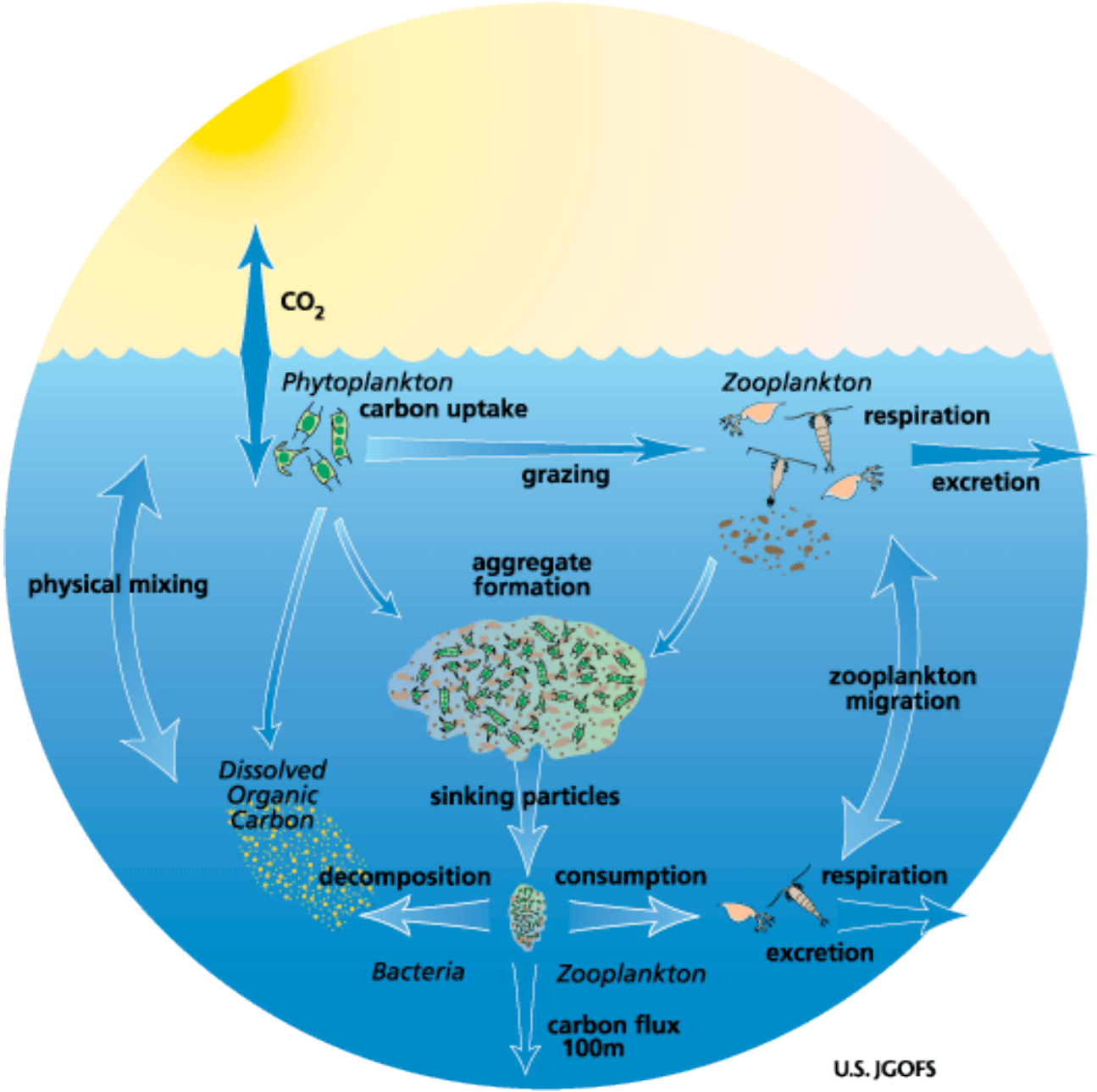
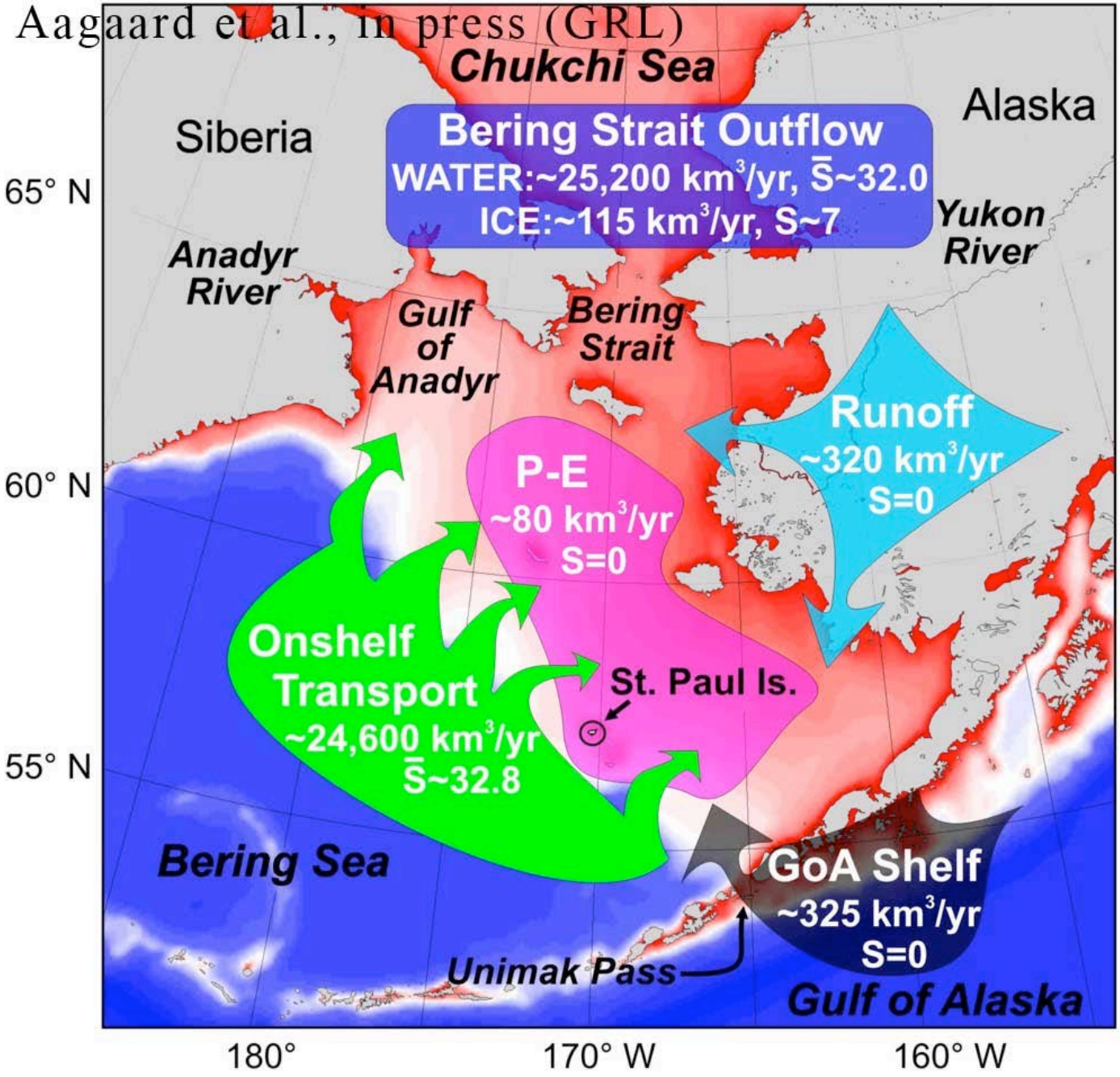
