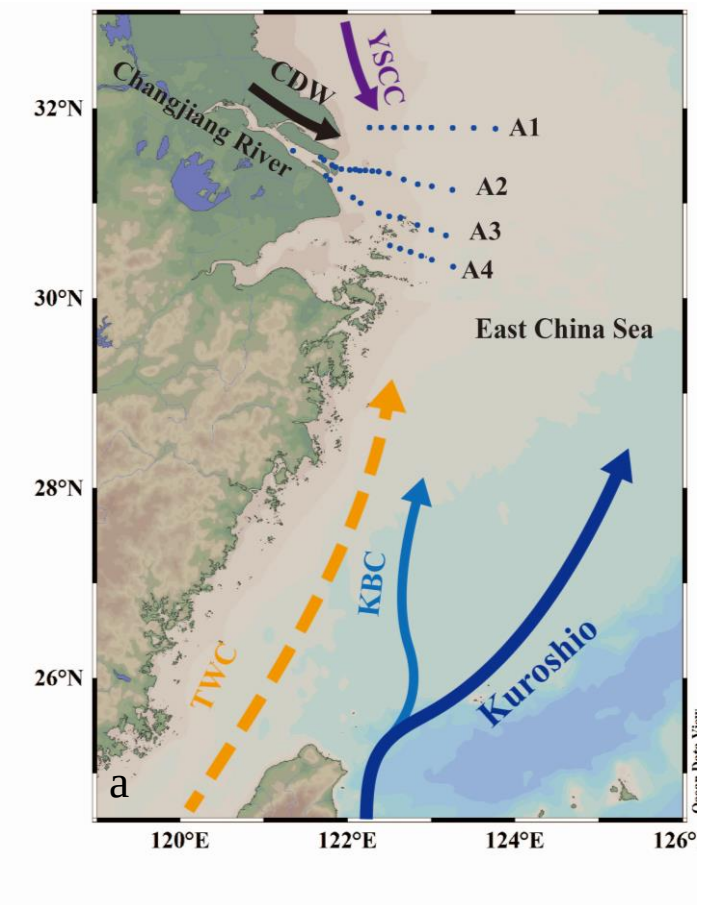

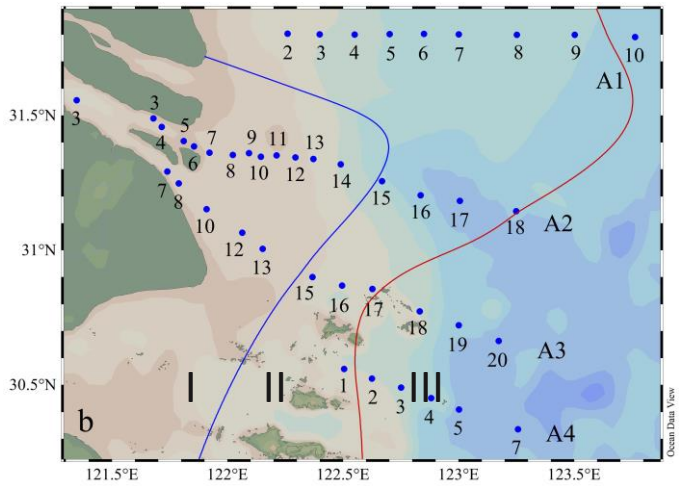

Figure 1. The map of the Changjiang River Estuary. a) The schematic diagram of currents, including Yellow Sea Coastal Current (YSCC), Changjiang Diluted Water (CDW), Taiwan Warm Current (TWC), and Kuroshio Branch Current (KBC) in summer. b) The hydrographic and sampling locations (blue dots). The river mouth to the sediment front (Zone I), between the sediment front and plume front (Zone II), and offshore seawater (Zone III) are separated with the isoline S = 15 as the sediment front (blue line) and the isoline of S=26 (red line) as the boundary of the core zone of CDW.

