Biogeochemistry of phosphorus in the Changjiang Estuary and its adjacent sea

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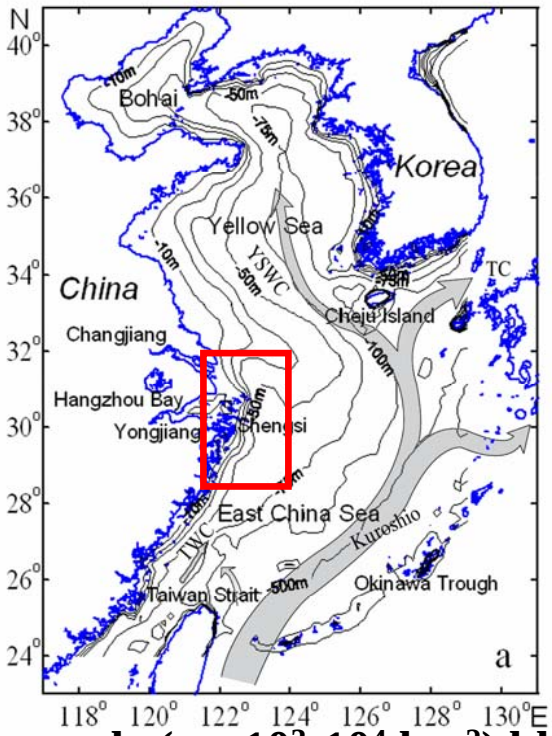
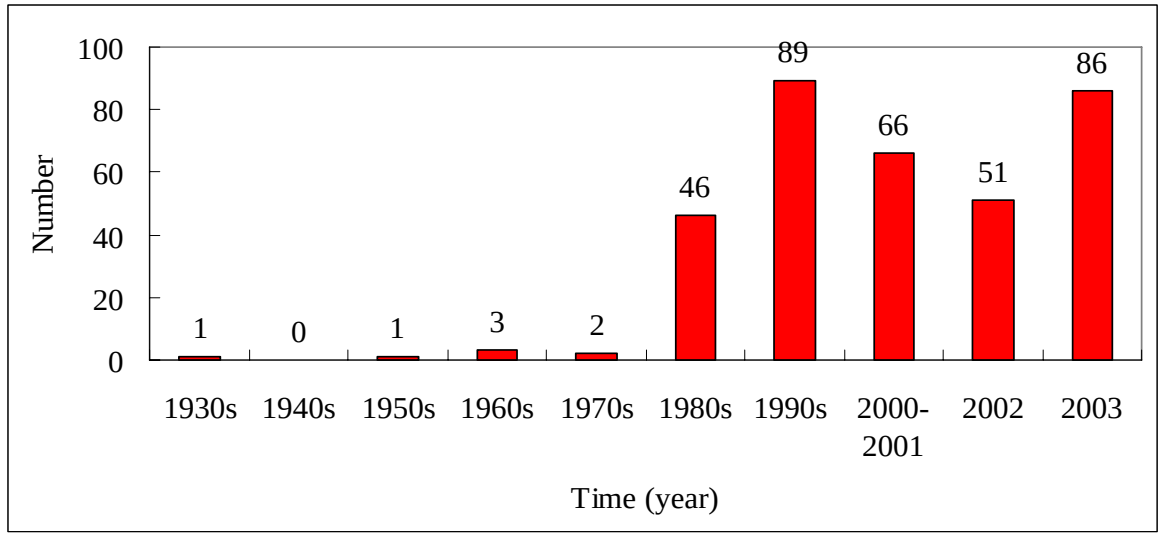
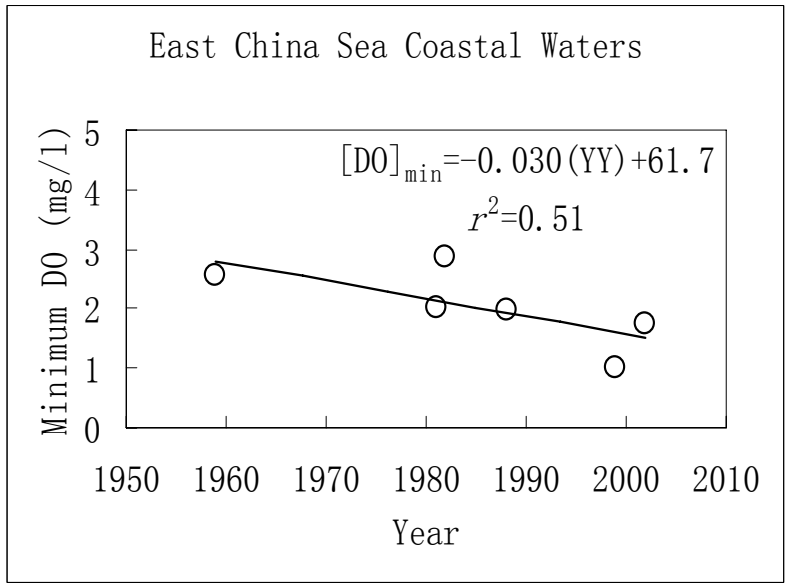




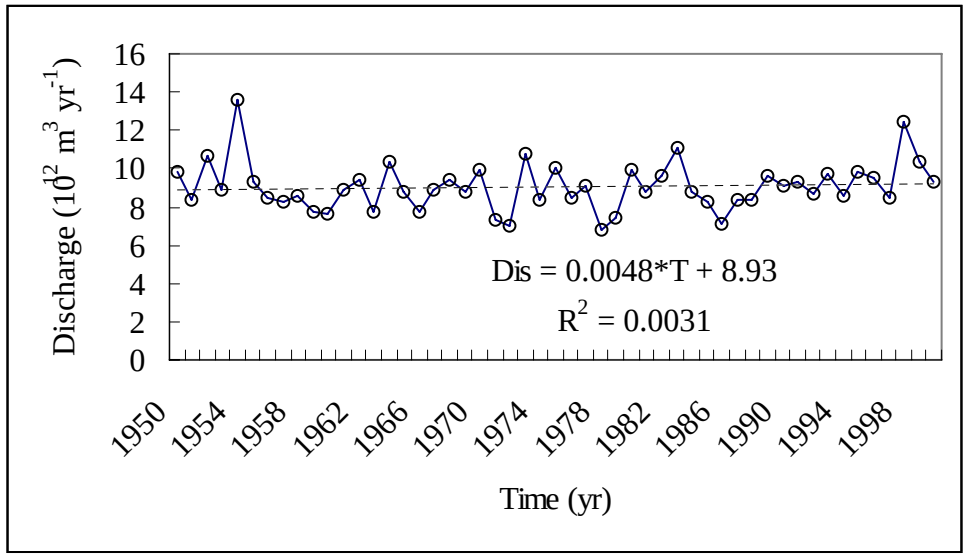
large-scale (ca. 10^3-10^4 km^2) blooms of *Prorocentrum dentatum* in the region adjacent to the Changjiang Estuary in 2000-2003

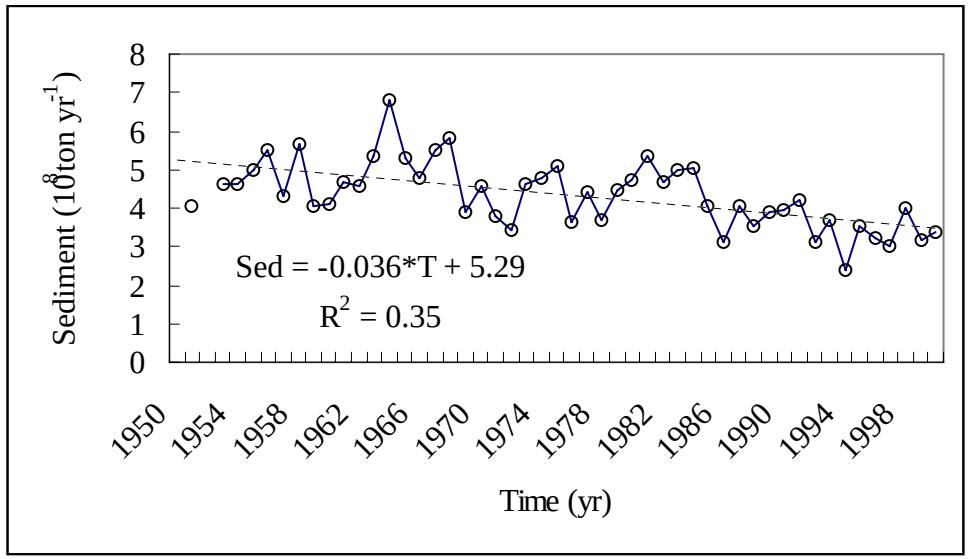
The number of HABs has been increasing dramatically after 1990s

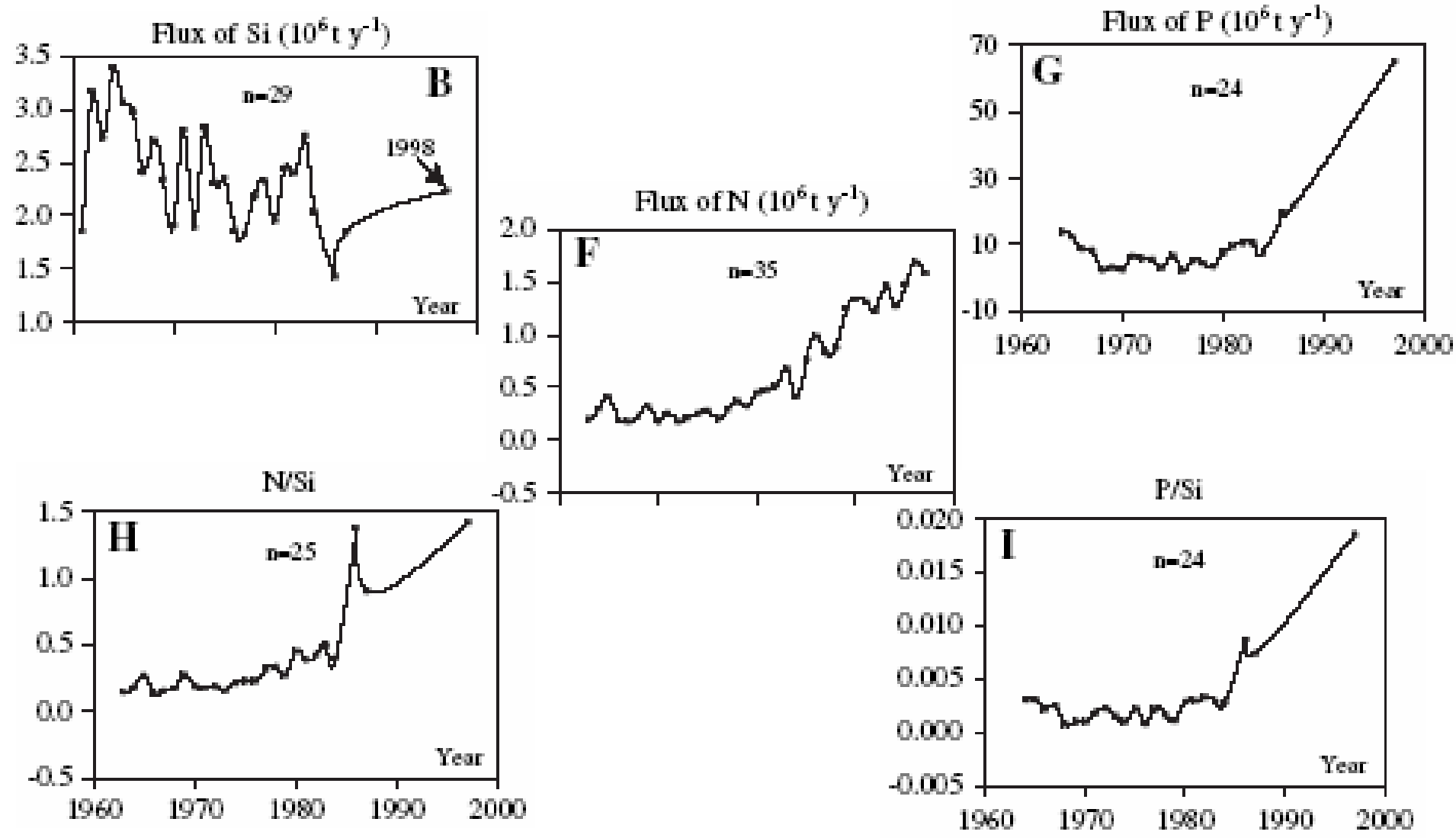


Zhang J., unpublished data; Li et al., 2002

Change of freshwater discharge (10^{12} m^3 yr^{-1}) and sediment load (10^8 ton yr^{-1}) of the Changjiang during the period of 1950-2000