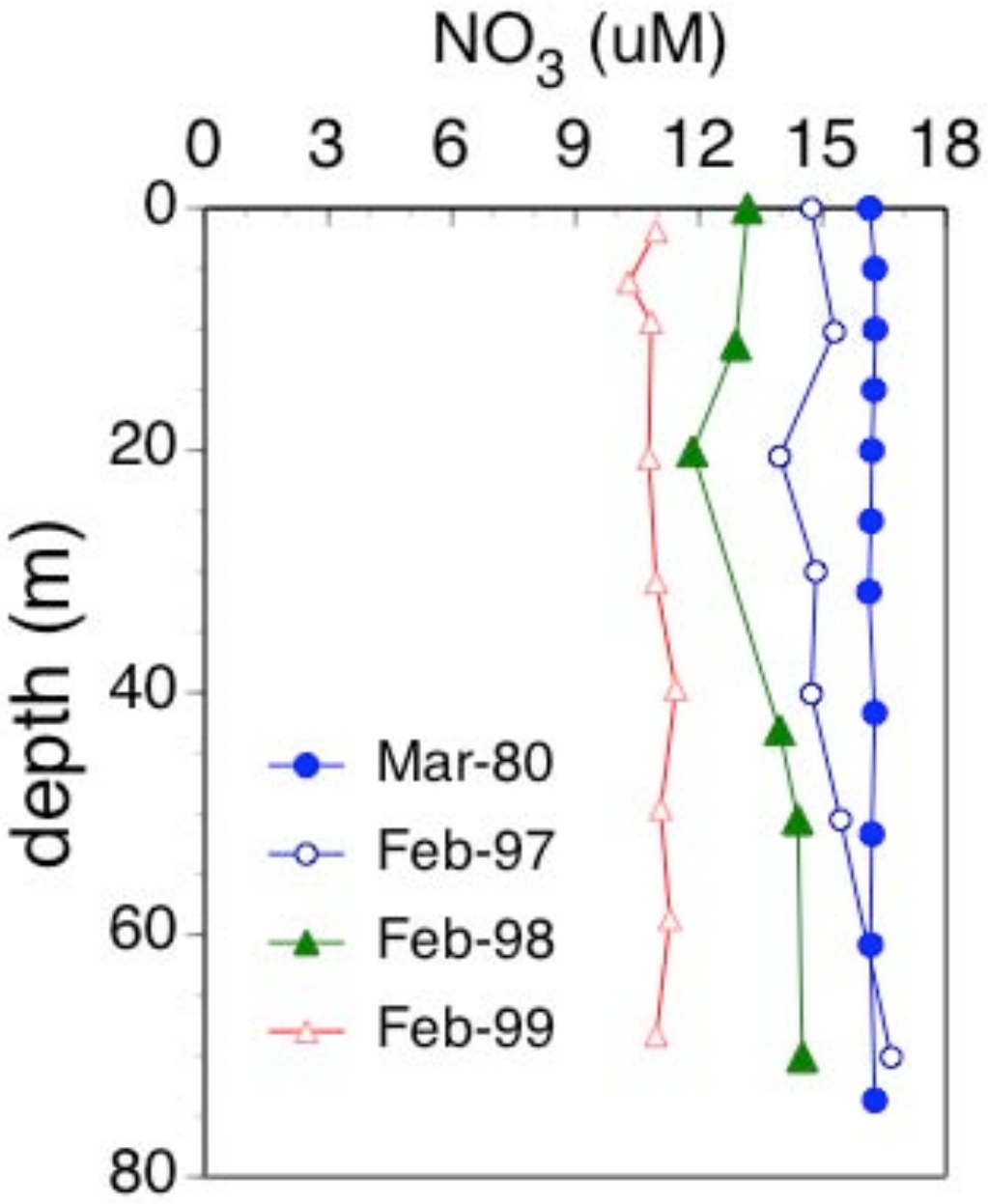
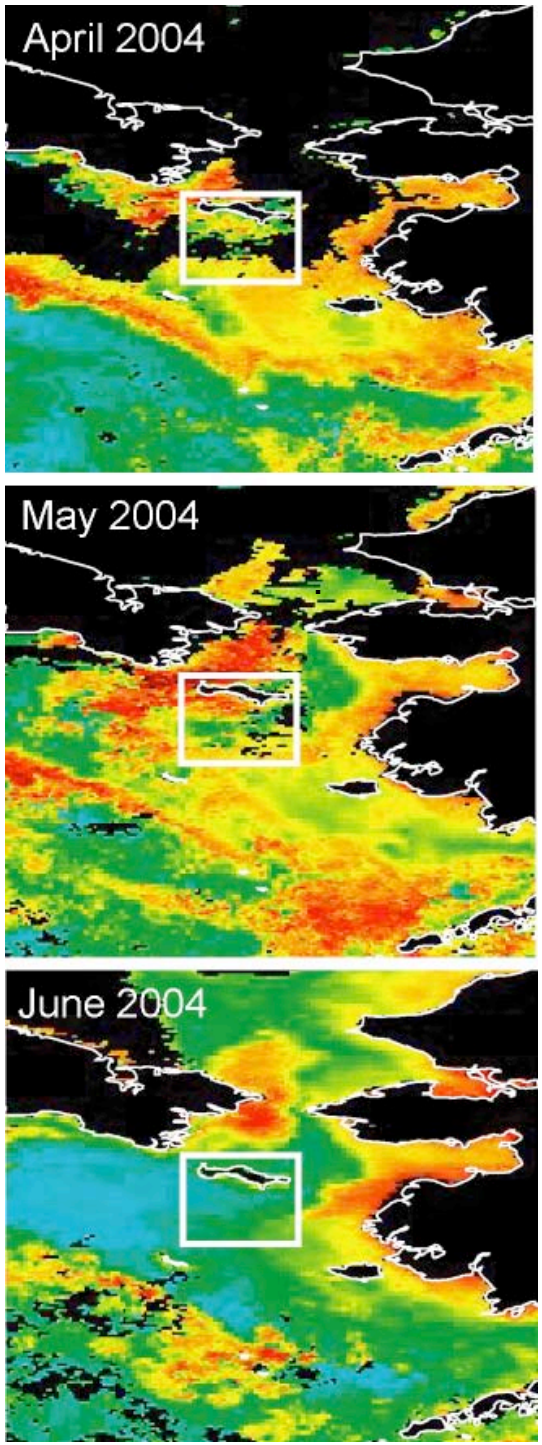