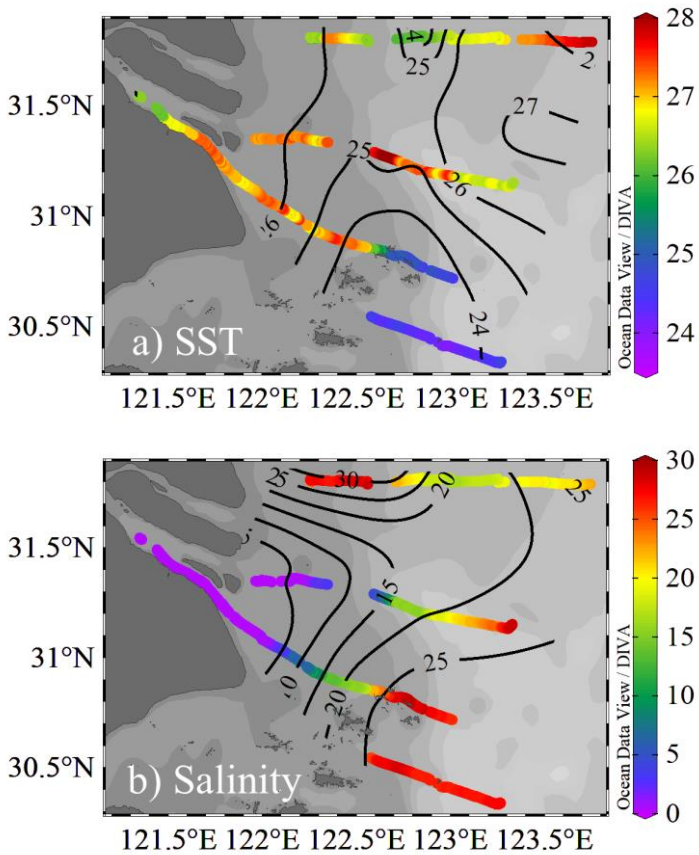

Figure 2 The spatial distribution of (a) temperature and (b) salinity at the surface. The spatial distribution obtained from CTD (contour) matched the underway observation (color points) well.