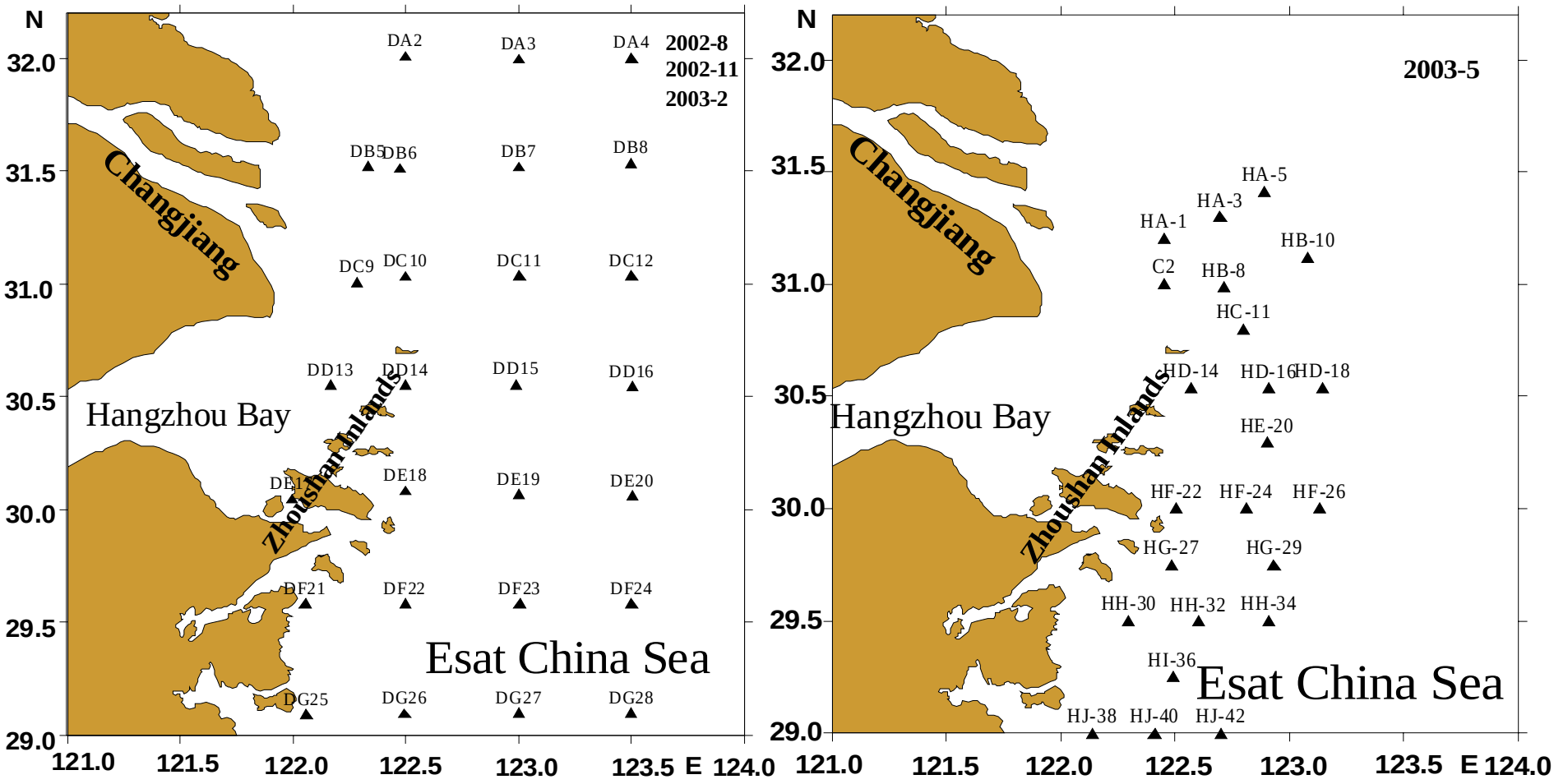




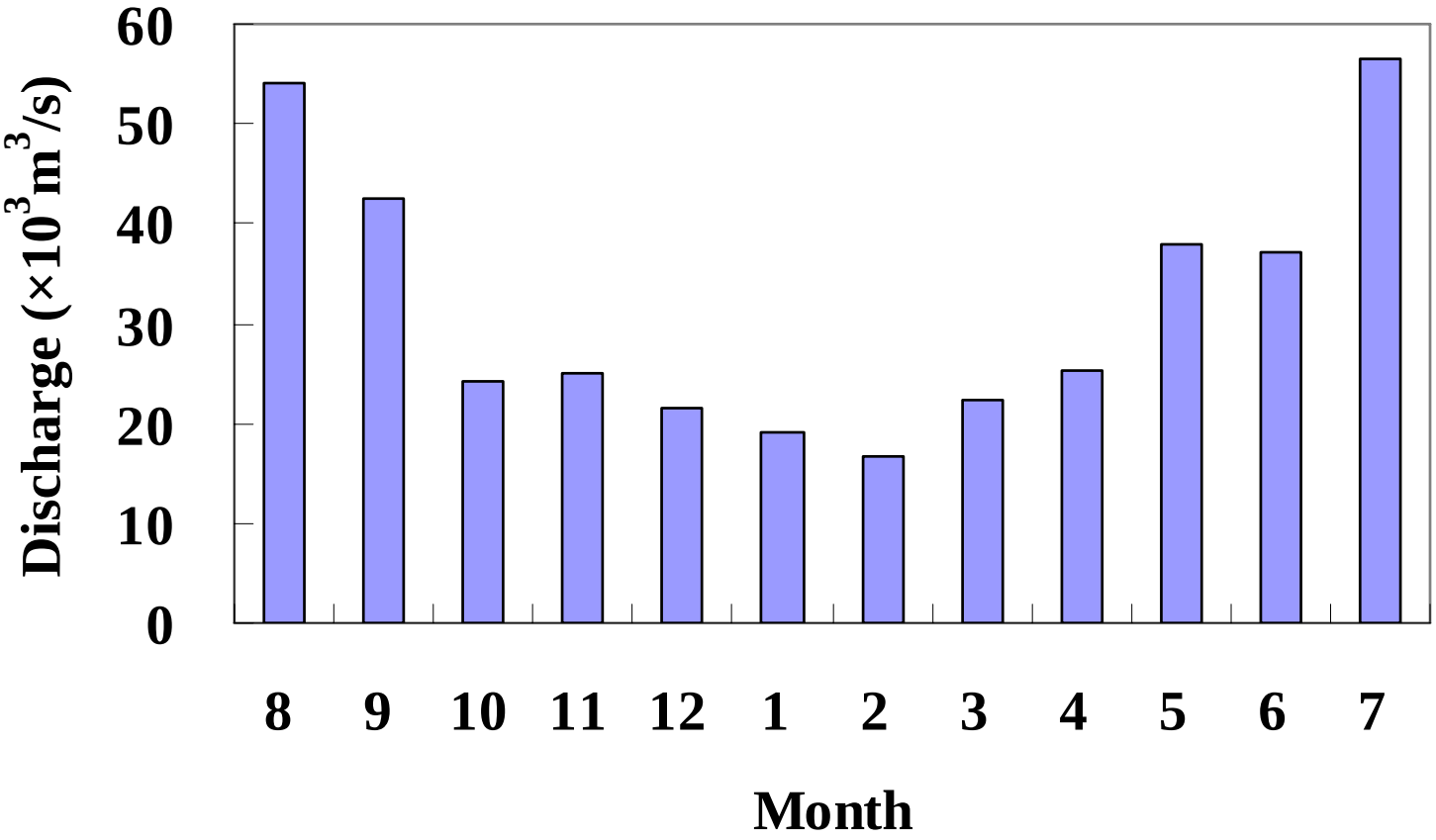


Inter-annual variations of DSi, DIN, and DIP fluxes and nutrient atomic ratios recorded at downstream-most Datong station of the lower Yangtze, since 1950

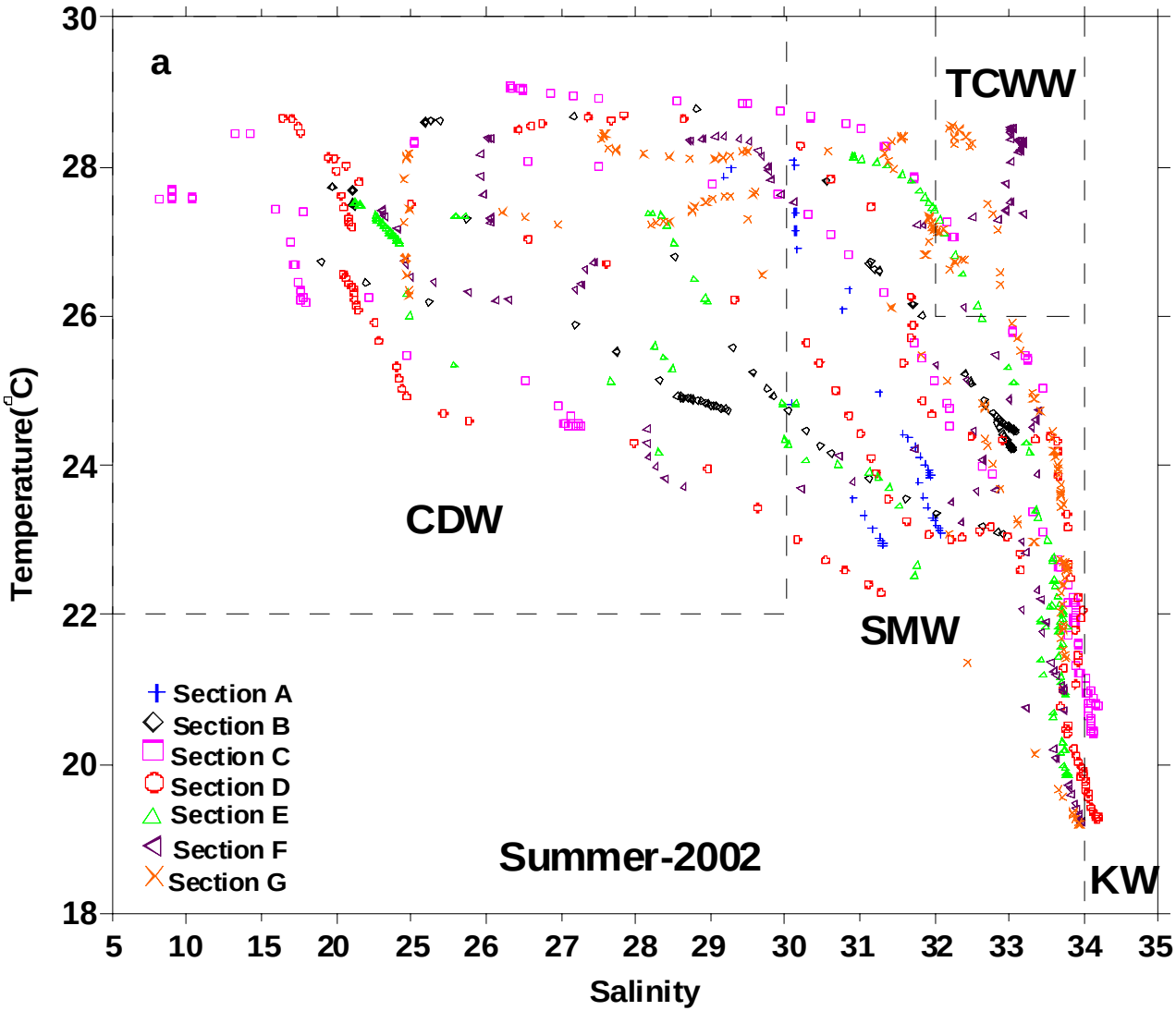
(Li et al., 2007).