CO_2
Phytoplankton
carbon uptake
Zooplankton
respiration
grazing
excretion
physical mixing
aggregate
formation
zooplankton
migration
Dissolved
Organic
Carbon
sinking particles
decomposition
consumption
respiration
excretion
Bacteria
Zooplankton
carbon flux
100m
U.S. JGOFS

Aagaard et al., in press (GRL)



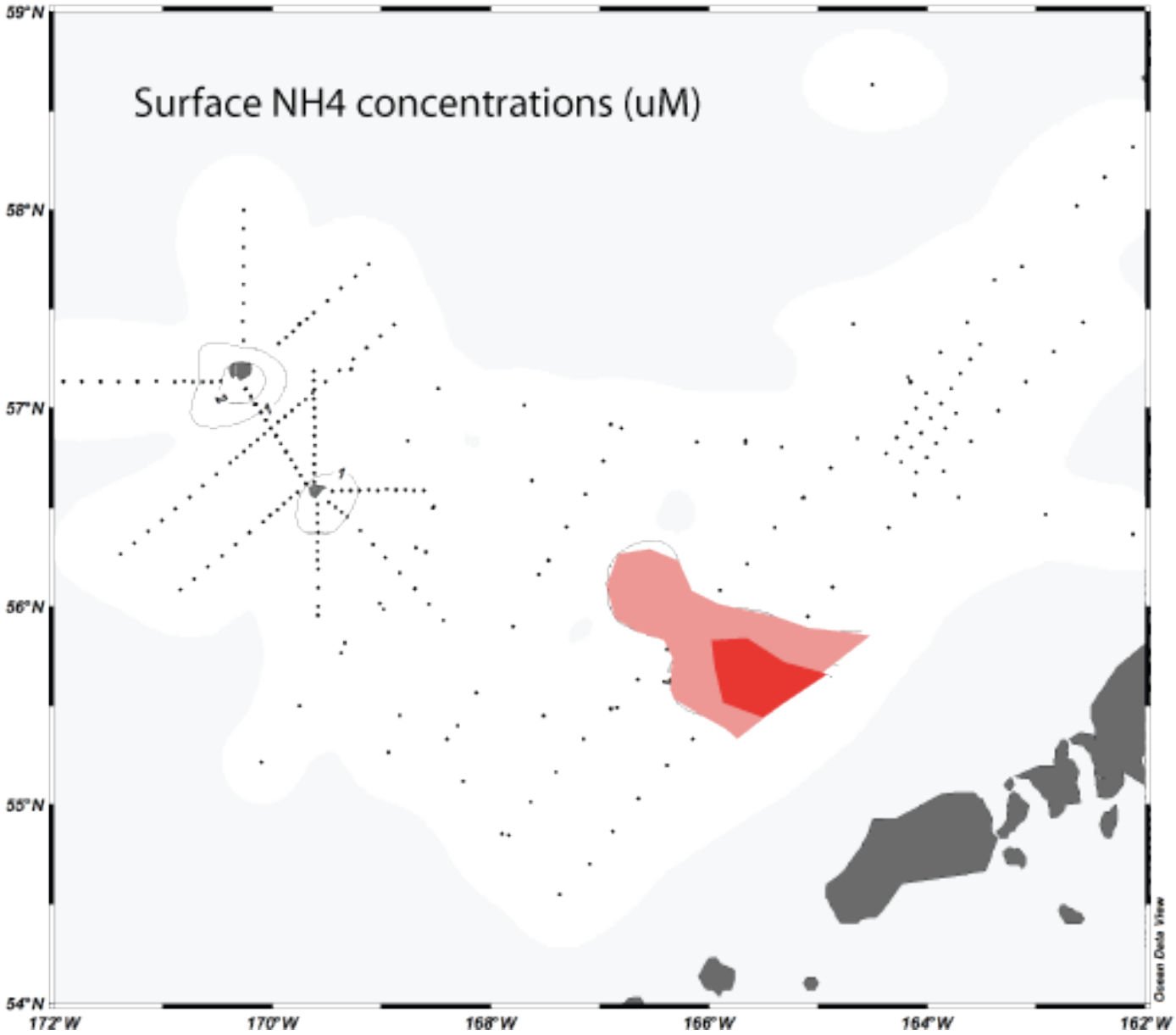

NO3 (uM)
0
3
6
9
12
15
18
depth (m)
0
20
40
60
80
Mar-80
Feb-97
Feb-98
Feb-99



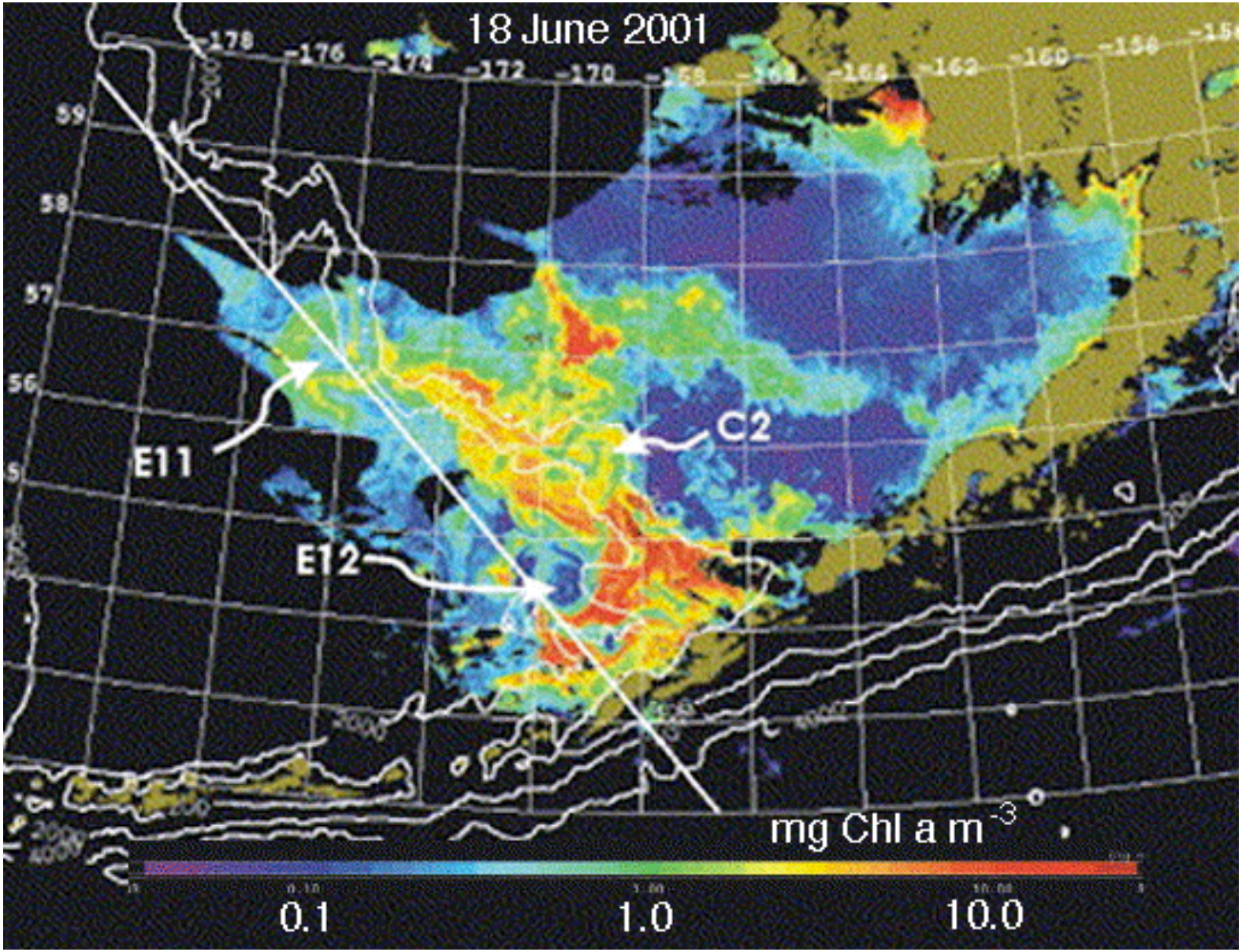
Chlorophyll-a concentrations (mg/m^3), as measured by the MODIS and SeaWIFS platforms in April, May, and June 2004. Black areas represent land areas, sea ice cover, or cloud cover. Note after the breakup of sea ice in April, chlorophyll-a concentrations peak in May and again subside in June. Data are from NASA and are available at http://oceancolor.gsfc.nasa.gov

