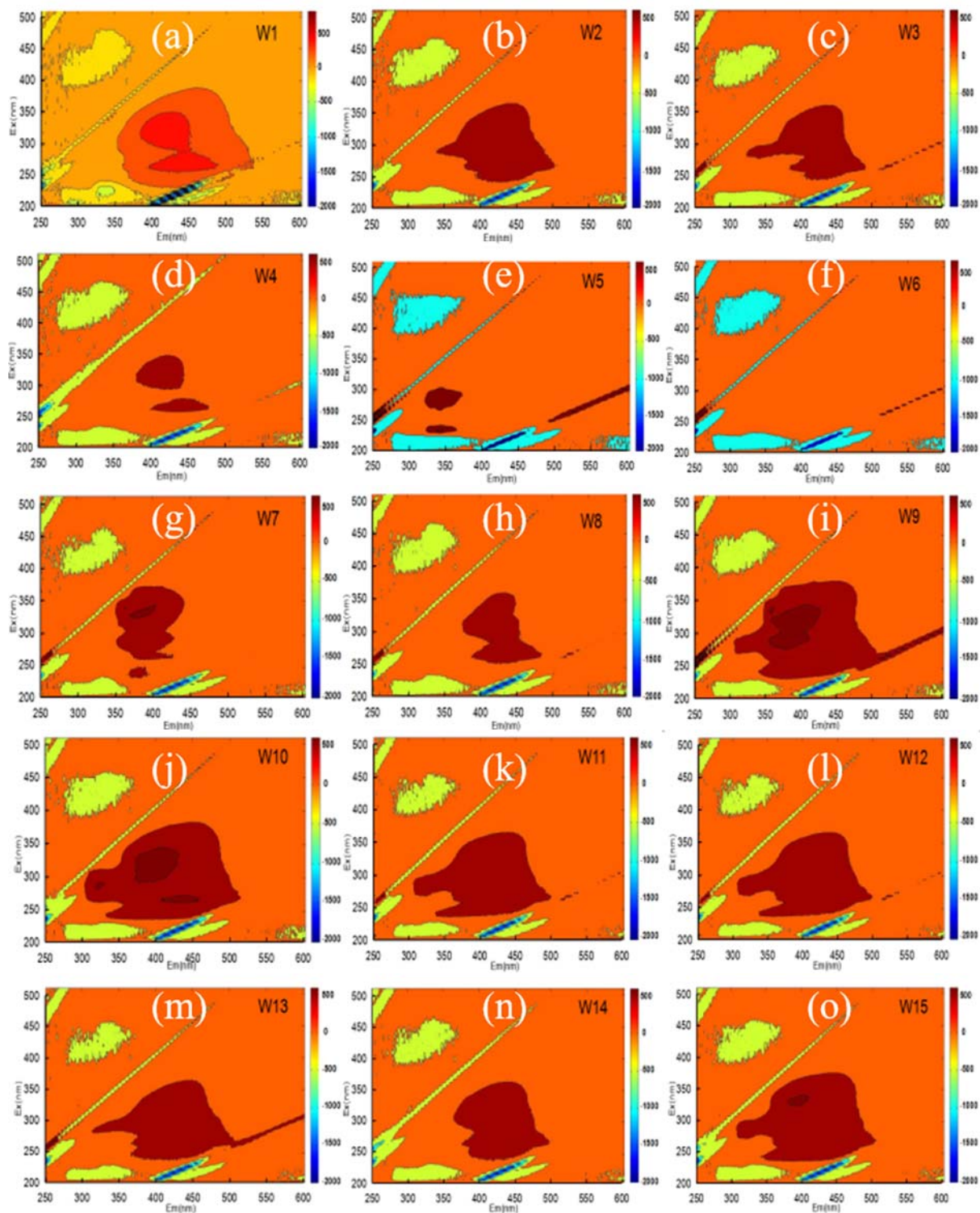


Fig. S3 DOM fluorescence contour plot spectroscopy in the surface water ((a–o): 1–15 sample sites of the surface water)