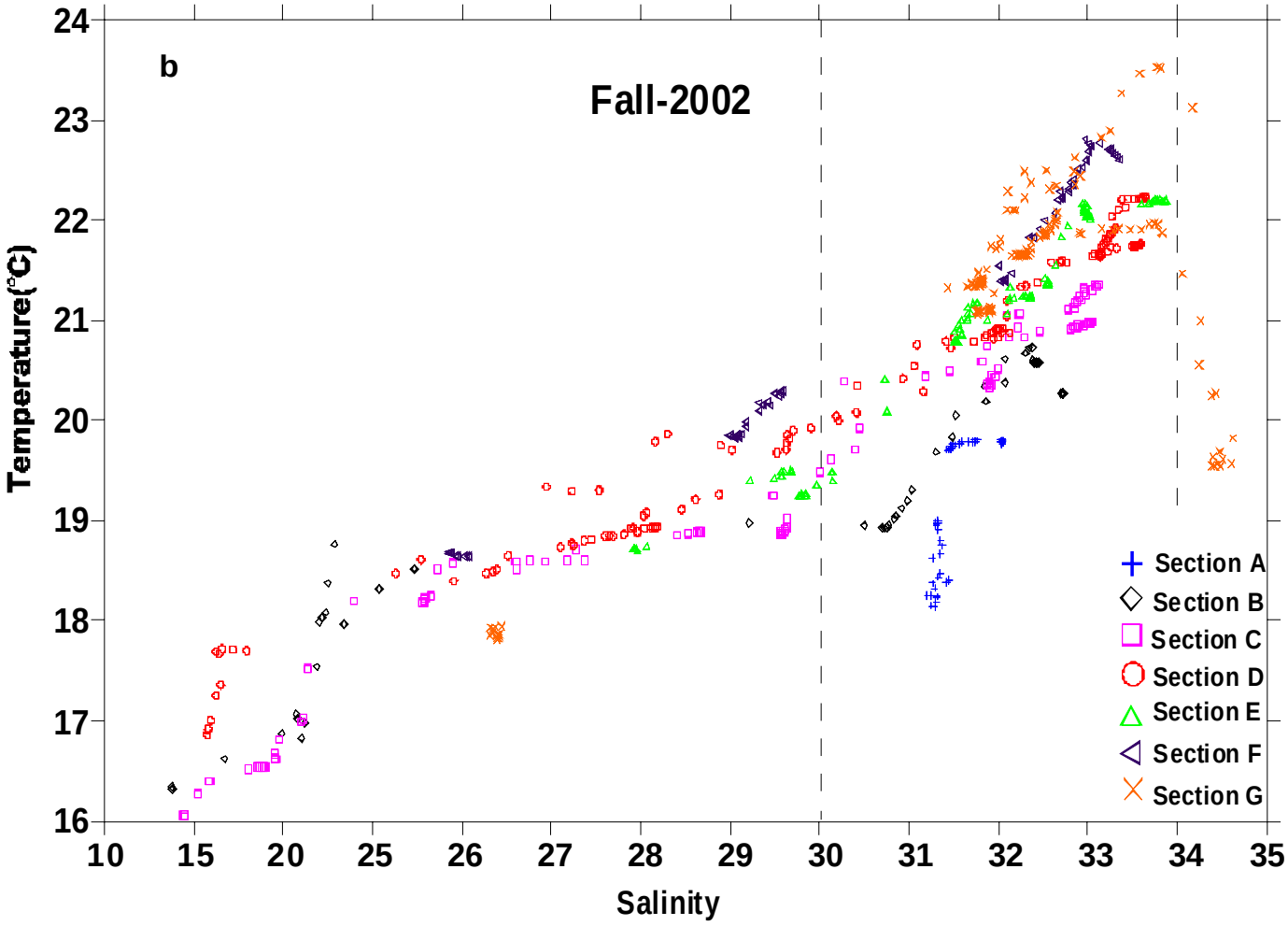


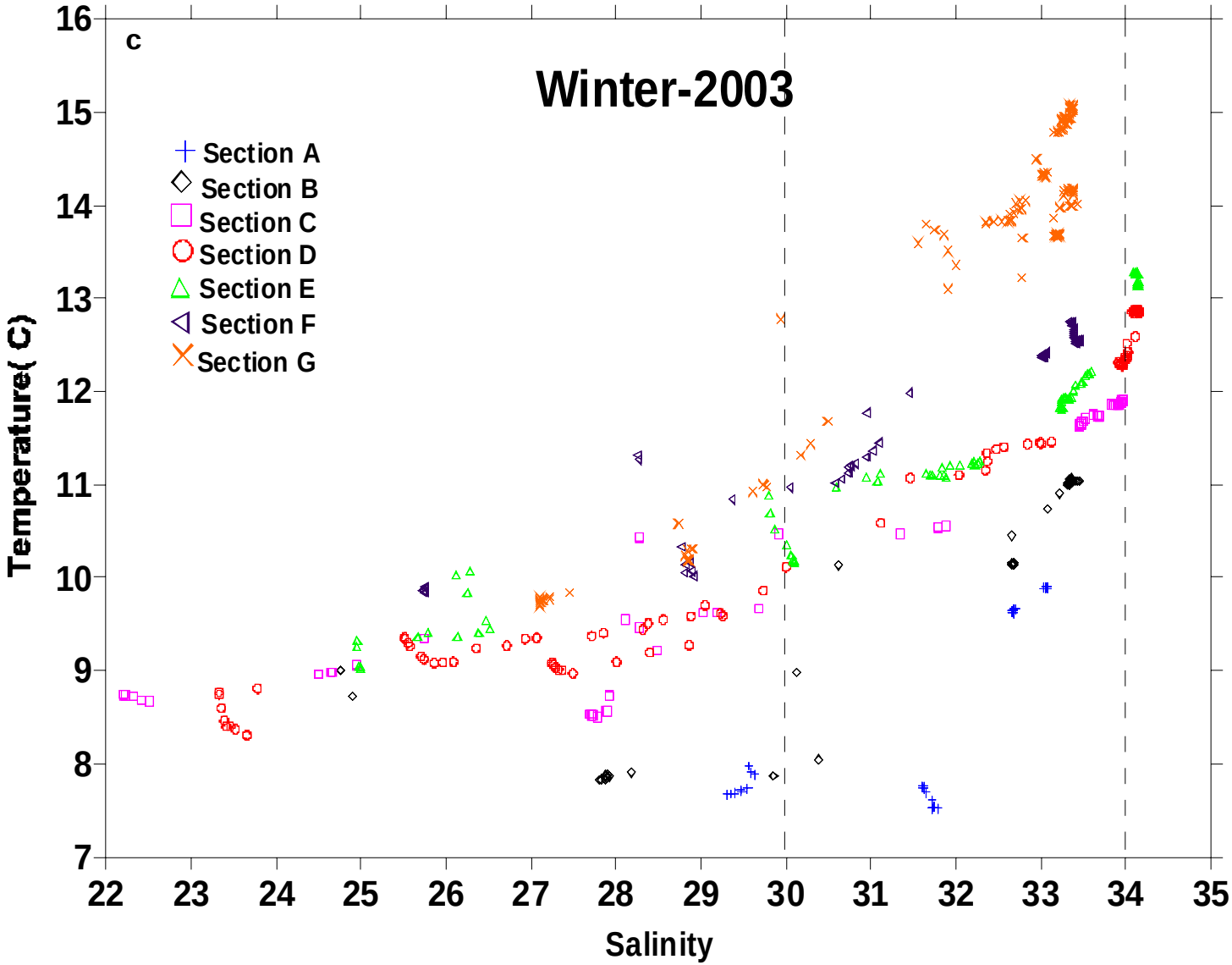
Sampling stations



Freshwater discharge (10^3 m^3 s^{-1}) of the Changjiang during the investigation period


a
TCWW
CDW
SMW
KW
Summer-2002
Section A
Section B
Section C
Section D
Section E
Section F
Section G
Temperature(°C)
Salinity
30
28
26
24
22
20
18
5
10
15
20
25
26
27
28
29
30
31
32
33
34
35


b
Fall-2002
Temperature(°C)
Salinity
24
23
22
21
20
19
18
17
16
10
15
20
25
26
27
28
29
30
31
32
33
34
35
Section A
Section B
Section C
Section D
Section E
Section F
Section G


c
Winter-2003
Section A
Section B
Section C
Section D
Section E
Section F
Section G
Temperature(C)
Salinity
16
15
14
13
12
11
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9
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7
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26
27
28
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30
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32
33
34
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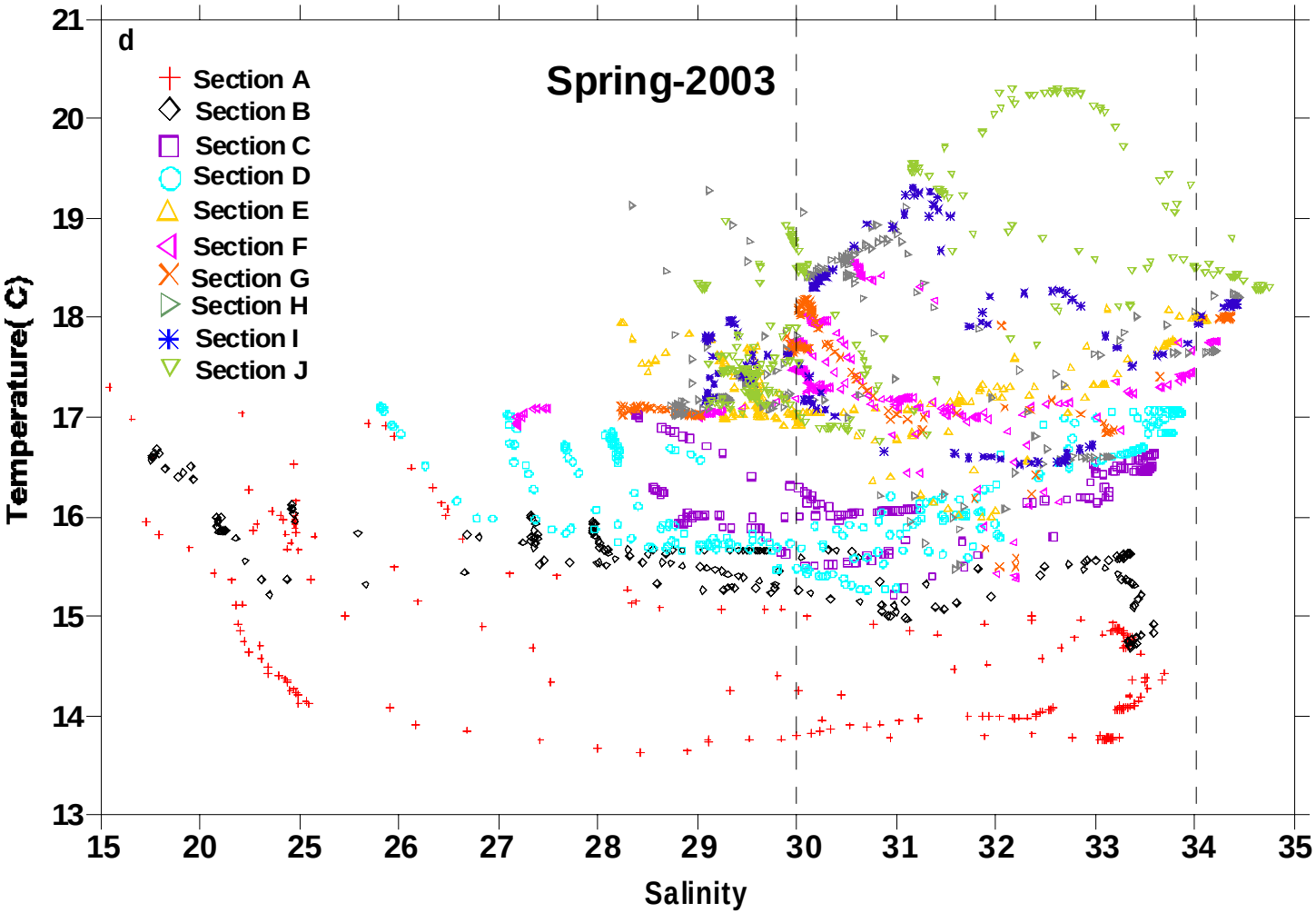
d
Spring-2003
Section A
Section B
Section C
Section D
Section E
Section F
Section G
Section H
Section I
Section J
Temperature(C)
Salinity
21
20
19
18
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32
33
34
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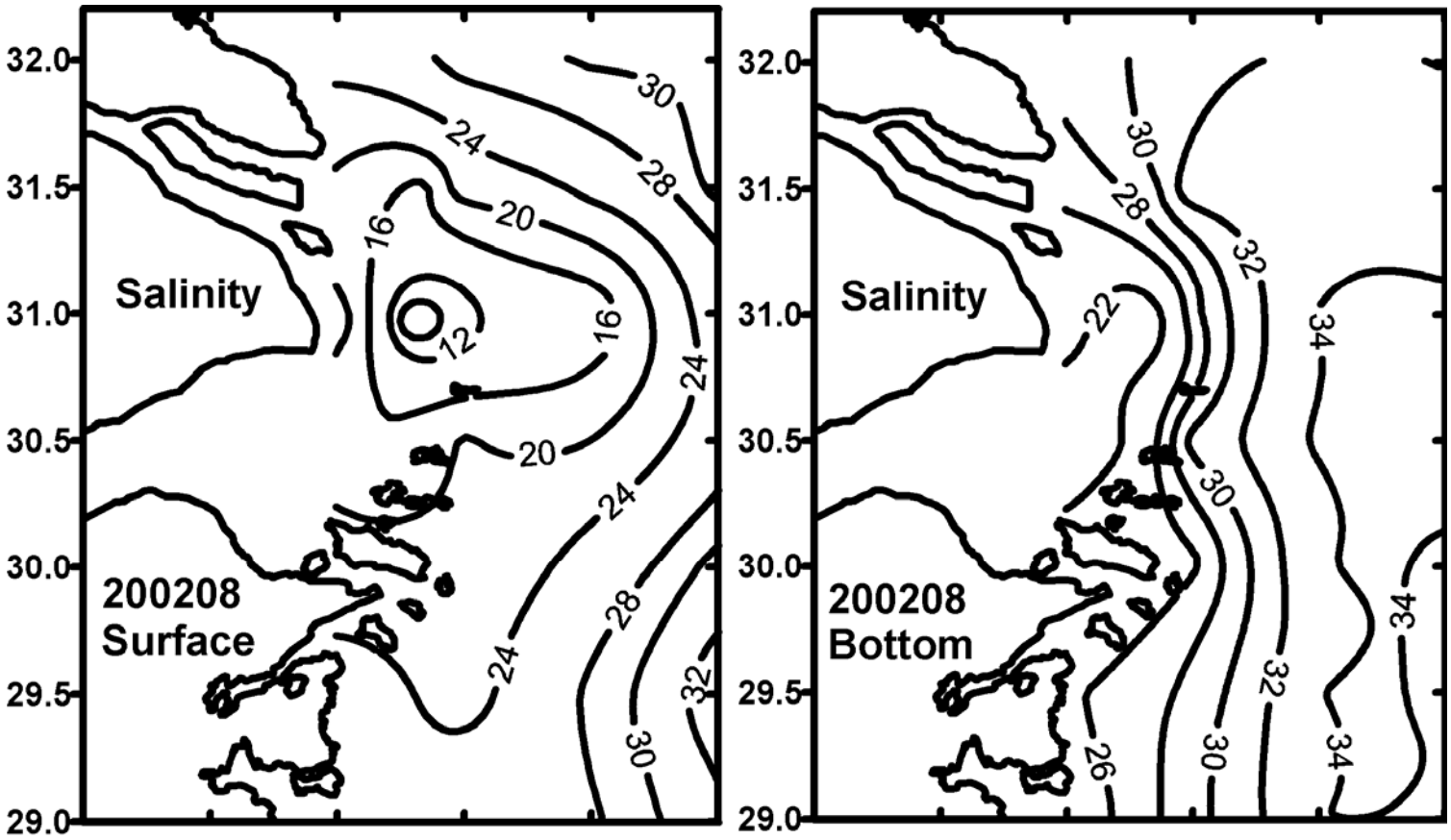
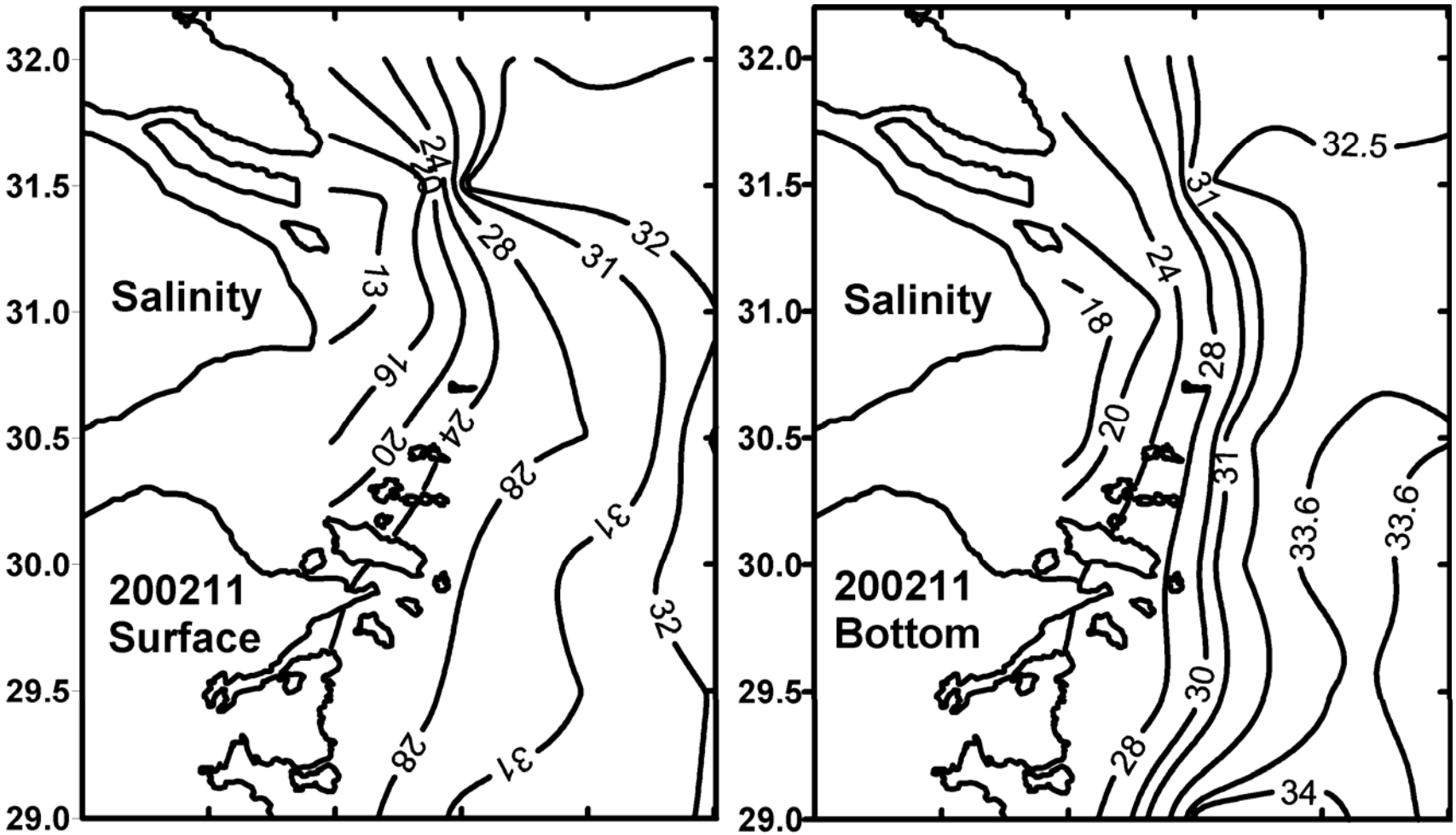
Salinity