(Grebmeier and Barry, 2006, in *Polynyas: Windows into Polar Oceans,* W.O.Smith, D. Barber, eds., in press)

C.


Surface NH4 concentrations (uM)
59°N
58°N
57°N
56°N
55°N
54°N
172°W
170°W
168°W
166°W
164°W
162°W
Ocean Data View


Depth [m]
0
20
40
60
80
100
200
300
400
Distance [km]
<31.8
<31.8
31.9
31.85
32
32.05
32.1
32.15
32.2
32.25
31.8
Ocean Data View



Okkonnen et al.,

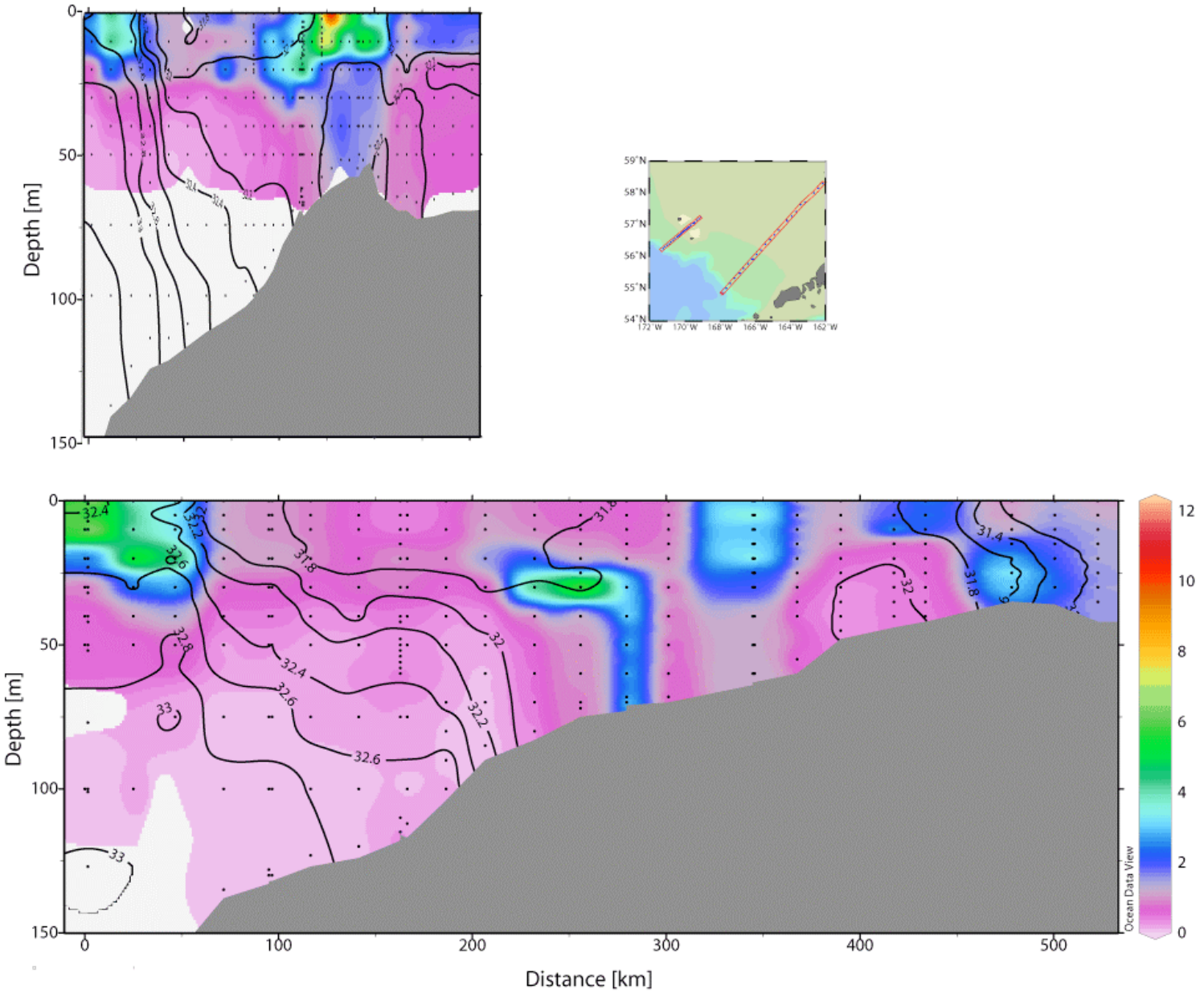

Depth [m]
0
50
100
150
59°N
58°N
57°N
56°N
55°N
54°N
172°W
170°W
168°W
166°W
164°W
162°W
Depth [m]
Distance [km]
0
100
200
300
400
500
32.4
32.2
32
31.8
31.6
31.4
32.6
32.8
33
32.4
32.6
32.2
32
31.8
32
33
Ocean Data View
12
10
8
6
4
2
0

Table 4. Estimated nitrate uptake, f-ratios and equivalent carbon production parameters along 170°W. Monthly column values are the average daily rates for that month; seasonal values are the time integrated rates; for nitrate the units are mmoles m^{-2} d^{-1} and mmoles m^{-2} $yr.^{-1}$ and for carbon the units are g C m^{-2} d^{-1} and g C m^{-2} $yr.^{-1}$. The bold numbers represent measured values. The remaining values were estimated (see text).

	Nov.	Dec.	Jan.	Feb.	Mar.	season
65°-61.5°S						
ρNO_3	2	**7.5**	6	**2.5**	1	570
f-ratio	0.25	**0.21**	0.18	**0.09**	0.05	0.18
ECP[1]		0.59		0.20		45.1
GCP[2]		2.81		2.22		250.8
61.5-59°S						
ρNO_3	6	**7**	3	**1.8**	1.5	579
f-ratio	0.25	**0.2**	0.20	**0.20**	0.05	0.19
ECP		0.55		0.14		45.8
GCP		2.75		0.70		241.1
59-55°S						
ρNO_3	2.1	**2.5**	3.5	**1.9**	1.5	345
f-ratio	0.08	**0.08**	0.10	**0.08**	0.05	0.09
ECP		0.20		0.15		27.3
GCP		2.5		1.88		303.3

[1] – Exportable carbon production (ρNO_3 times particulate C/N ratio of 6.6).