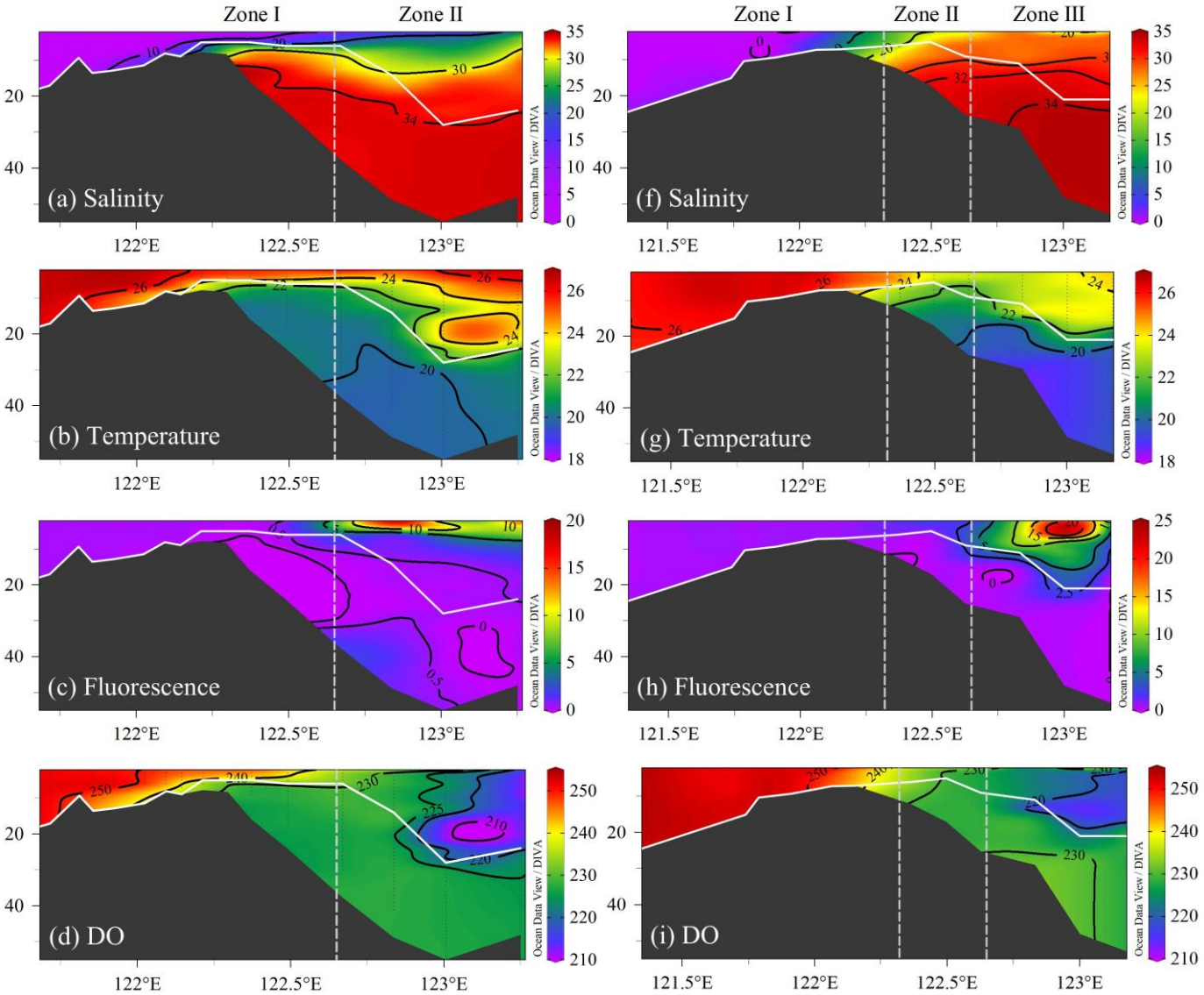

Figure 3 At transects A2 (a-e) and A3 (f-j), the vertical changes salinity (a, f), temperature (℃, b, g), Chlorophyll *a* Fluorescence (mg m^{-3}, c, h), and dissolved oxygen (DO, μmol kg^{-1}, d, i). The white-solid lines refer to the mixed layer depth (MLD). The transect A2 passes through Zone I and II, while transect A3 divided transect A3 into Zone I to III. transect A2