Summer



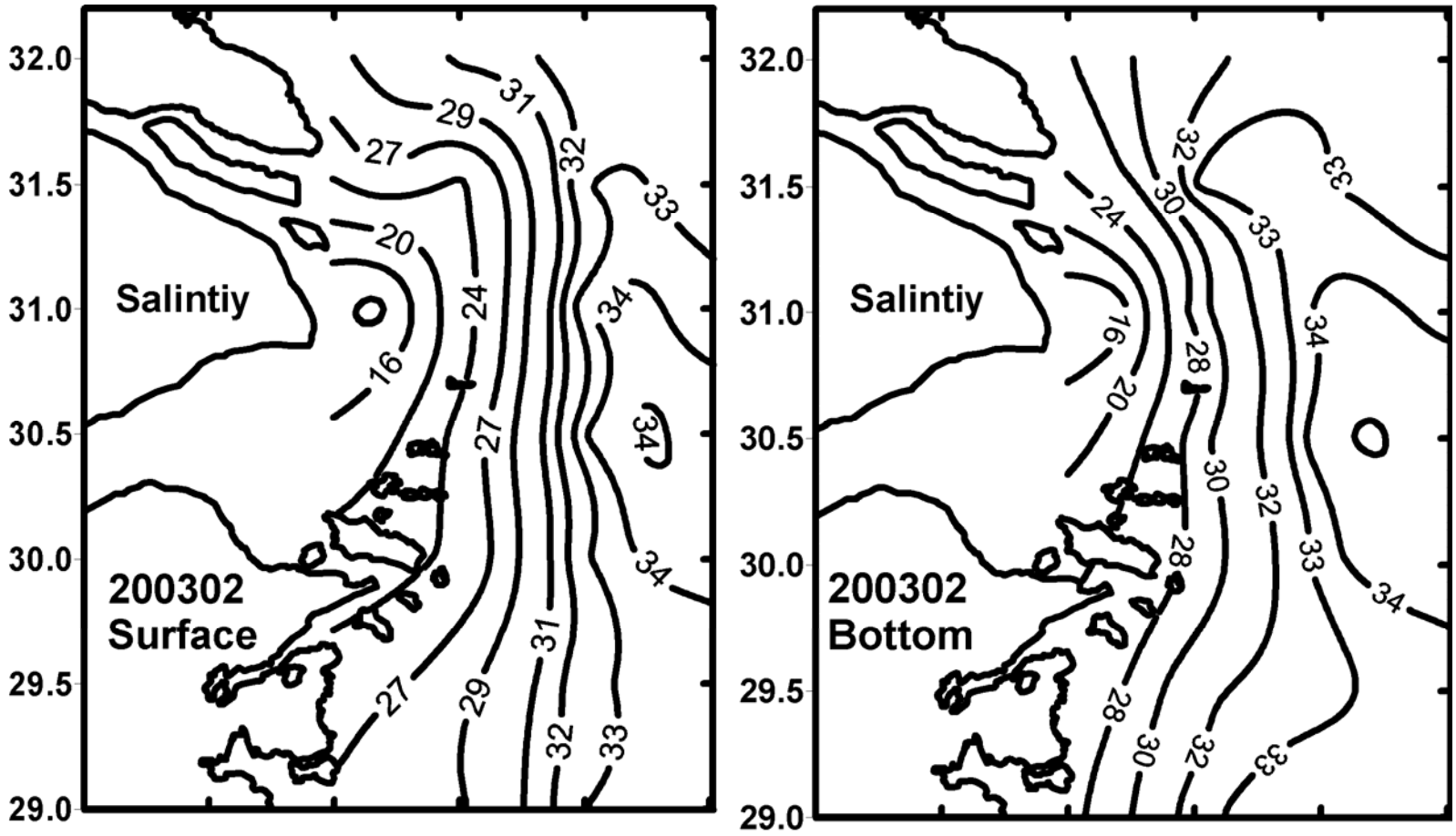
Salinity

Fall



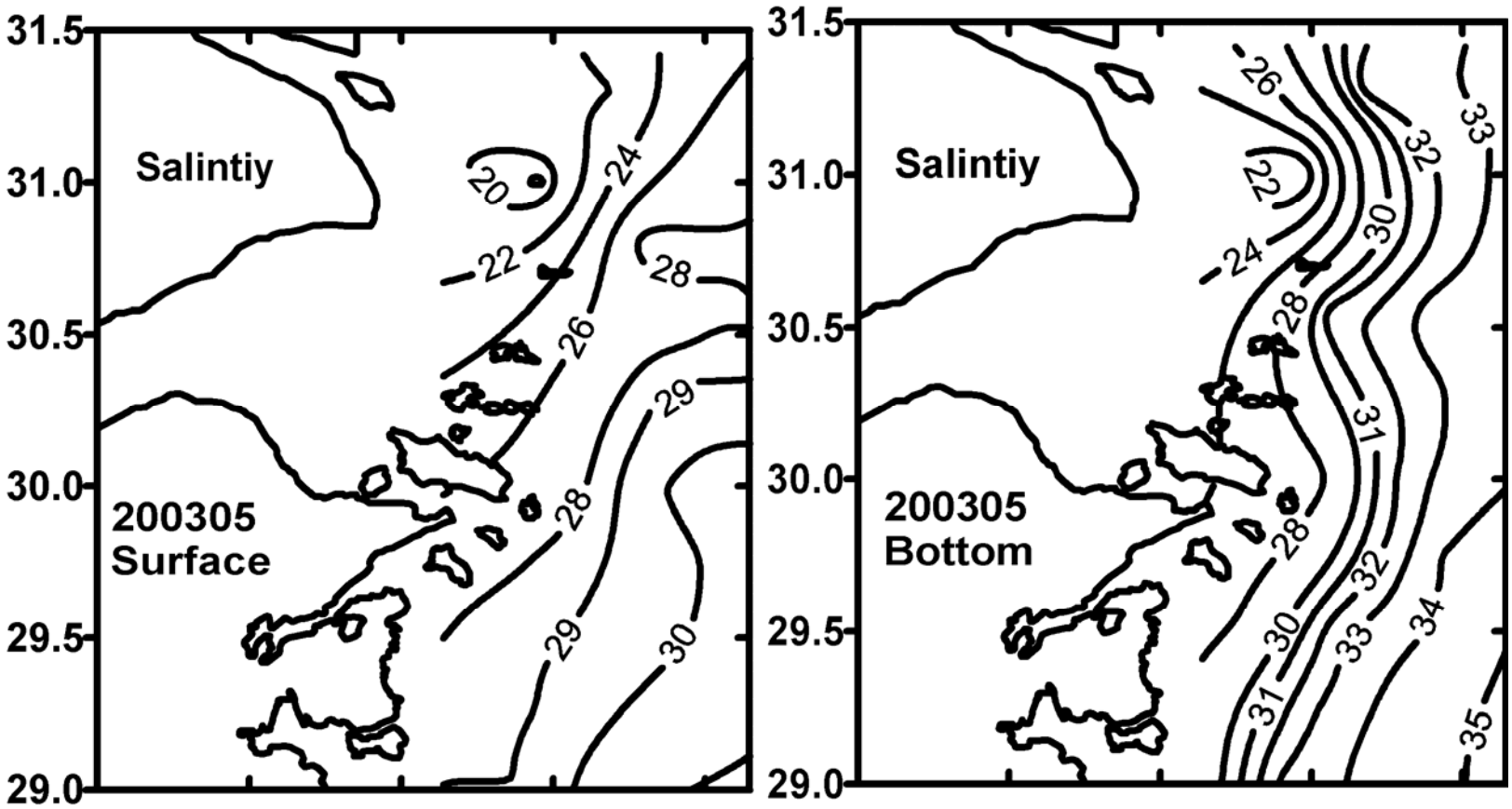
Salinity

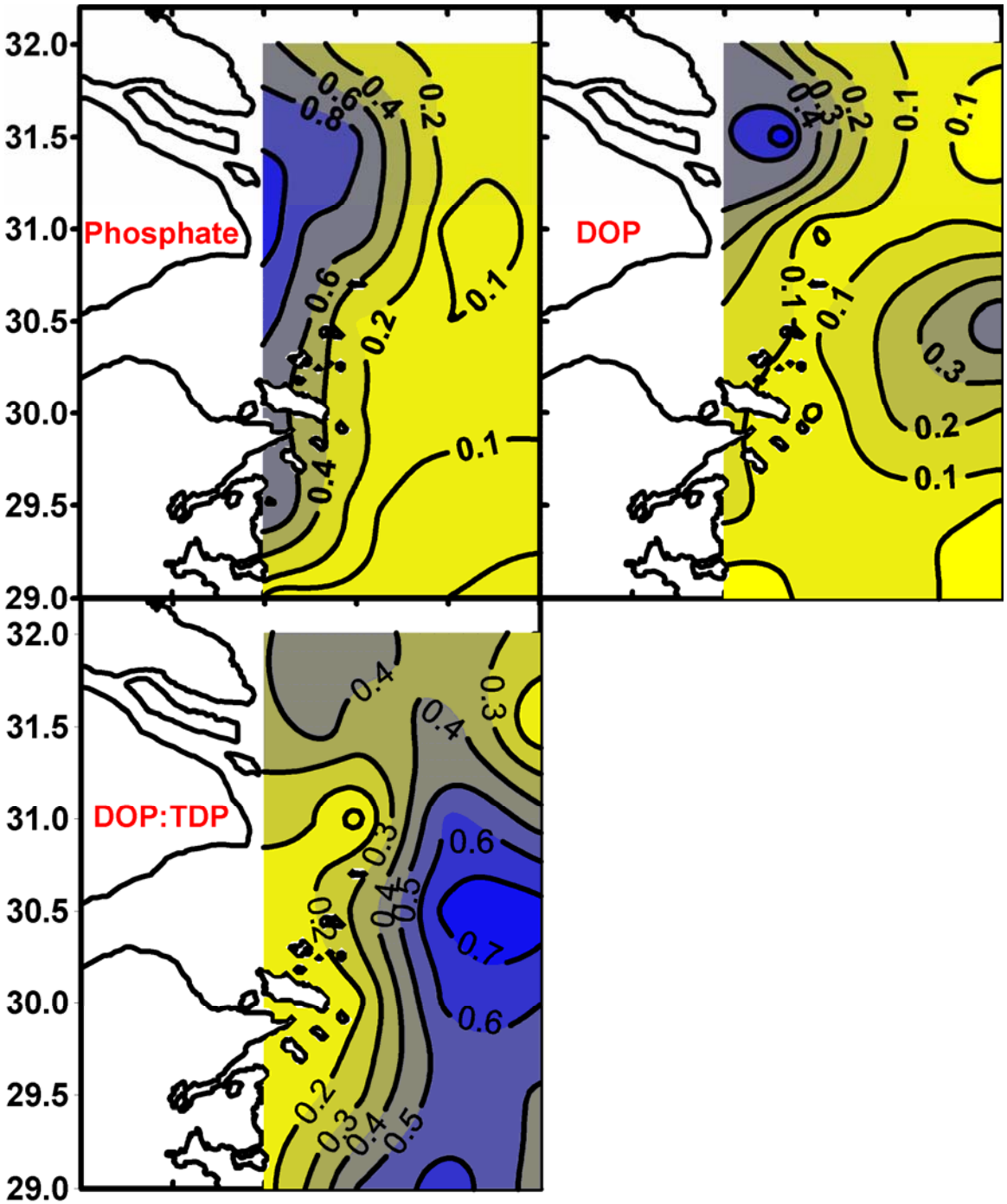
Winter



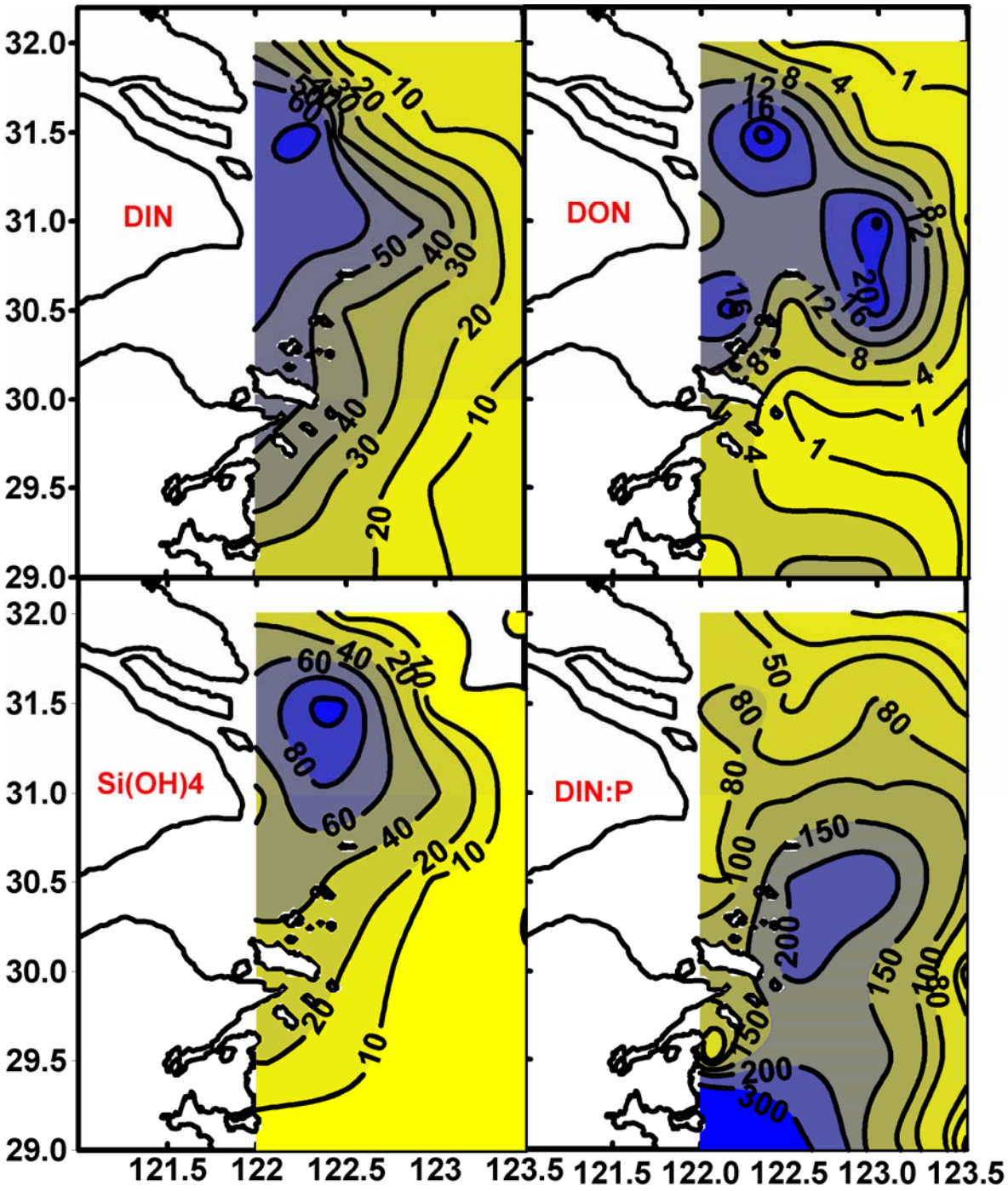
Salinity

Spring

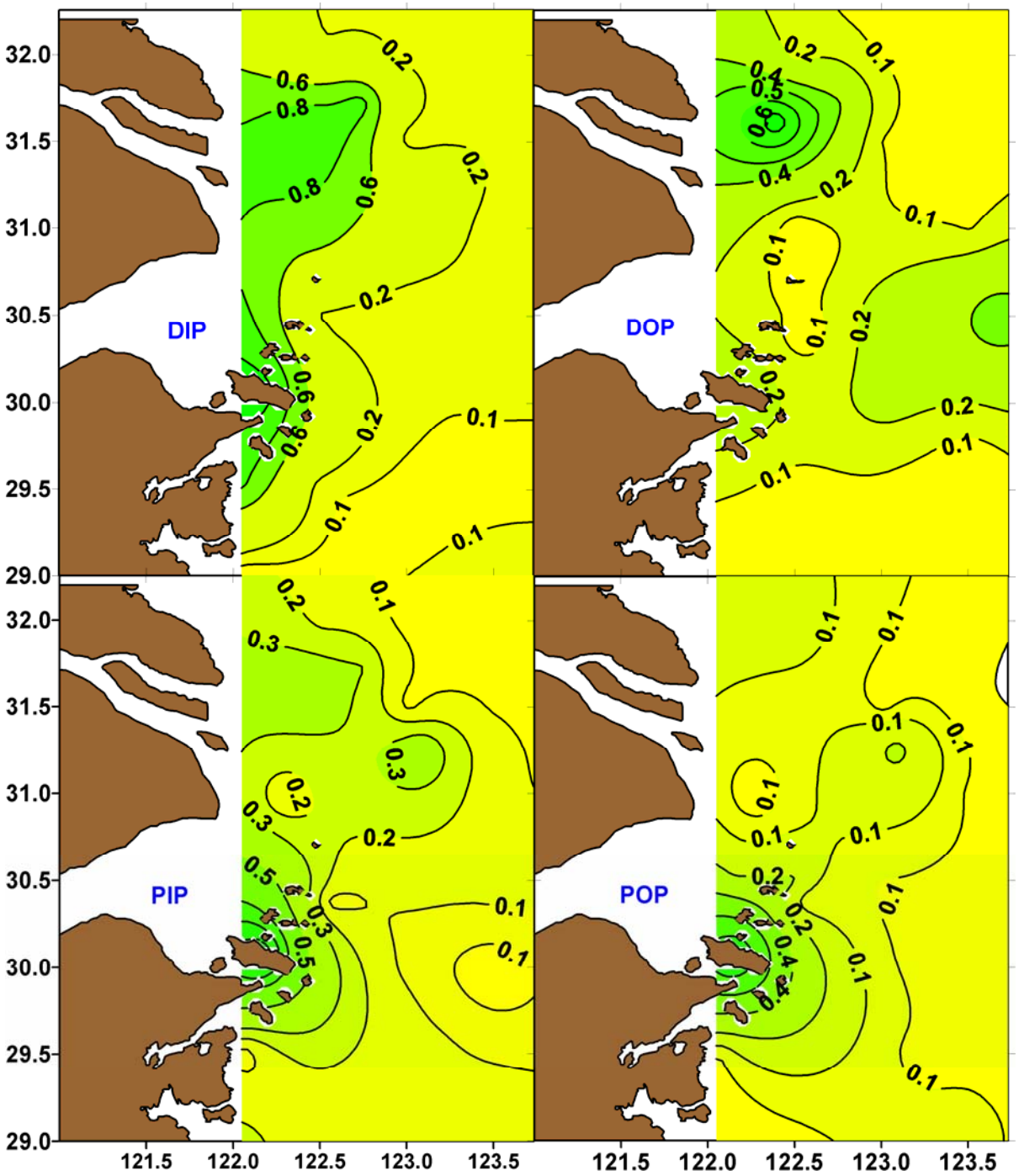




Aug-2002 Surface

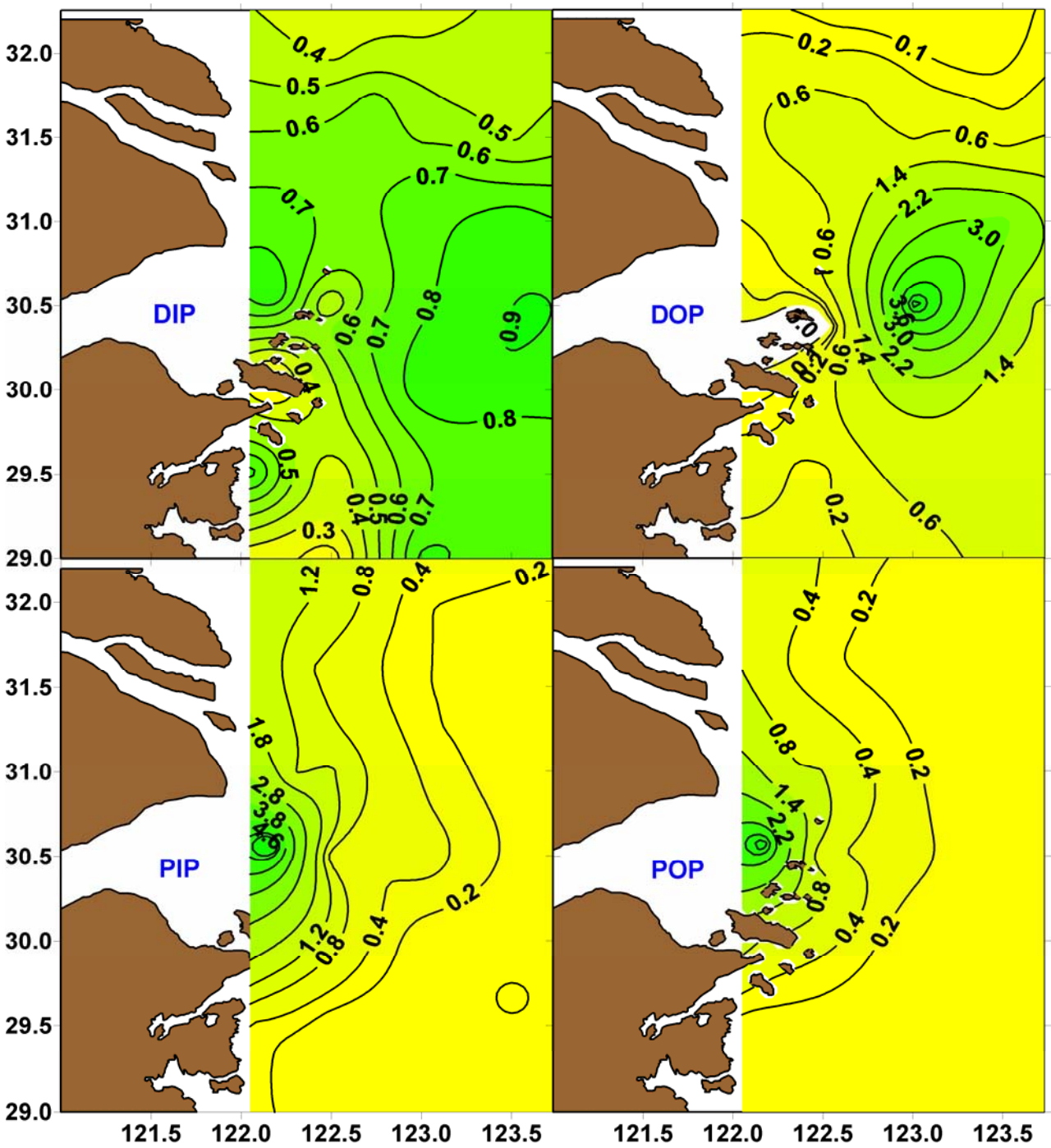


Aug-2002 Surface



Phosphorus

200208-Surface