[2] – Gross carbon production estimated as ECP/ f-ratio.

Sambrotto and Mace, 2000

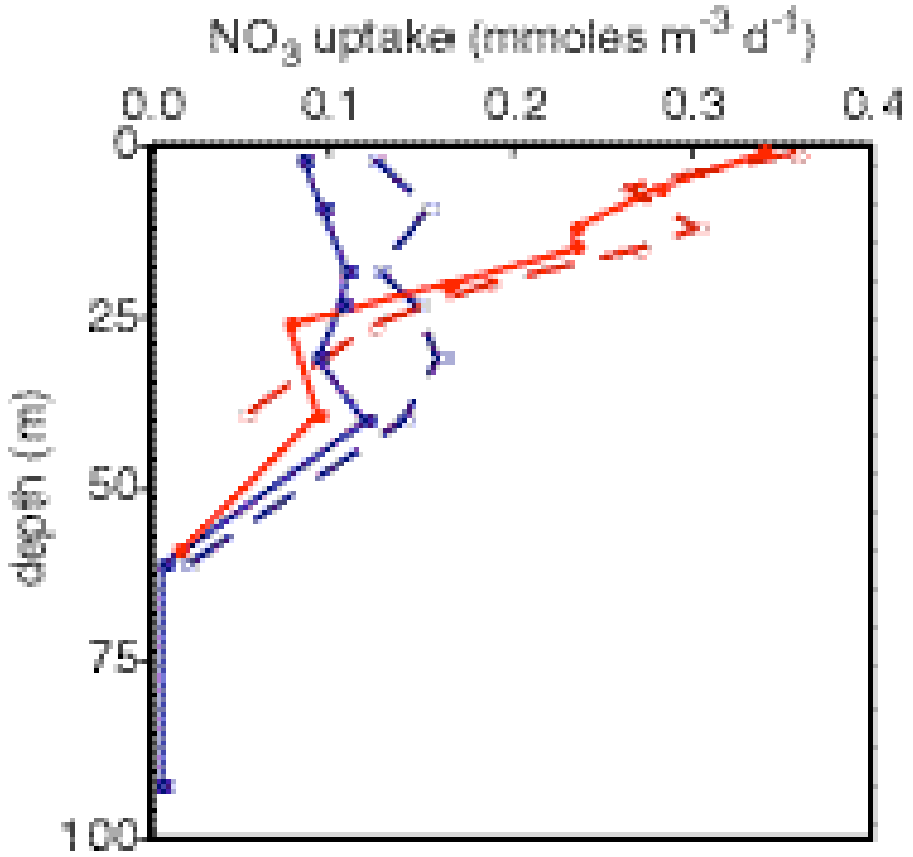
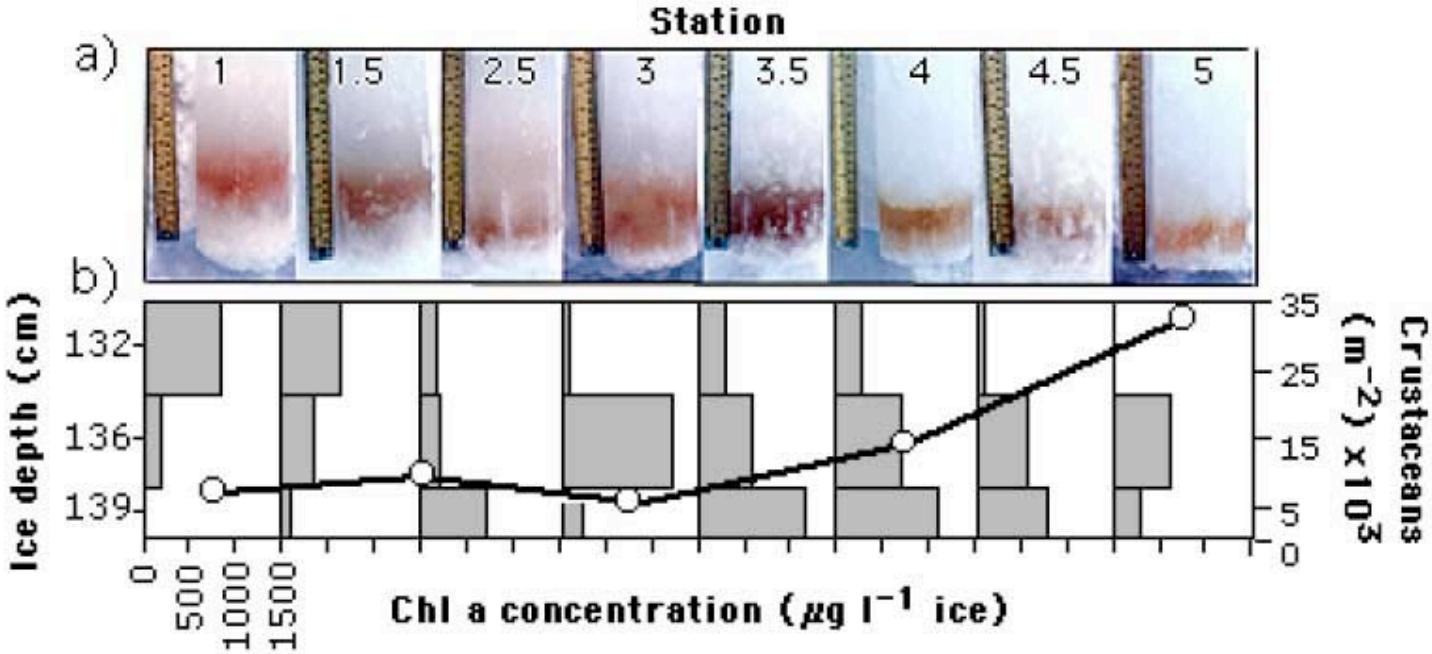
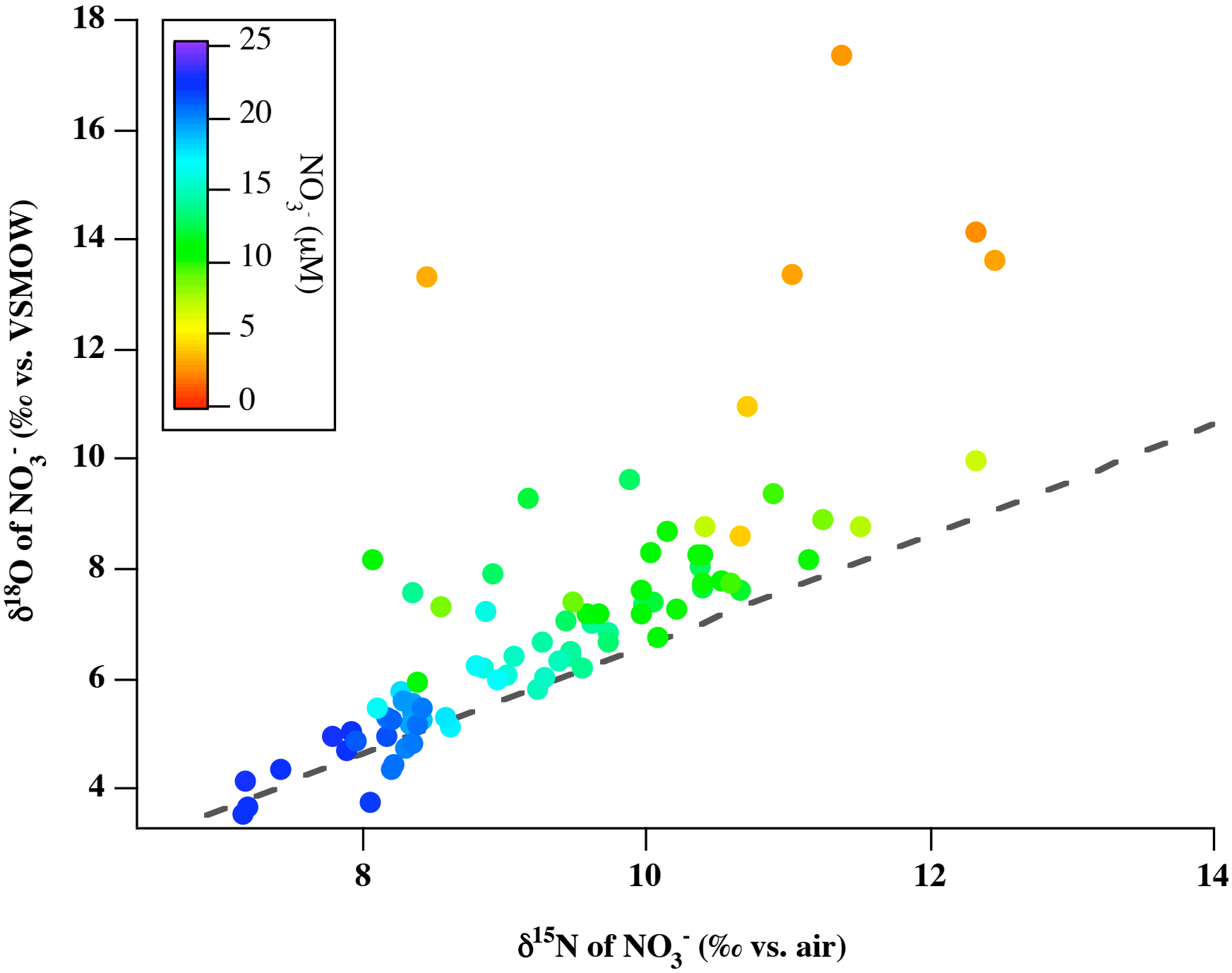