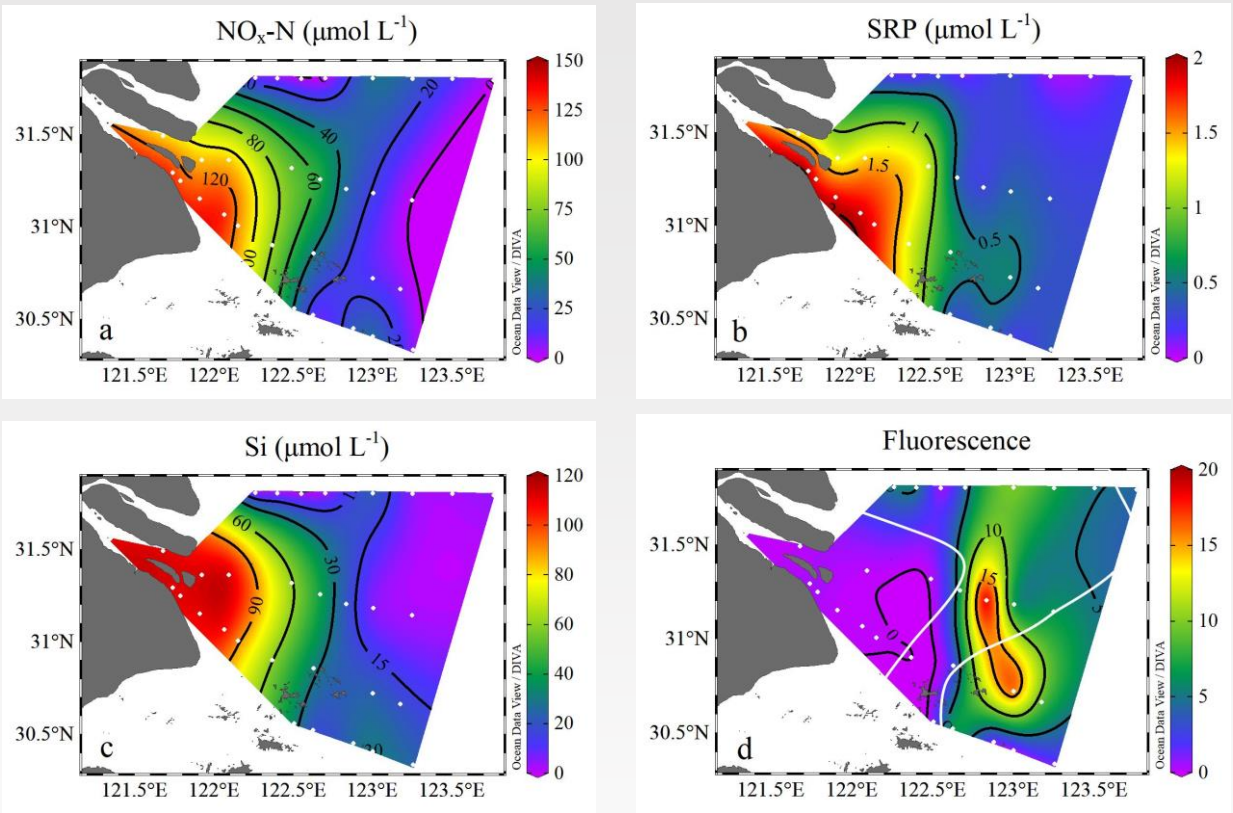

Figure 4 The surface distribution of (a) NO_x-N (NO_3-N+ NO_2-N), (b) SRP, (c) Si and (d) Chlorophyll *a* Fluorescence (mg m^{-3}). The study area is divided by the sediment front and Changjiang River plume front (white lines).

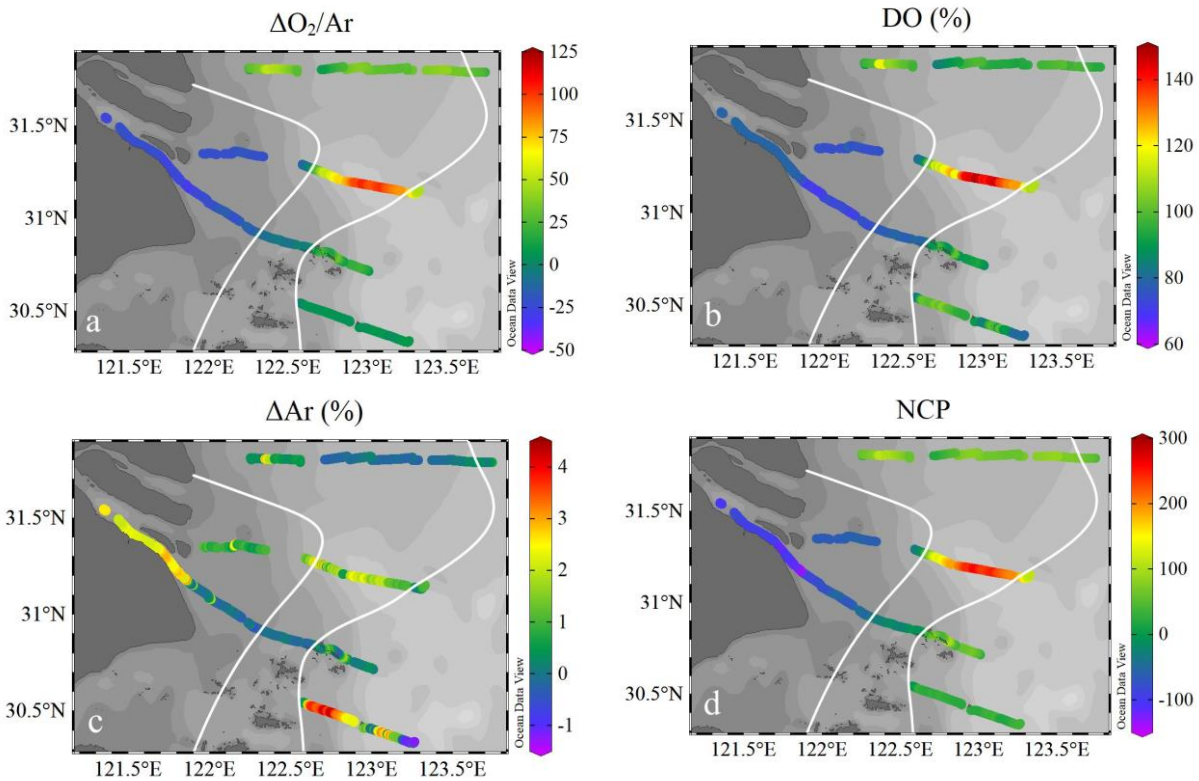

Figure 5 The spatial distribution of (a) biological oxygen supersaturation ($\Delta O_2/Ar$), (b) oxygen saturation (DO%), (c) argon saturation (ΔAr%), and (d) net community production (NCP, mmol C m^{-2} d^{-1}). The study area is divided by the sediment front and Changjiang River plume front (white lines).