Phosphorus

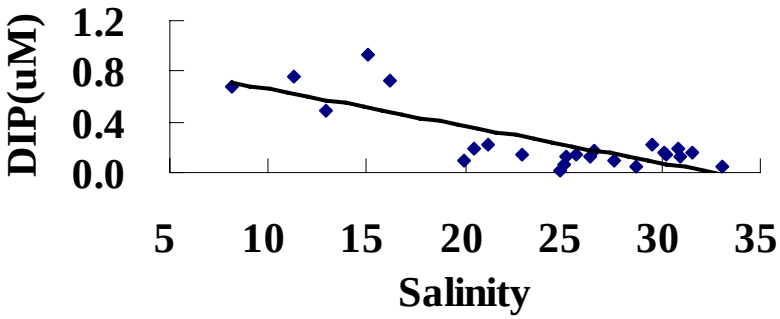
200208-Bottom

DIP concentrations vs. salinity

August 2002

DIP = -0.0292 S + 0.9515

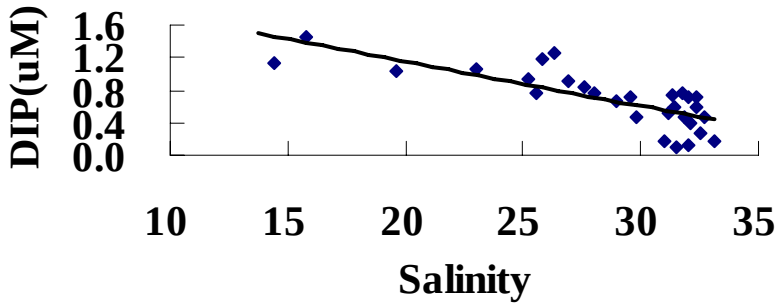
R^2 = 0.6296



Demember 2002

DIP = -0.0552 S + 2.2589

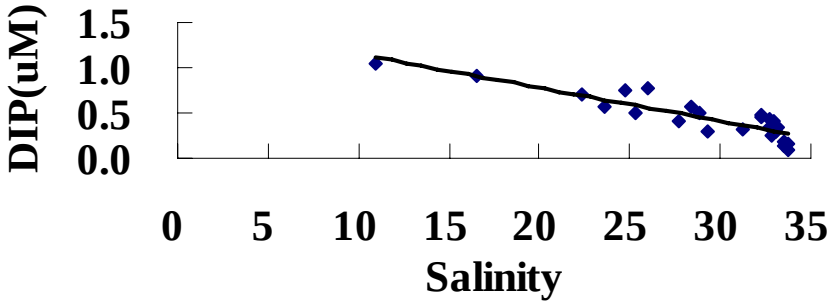
R2 = 0.6113



March 2003

DIP = -0.0369 S + 1.5164

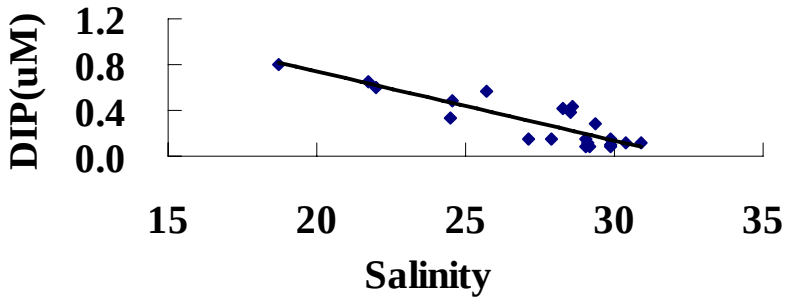