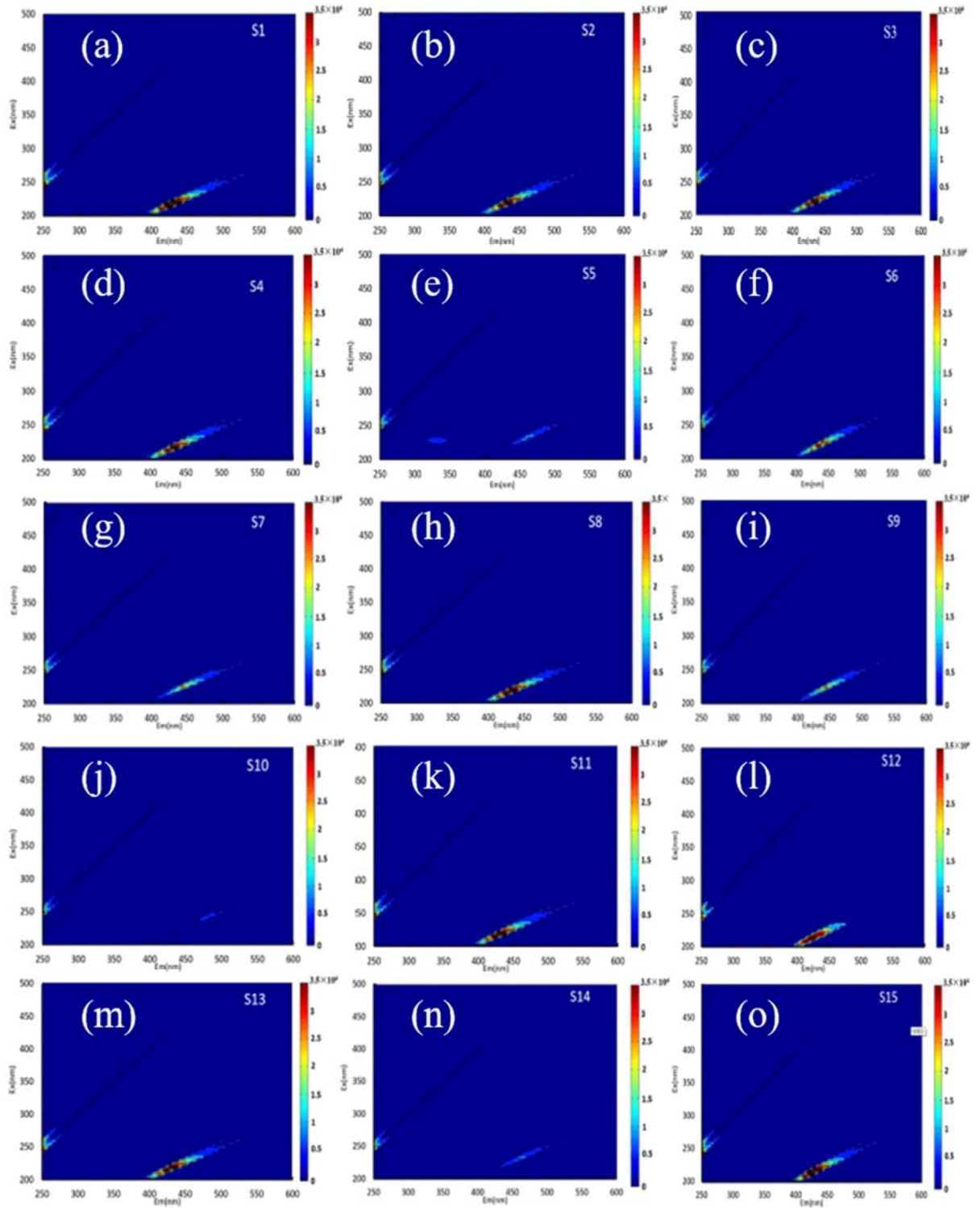


Fig. S4 DOM fluorescence contour plot spectroscopy in sediment ((a–o): 1–15 sample sites of the sediment)