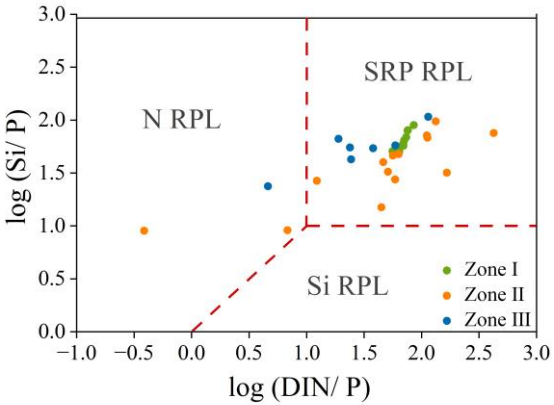

Figure 6 The Relative Potential Limitation (RPL) of DIN,SPR and Si. The red dashed line indicates DIN/P=10, Si/P=10, and Si/DIN=1.

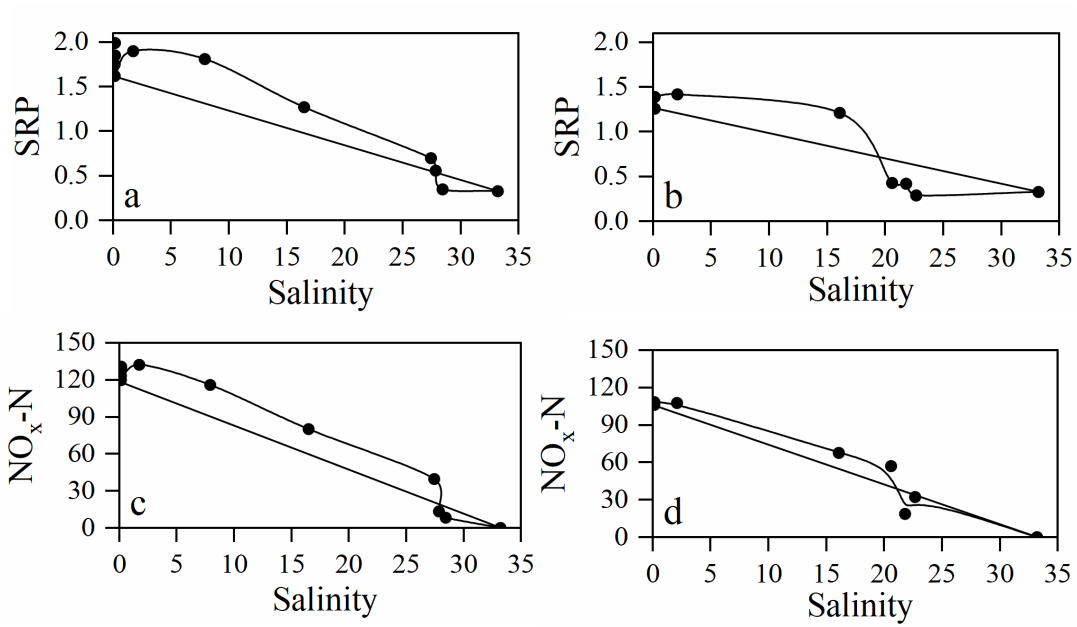

Figure 7 Salinity – nutrient diagram of A3 (a, c) and A2 (b, d) to separate nutrient removal by biological intake and nutrient supply from organic matter decomposition.