R2 = 0.8015



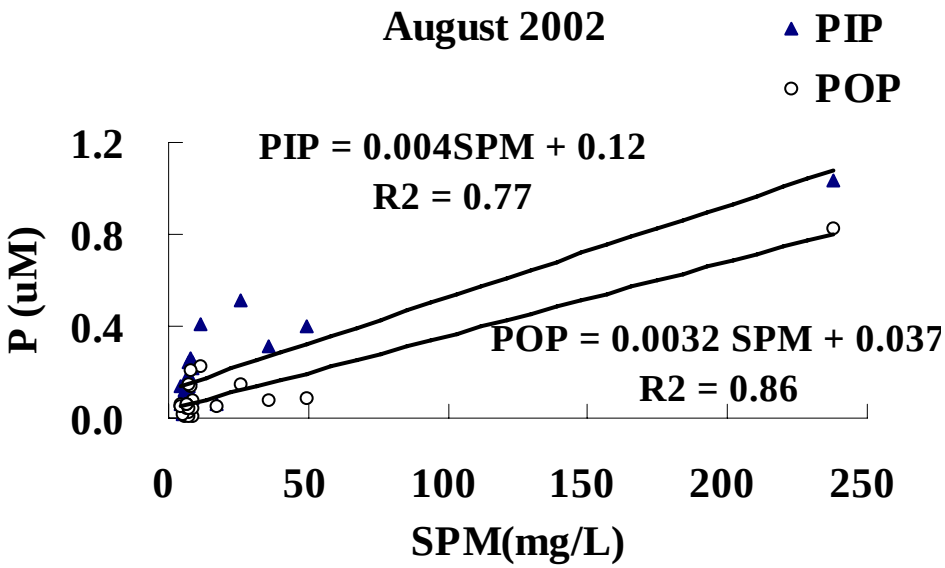
May 2003

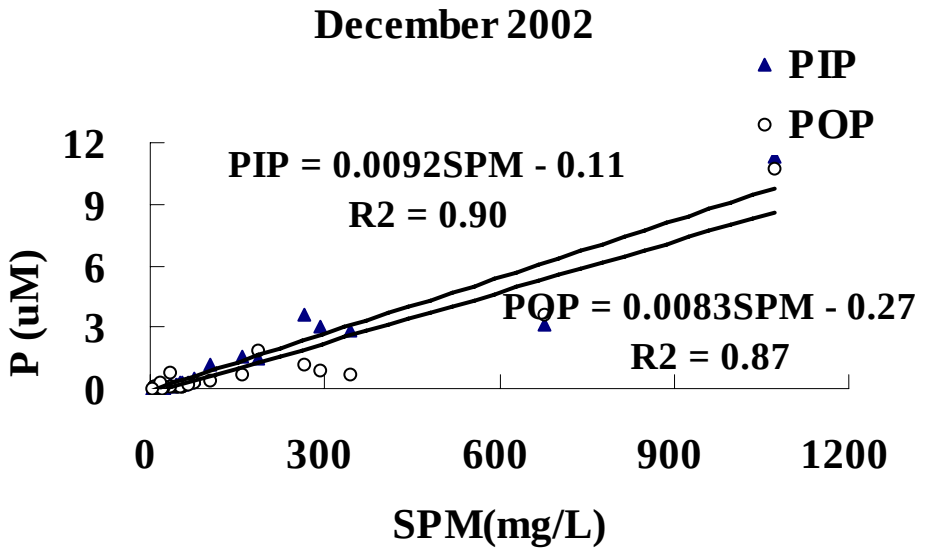
DIP = -0.0592 S + 1.9181

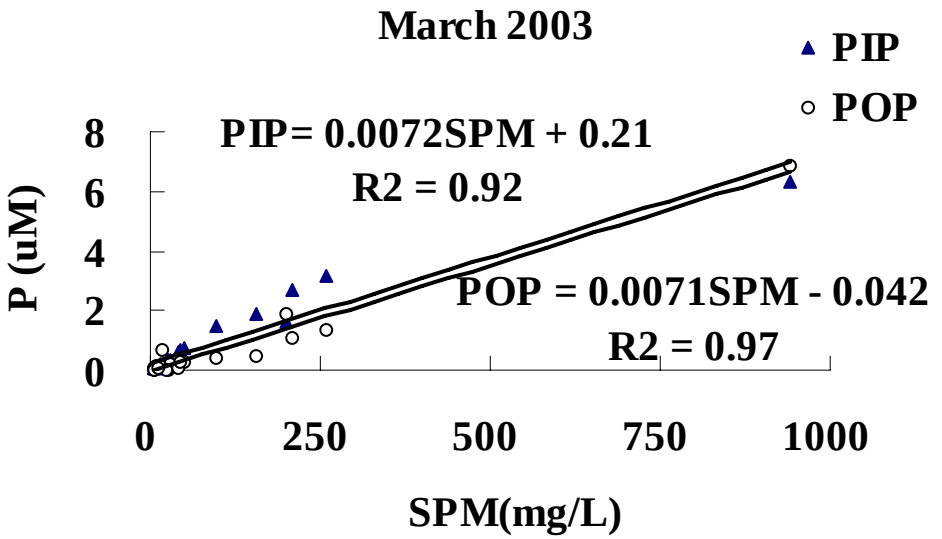
R2 = 0.757

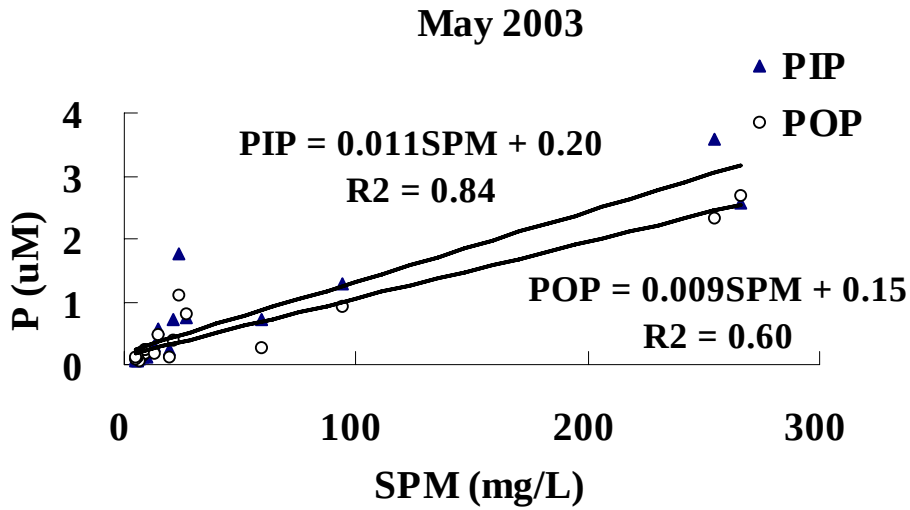


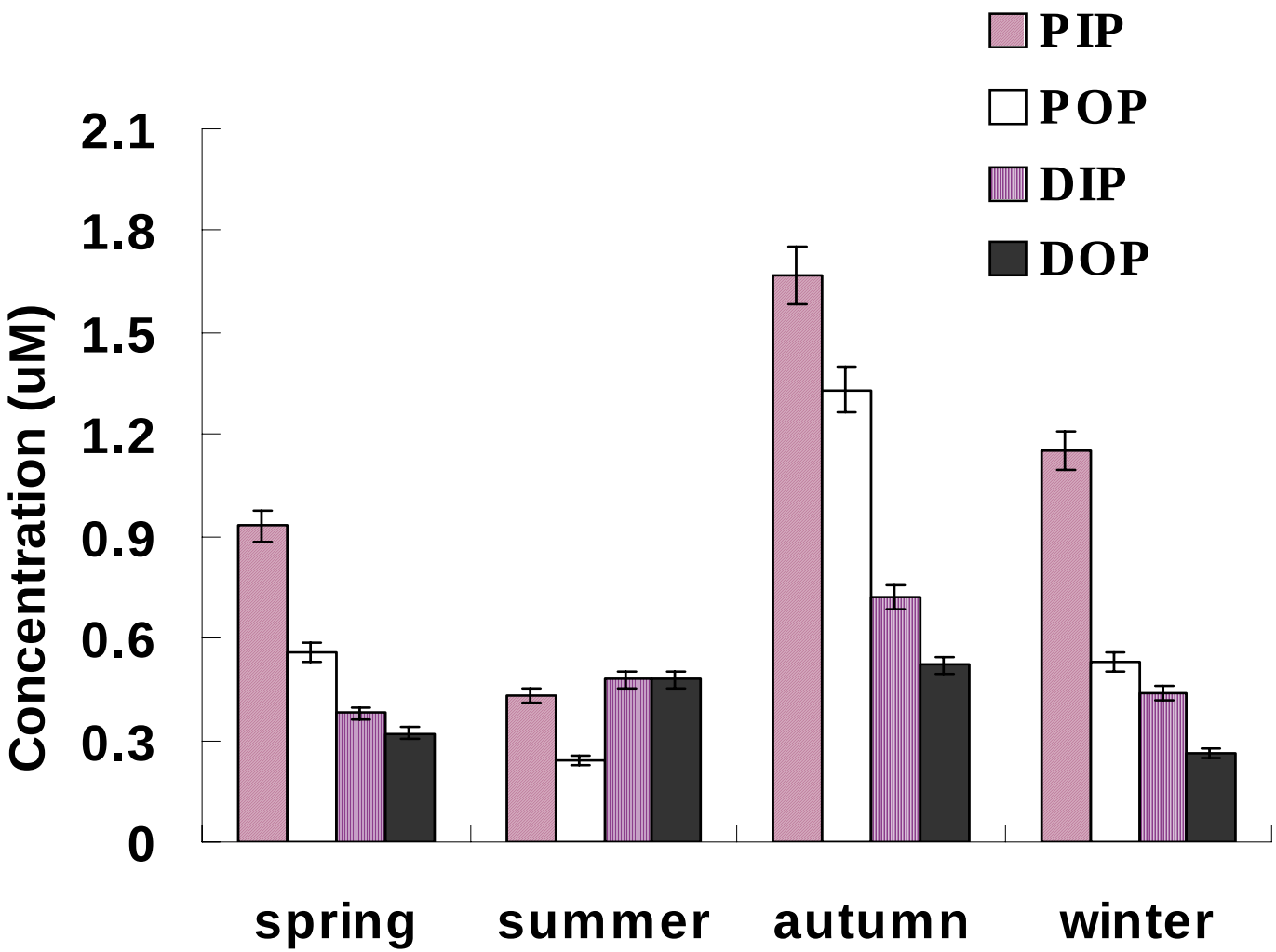
Plots of PIP and POP vs. SPM in the Changjiang Estuary and its adjacent sea during Aug. 2002-May 2003