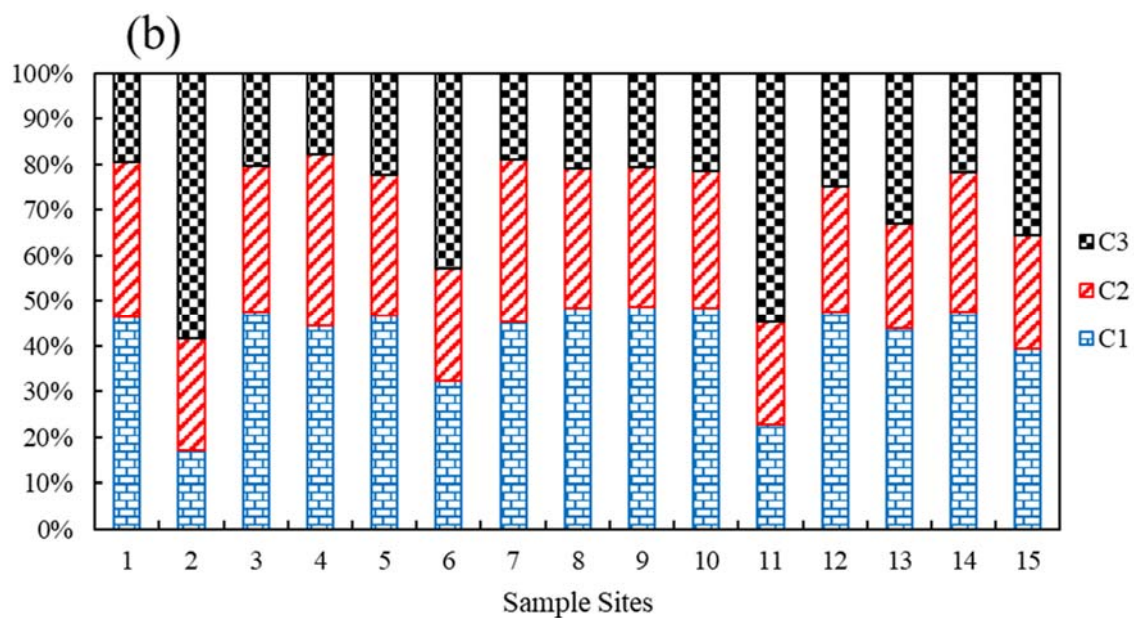
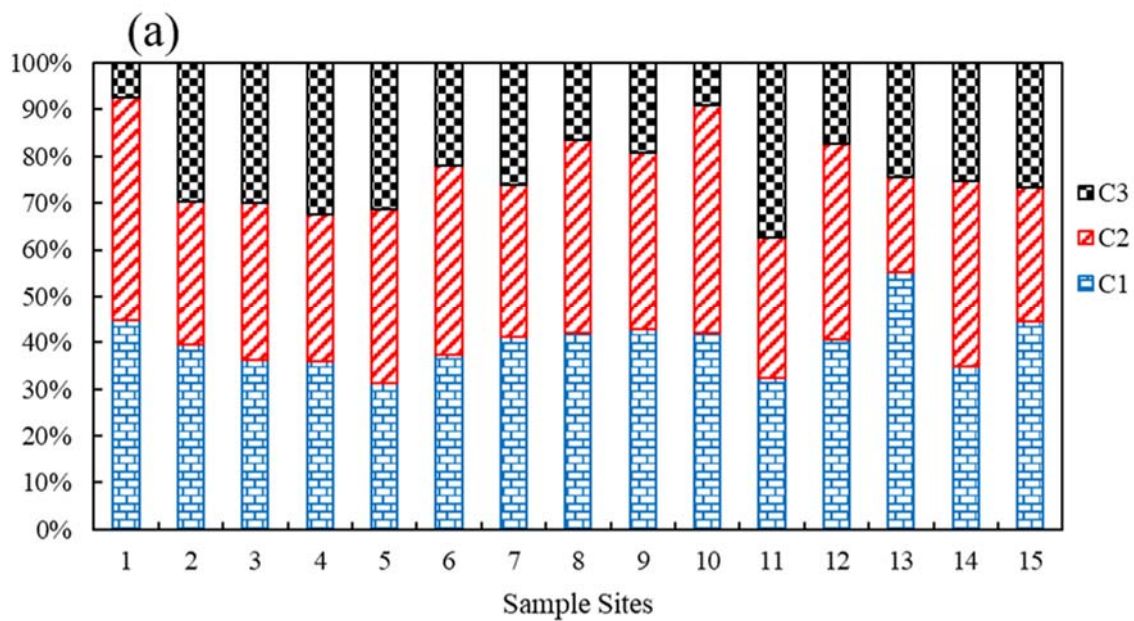


Fig. S5 The abundance of each PARAFAC-component to the total three components of surface water and sediment ((a): surface water; (b): sediment)