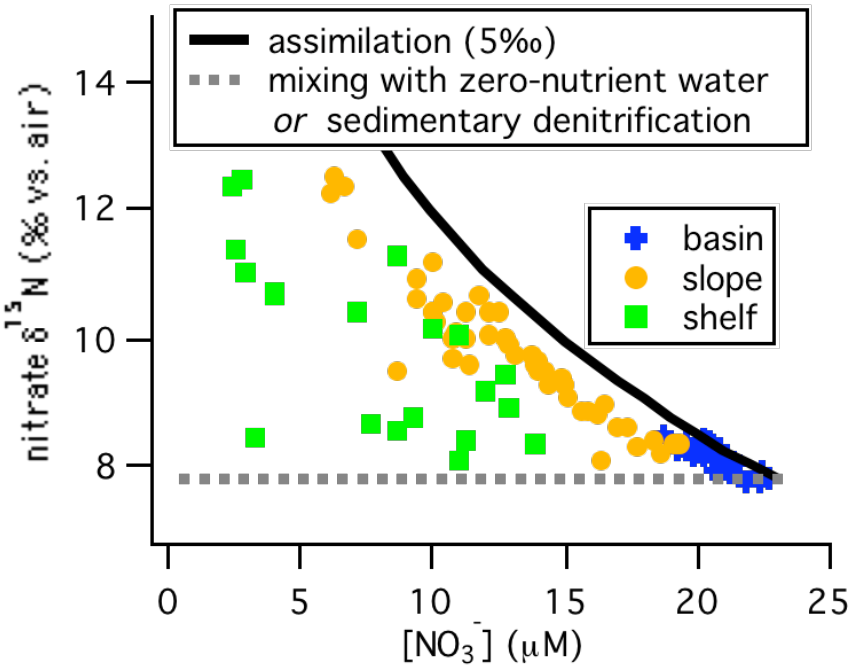
Fig. 5. Comparisons between in situ and on-deck incubation methods. Comparisons were done at St. 5 (squares) and 6 (circles). In both comparisons the solid symbols represent the results of the on-deck incubations and the open symbols represent the results of the in situ incubations.

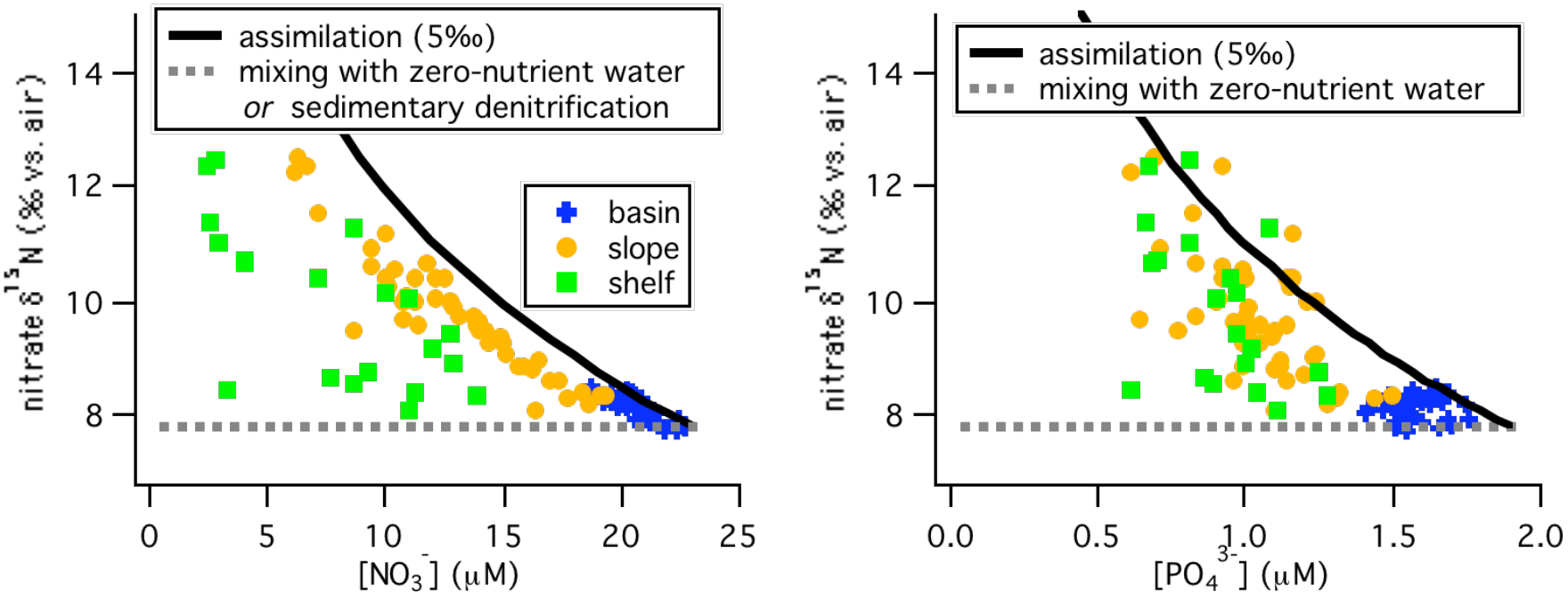
New prod. (mmoles m^{-2})	Sources & notes	C prod. (g C m^{-2})	Sources & notes
Coastal domain			
650	Seasonal nitrate decrease plus horizontal flux derived from Kachel et al, 2002	133	Rho and Whitledge, in press[1]
Middle shelf			
545-1100	Bloom values from Sambrotto et al., 1986; Whitledge et al., 1986;	117-184	Bloom values from Probes data; summer values this study
	Hansell et al., 1993; summer values this study	144	Rho and Whitledge, in press
Middle shelf near Pribilof Islands			
1400-1600	Higher bloom values from middle shelf; summer values this study	200-250	Higher bloom values from middle shelf; summer values this study
Outer shelf			
820-970	Bloom - nitrate budget from Probes data; summer values this	133-177	Bloom values from Probes data; summer values this study
	study	138	Rho and Whitledge, in press
Thermohaline front regions			
1890	summer values this study extrapolated for 150 days	165	summer values this study extrapolated for 150 days
1000	Shelf-break only; Hansell et al., 1993	144	Rho and Whitledge, in press
Near-shelf basin region			
690-730	Wong et al., 2002	77	Rho and Whitledge, in press[2]
		70-100	Mordy et al., 2005, Whitledge et al., 1988[3]