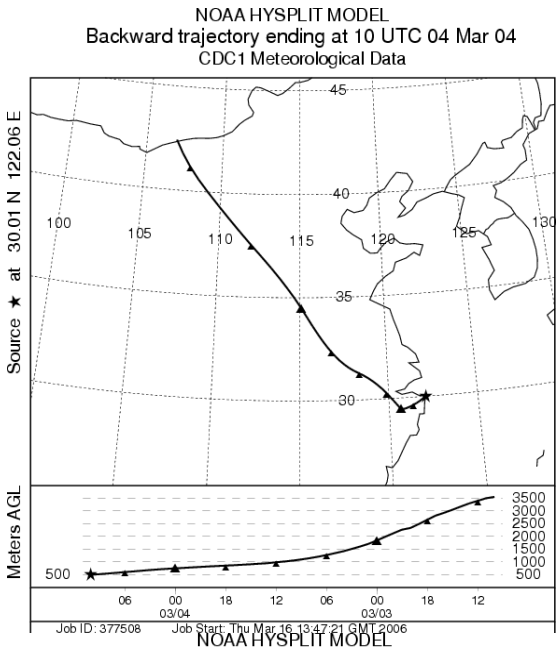


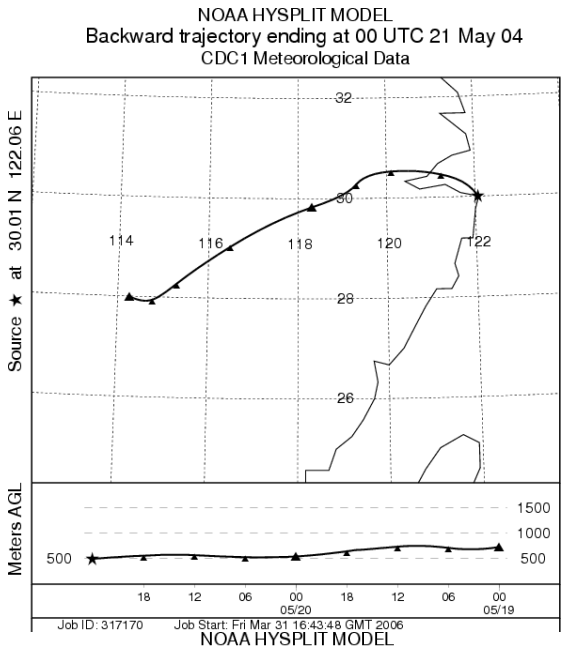
Concentrations of DIP, DOP, PIP, POP and Chl a in the Changjiang Estuary and its adjacent sea during Aug 2002-May 2003

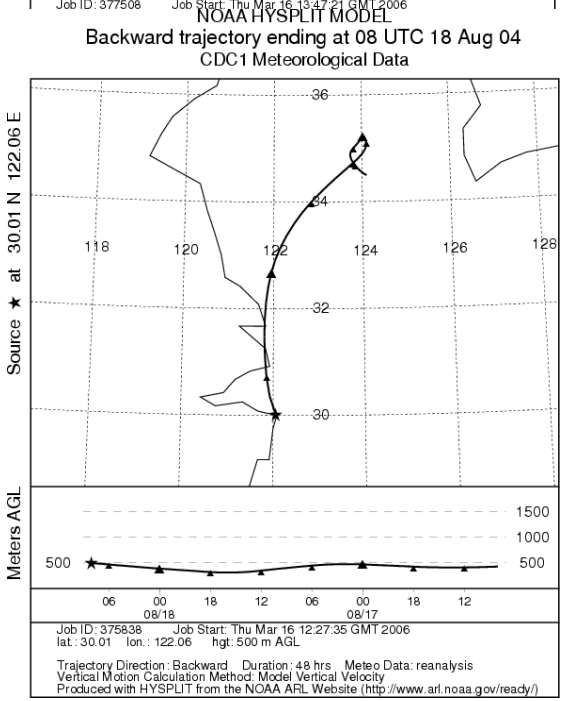
Comparison with the other world areas

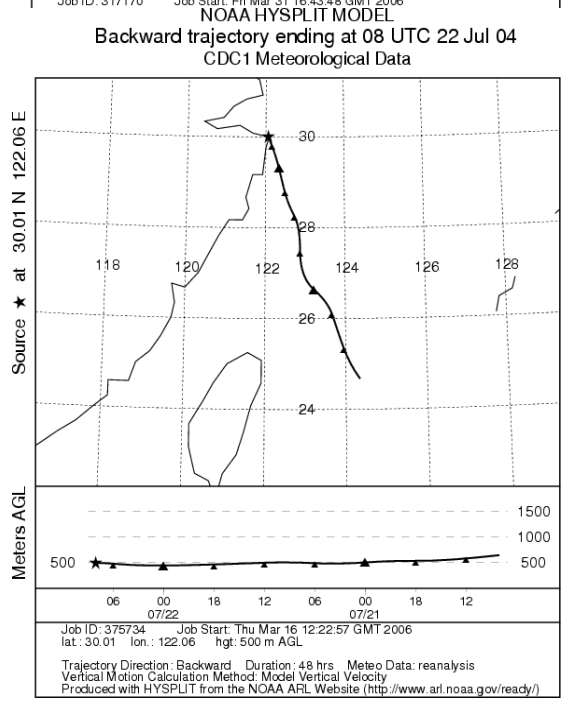
		DIP	PIP	POP	PP	TP	Ref.
Fourleague Bay		0.7~1.1			1.8	0.4~13.5	Brian et al., 2003
Traunsee lake					0.009~0.665		Dale et al., 2001
North Pacific Ocean					Winter 0.15 Spring 0.17 Autumn 0.2 Winter 0.16		Dale et al., 2001
Lake Hayes		0.54~1.35			1.42	2.10	Caruso, 2000
Tanshui Estury		0.35~5.46			0.28~9.47		Fang, 1999
South Pacific Ocean		0.26~3.18	0.01	0.03	0.01~0.03		Ai Ning Loh, 1999
Biscay Bay		0.04~0.09		0.02~0.08			Alain, 1998
Tokyo Bay		0.17~0.49			1.03~2.18		Masahiro, 2000
Changjiang Estuary	spring	0.44	0.93	0.55	1.48	1.92	This study
	summer	0.48	0.42	0.24	0.66	1.14	
	autumn	0.72	2.66	1.33	2.99	3.71	
	winter	0.44	1.15	0.52	1.67	2.11	