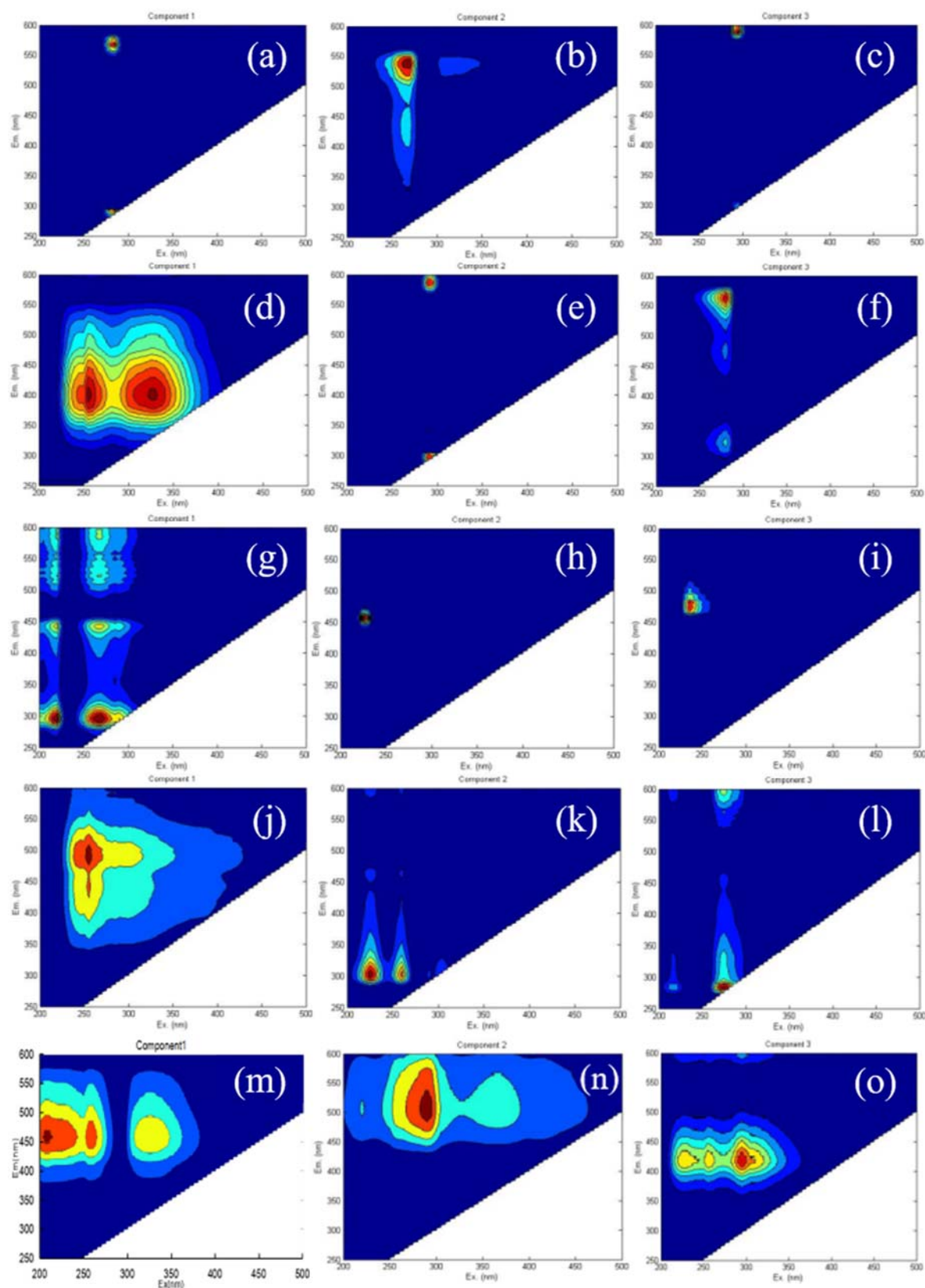


Fig. S6 The PARAFAC model output showing fluorescence signatures of the three fluorescent components during light treatments (W1: Sample 1 of surface water; W10: Sample 10 of surface water; S1: Sample 1 of sediment; S10: Sample 10 of sediment; F: Fulvic Acid Standard. (a–c): W1; (d–f): W10; (g–i): S1; (j–l): S10; (m–o): F)

References

- Stedmon C A, Bro R (2008). Characterizing dissolved organic matter fluorescence with parallel factor analysis: a tutorial. *Limnology and Oceanography-Methods*, 6(11): 572–579
- Ying B, Su R, Yao Q, Zhang C, Shi X (2015). Characterization of Chromophoric Dissolved Organic Matter (CDOM) in the Bohai Sea and the Yellow Sea using Excitation-Emission Matrix Spectroscopy (EEMs) and Parallel Factor Analysis (PARAFAC). *Environmental Science*, 36(1): 1–21