Table 1 The environmental factor in three zones

	Zone	Temperature (℃)	Salinity	DO (μmol kg^{-1})
I	River-TMZ	26.21 ± 0.59 24.91 ~ 26.99	2.87 ± 3.97 0.13 ~ 11.65	248.82 ± 3.95 240.68 ~ 254.09
II	CDW	25.11±1.20 23.20 ~ 26.64	23.08 ± 4.81 15.35 ~ 30.21	223.01 ± 8.22 210.67 ~ 234.44
III	offshore	23.89 ± 0.70 23.14 ~ 25.48	26.96 ± 0.83 25.69 ~ 27.99	221.97 ± 3.11 215.90 ~ 225.31

	Zone	NO_x-N (μmol L^{-1})	SRP (μmol L^{-1})	Si (μmol L^{-1})	Fluorescence (mg m^{-3})
I	River-TMZ	114.04 ± 18.92 67.69 ~ 132.25	1.62 ± 0.28 1.21 ~ 1.99	104.62 ± 16.50 61.45 ~ 113.21	0.23 ± 0.14 0.10 ~ 0.48
II	CDW	26.43 ± 23.13 0.13 ~ 80.27	0.39±0.34 0.07 ~ 1.27	17.51 ± 18.37 2.44 ~ 60.47	5.60 ± 4.74 0.11 ~ 18.87
III	offshore	14.70 ± 11.11 0.98 ~ 32.12	0.37 ± 0.11 0.21 ~ 0.56	21.24 ± 8.07 4.97 ~ 30.12	5.81 ± 5.99 0.60 ~ 17.44

Table 2 The regional range of NCP (mmol C m^{-2} d^{-1})

Regional effect			
Zone	Zone I	Zone II	Zone III
Mean	- 80.83 ± 26.75	88.01 ± 79.08	43.89 ± 33.27
Range	- 141.00～2.11	- 29.10～261.78	- 4.85～170.28

Table 3 the Recorded summer integrated primary production (IPP) and net primary production (NPP) from the Changjiang River to the East China Sea (mmol C m^{-2} d^{-1})

Sampling time	Station or location	Method	Intergrated PP (mg C m^{-2} d^{-1})	Net primary production (mg m^{-3} h^{-1})	Reference
1986.6	30.75° N-32.0° N, 122.0° E-124.05° E	^{14}C	169±224 to 1514±1145		Ning et.al., 1988
1996.5.2-5.15	25.5° N-30.5° N, 122° E-126°	^{14}C	153-1007		Hung et.al., 2000
	3 stations within our study region		344,505,467		
1998.6.28-7.8	26.0° N-32.0° N, 120° E-127° E	^{14}C	485±166 (640-4500)		Chen et.al., 2004
2002.8	29° N-32° N, 122° E-123.5° E	^{14}C	5.077 (0.208-12.054)		Zhou, Weihua et.al., 2004
2006.7.18-8.14	31° N-32.5° N, 122° E-124° E	DIN, P and Si	465,344,626		Wang et.al. ,2014
2007.7.1-7.11	26° N-32° N, 121° E-126° E	^{14}C	337-3377		Hung et.al.,2013
	29° N-32° N, 122.5° E-123.5° E (3 stations in CDW:S19,S29,S18)		189,730,453,377		
2008.8	26.0° N-35.0° N, 122° E-126.5° E	^{14}C		375.03 (4.17-1365.59)	Zhang, Rongyu et. al., 2016
2009.6	28–33° N, 122–124° E	^{14}C	1038±860 (116-2429)		Chu et.al. ,unpublished
2009.8	28–33° N, 122–124° E	^{14}C	677±495 (21-1498)		Chu et.al. ,unpublished
2006.7-8	CDW	DIN removal	465		Wang et.al. ,2014
		P removal	344		
		Si removal	626		
2010 summer	CDW	POC/234Th ratios	486 ± 275		Hung,2013

Table 4 Uncertainty estimate of NCP (mmol m^{-2} d^{-1}) in the upwelling region

Upwelling velocity (m s^{-1})	**ΔDO (μmol kg^{-1})**	**Vertical flux (mmol m^{-2} d^{-1})**		**References**
		Mean	Range	
3.5×10^{-5}	-0.814	-1.69 ± 3.44	-4.57~2.11	Luo et al., 1998
4.8×10^{-5}	-0.464	-1.25 ± 2.54	-3.38~1.56	Shen et al., 2020
1.5×10^{-5}	0.376	-0.39 ± 0.79	-1.06~0.49	Lv et al., 2006