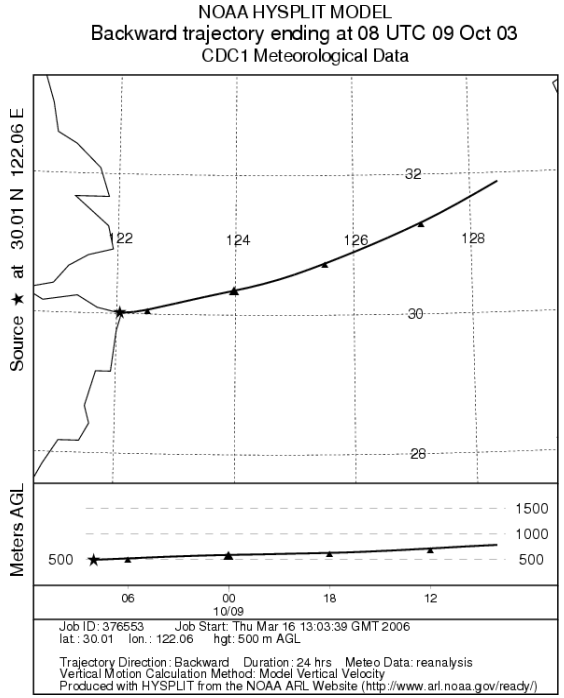
Aerosol sources at Zhoushan Island

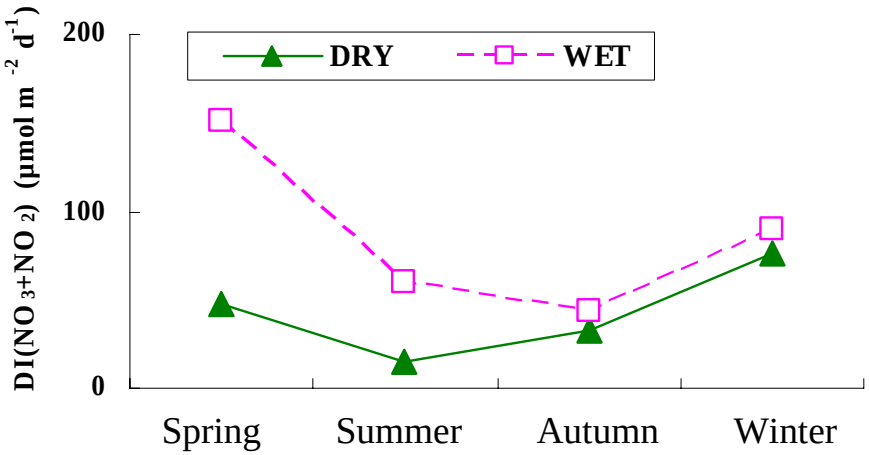


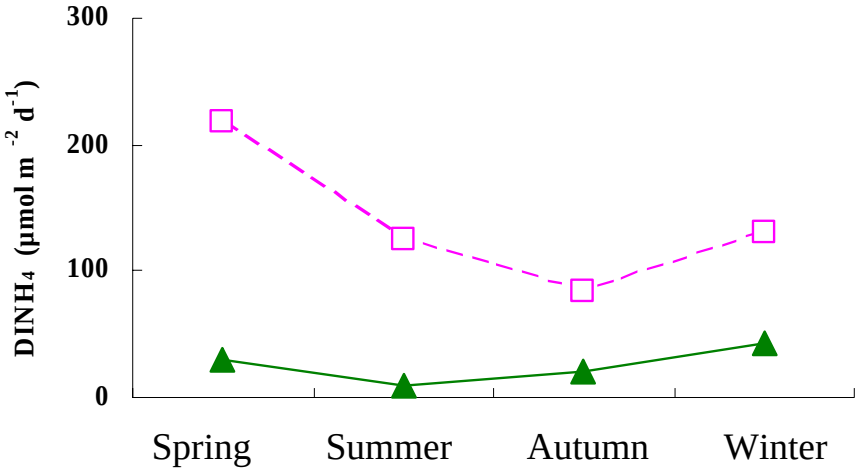


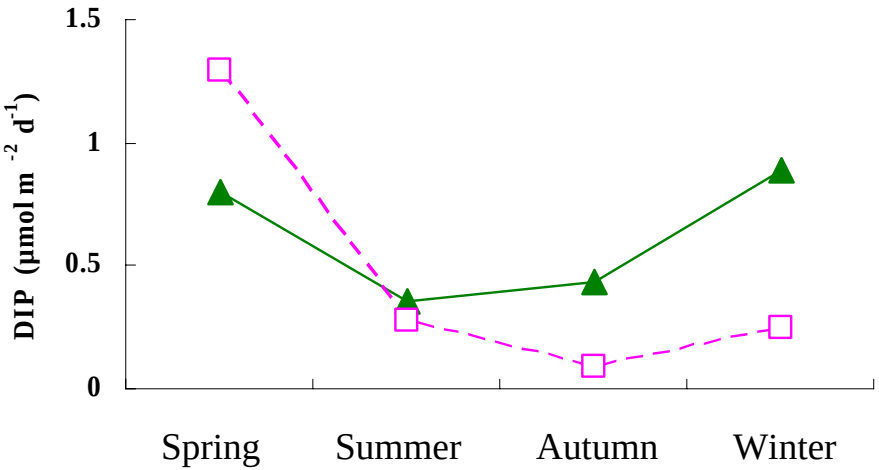






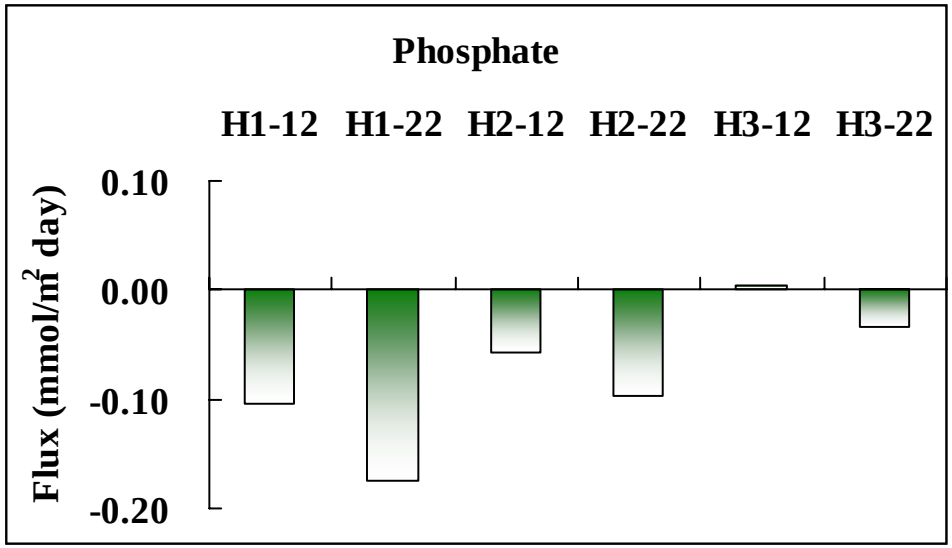


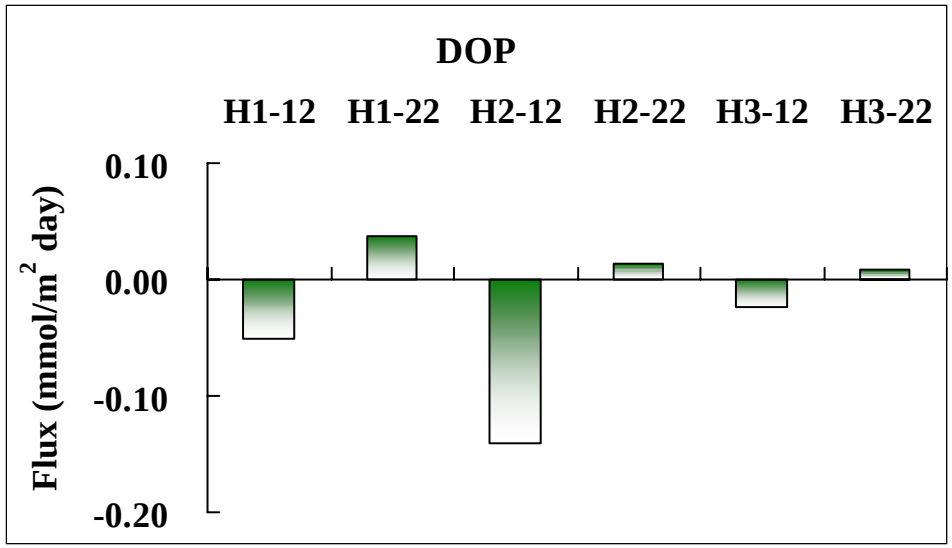




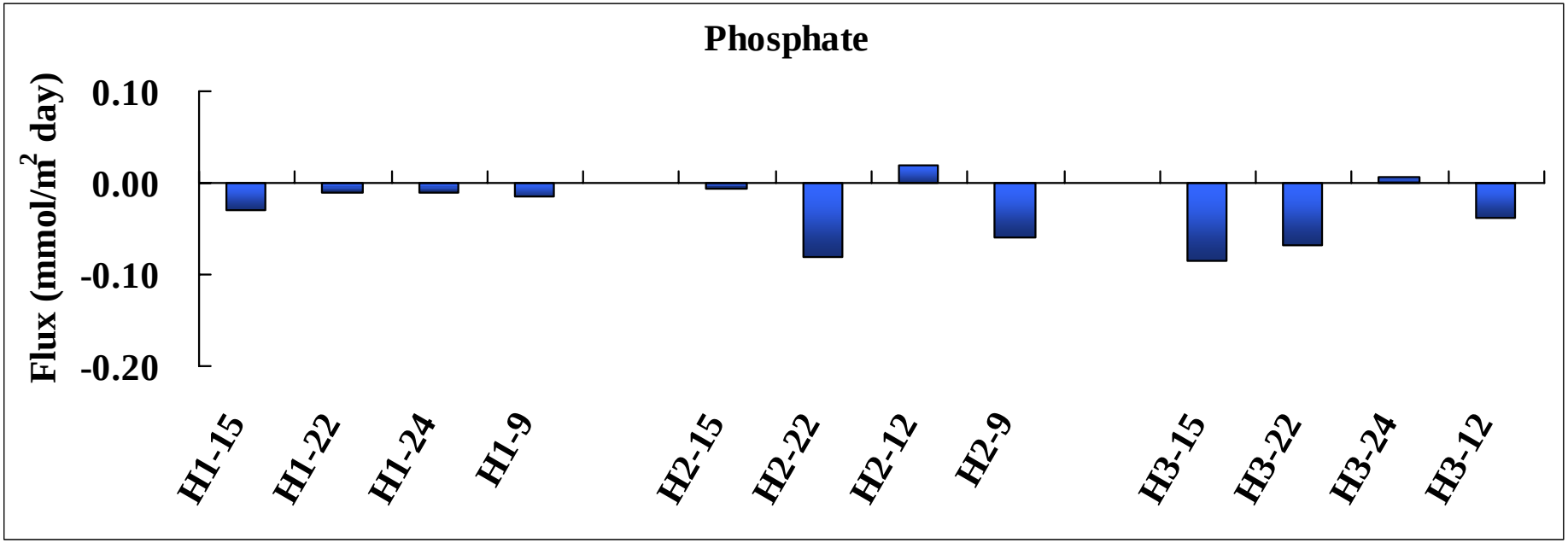
Dry and wet depositions of nutrients at Zhoushan Island

(Bi, unpublished data)

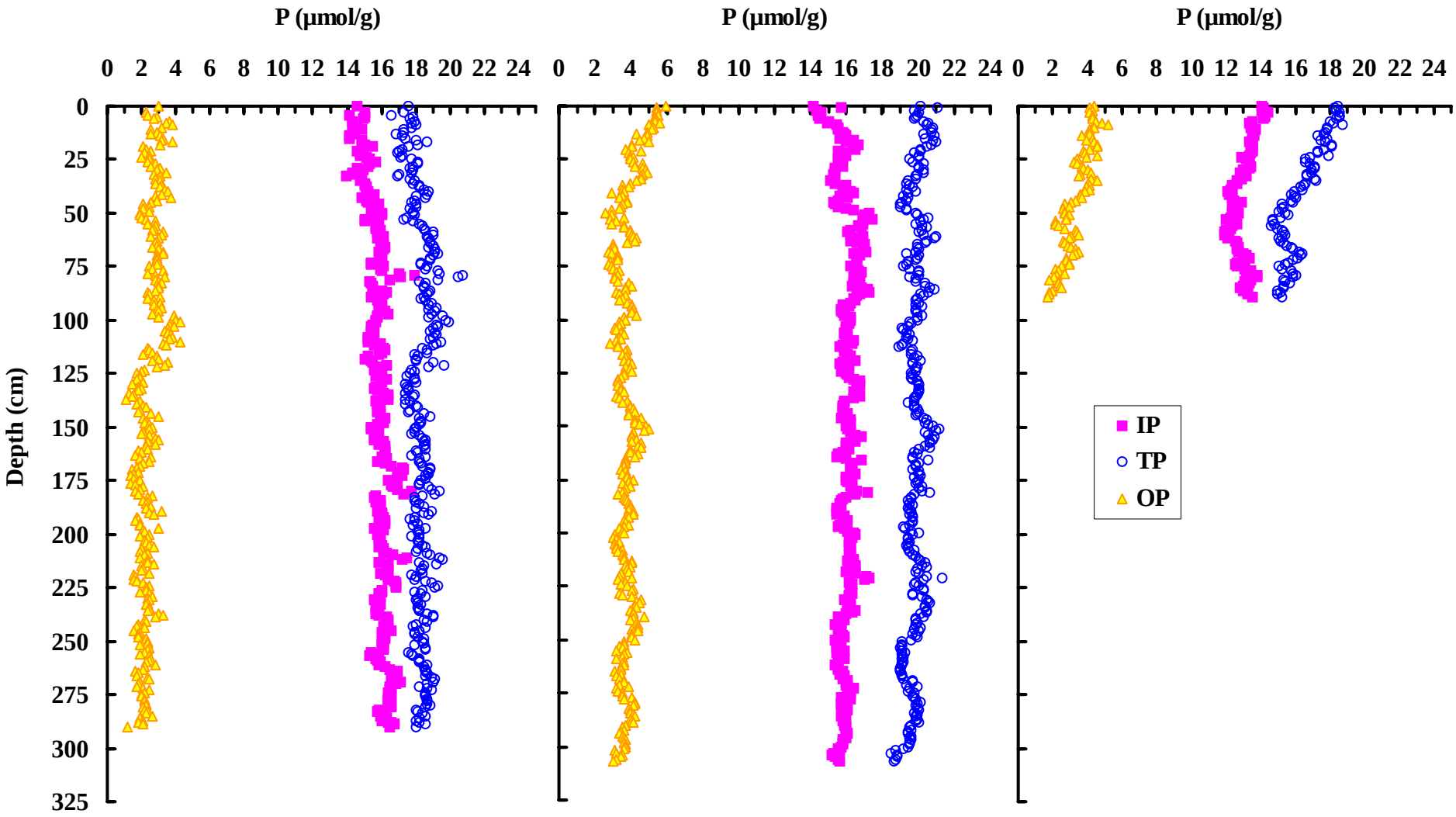




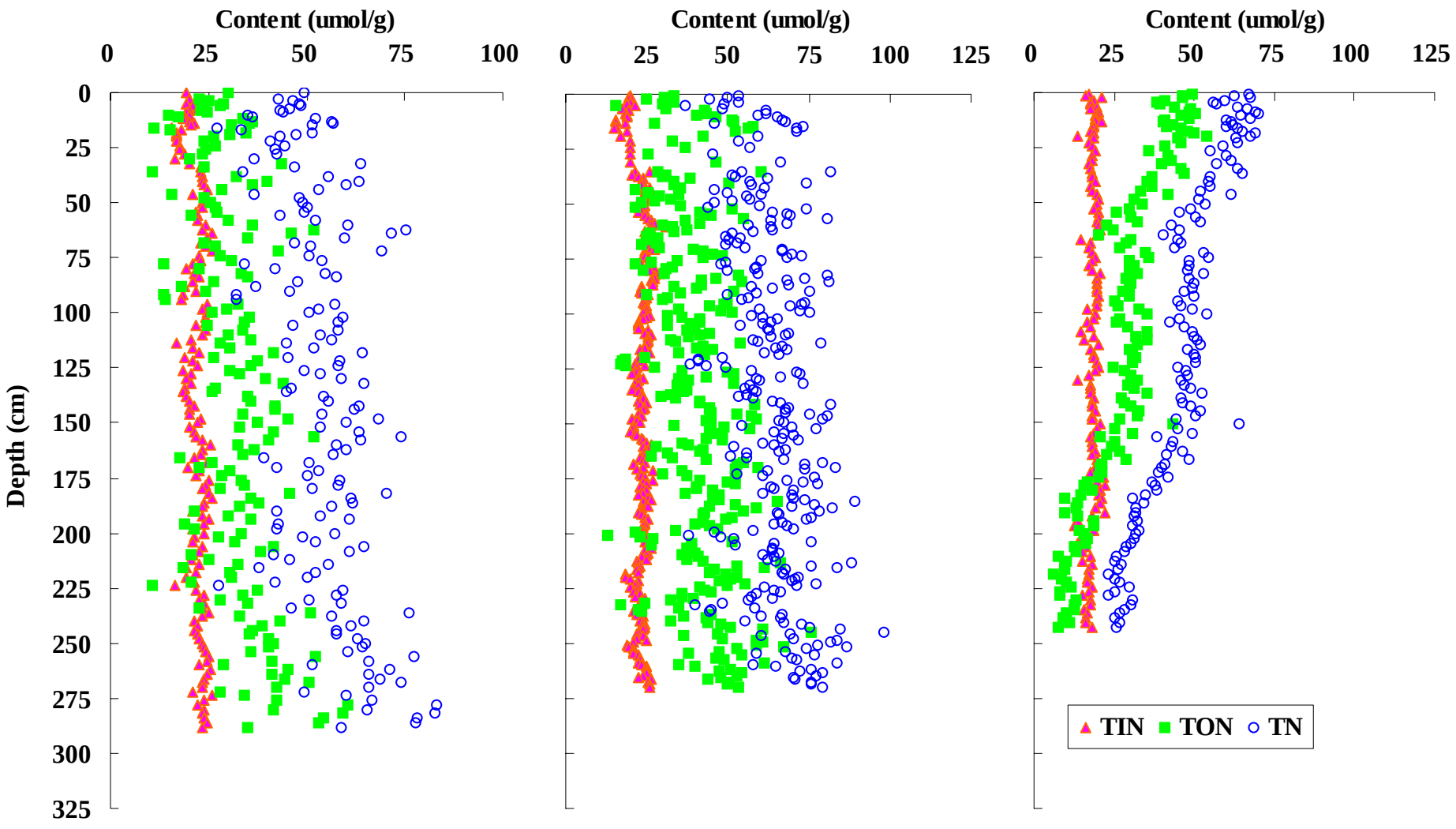
Benthic nutrient fluxes incubated on boat in the Changjiang Estuary



Benthic nutrient fluxes calculated from pore water profile in the Changjiang Estuary



Phosphorus species in core sediments in the Changjiang Estuary



Nitrogen species in core sediments in the Changjiang Estuary

Budgets of nutrient elements in the ECS shelf (kmol/s)

	PO_4^{3-}	DOP	PIP	POP
River	0.013	0.21	0.067	0.018
Atmospheric	0.002	0.001	0.004	0.001
Taiwan Strait	0.36	0.43	0.059	0.045
Kuroshio	0.38	0.16	0.013	0.014
Total input	0.76	0.80	0.14	0.079
Yellow Sea	-0.004	-0.005	-0.003	-0.001
ECS shelf water	-0.57	-0.62	-0.22	-0.15
Total output	-0.57	-0.62	-0.23	-0.15
Net transport	0.18	0.18	-0.084	-0.072

Summary

Distribution of phosphorus species

Major sources and phosphorus species budgets in the East China Sea Shelf

Thank you!