1 – Compilation of Probes and newer data; includes fall production to October 24.
2 – Extrapolated from their spring – early summer values
3 – Based on stations north of Unimak Pass and in central basin


Station
a)
1
1.5
2.5
3
3.5
4
4.5
5
b)
Ice depth (cm)
132
136
139
0
500
1000
1500
Chl a concentration (µg l⁻¹ ice)
35
25
15
5
0
Crustaceans (m⁻²) x 10³

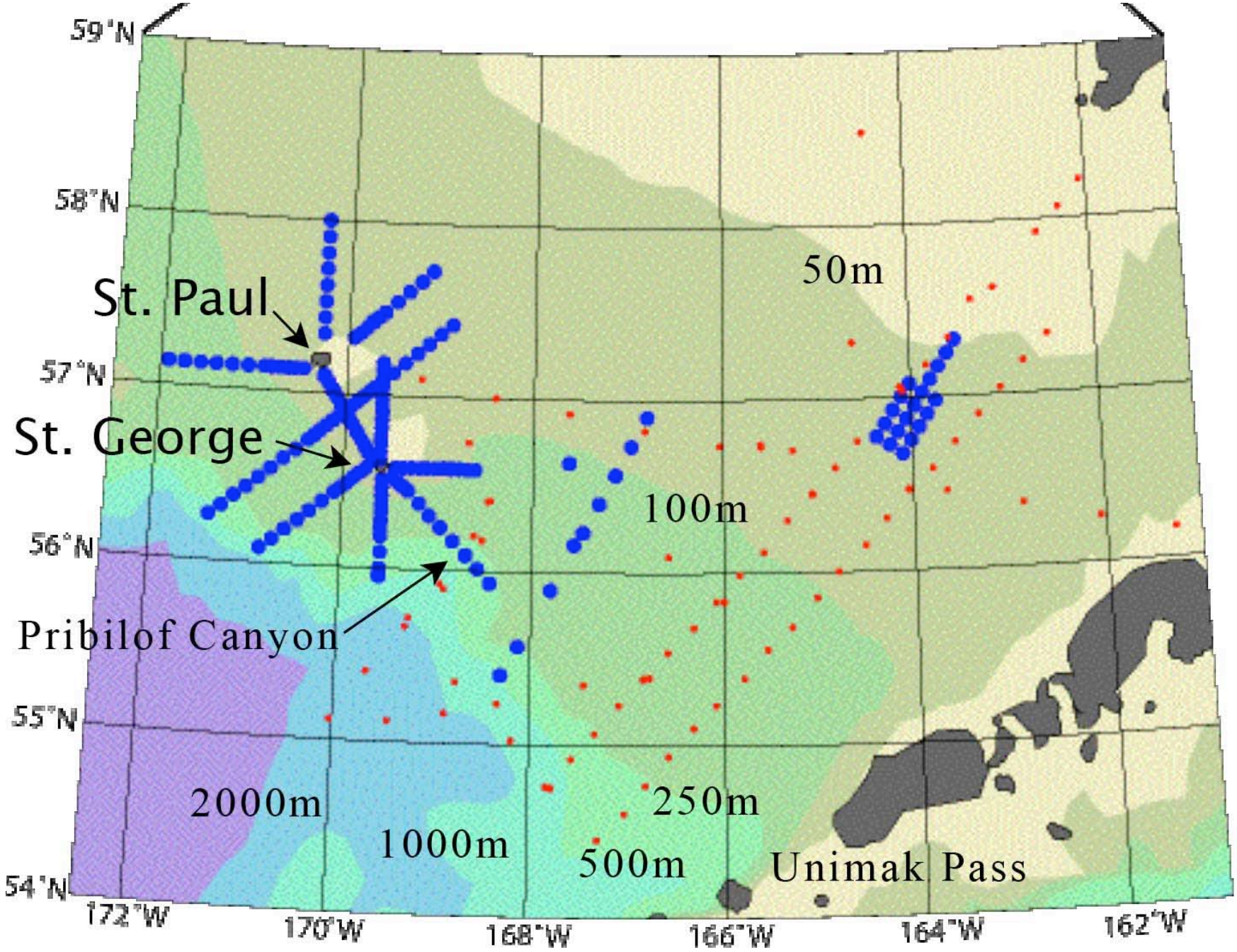

18
16
14
12
10
8
6
4
8
10
12
14
25
20
15
10
5
0
NO_3^- (μM)
$\delta^{18}O$ of NO_3^- (‰ vs. VSMOW)
$\delta^{15}N$ of NO_3^- (‰ vs. air)


assimilation (5‰)
mixing with zero-nutrient water
or sedimentary denitrification
basin
slope
shelf
nitrate δ15N (‰ vs. air)
14
12
10
8
0
5
10
15
20
25
[NO3-] (μM)


assimilation (5‰)
mixing with zero-nutrient water
or sedimentary denitrification
basin
slope
shelf
nitrate δ15N (‰ vs. air)
[NO3-] (μM)
assimilation (5‰)
mixing with zero-nutrient water
[PO43-] (μM)

Priorities for Cruise - Sambrotto/ Sigman

- Define early spring levels and distributions of: inorganic nutrients; dissolved organic N & P; and nitrogen isotopes.
- Compare initial conditions in nutrients, isotopes and productivity for ice vs. non-ice & on-shelf vs. off-shelf regions.
- Determine nutrients and nitrogen isotopic signatures in and under ice.
- Associate communities with characteristic fractionation.
- Characterize source waters.


59°N
58°N
57°N
56°N
55°N
54°N
172°W
170°W
168°W
166°W
164°W
162°W
St. Paul
St. George
Pribilof Canyon
50m
100m
250m
500m
1000m
2000m
Unimak Pass

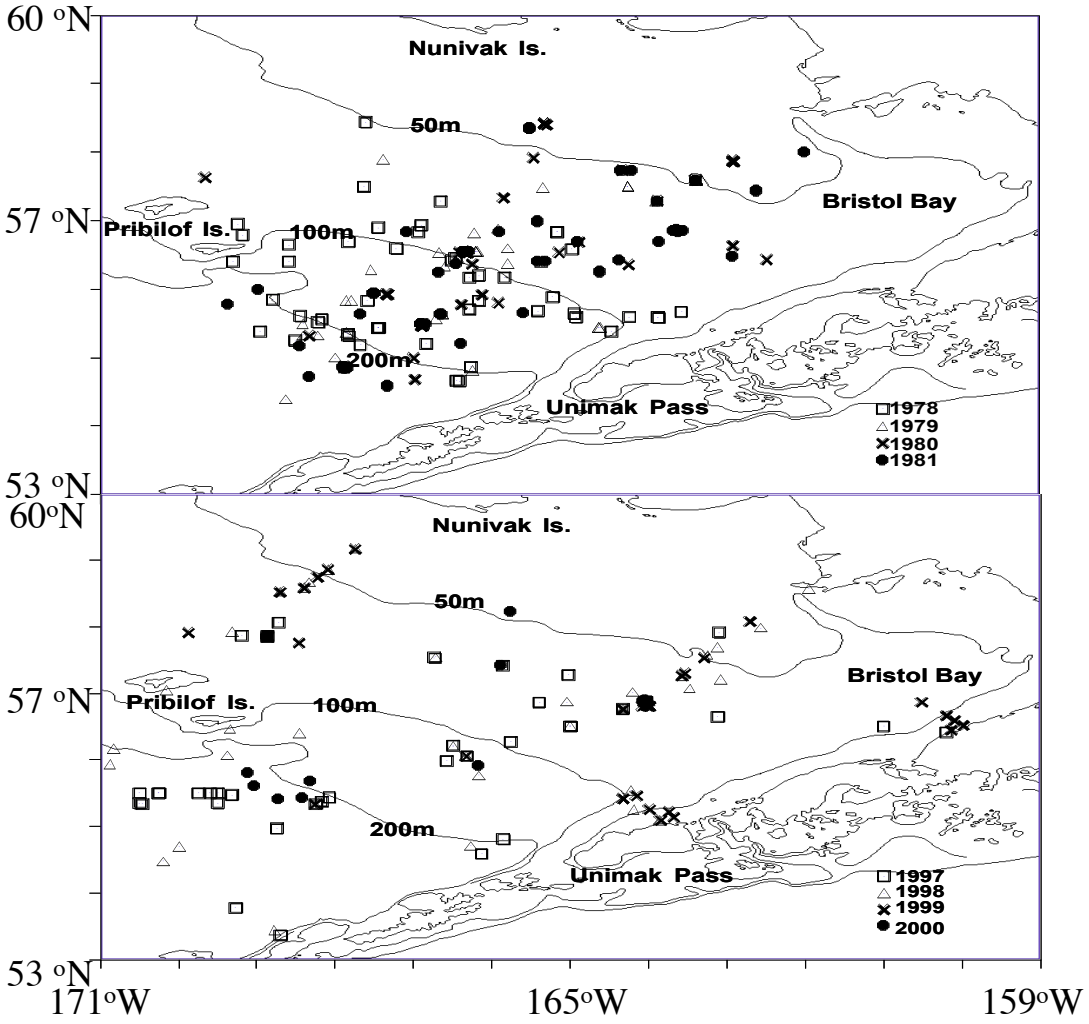


Fig. 1. Location of productivity stations over the southeastern Bering Sea shelf during PROBES (upper panel) and the recent measurements (lower panel) (Rho and Whitledge, in press, Prog. Ocn.)

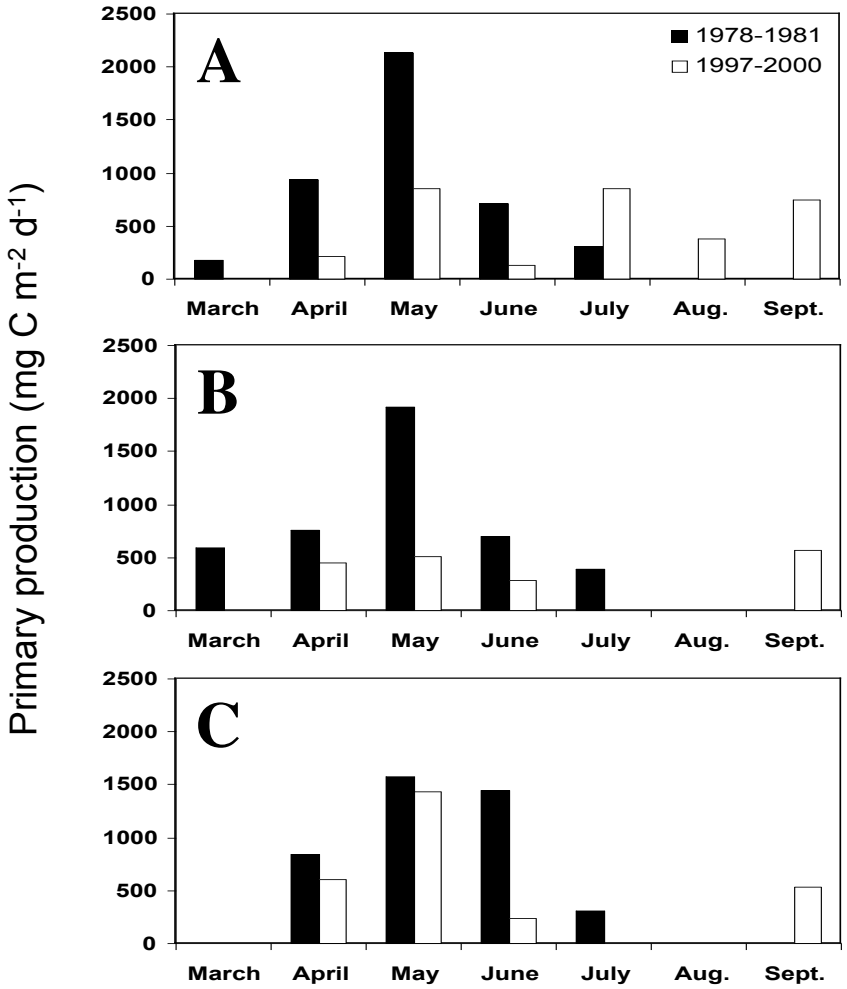
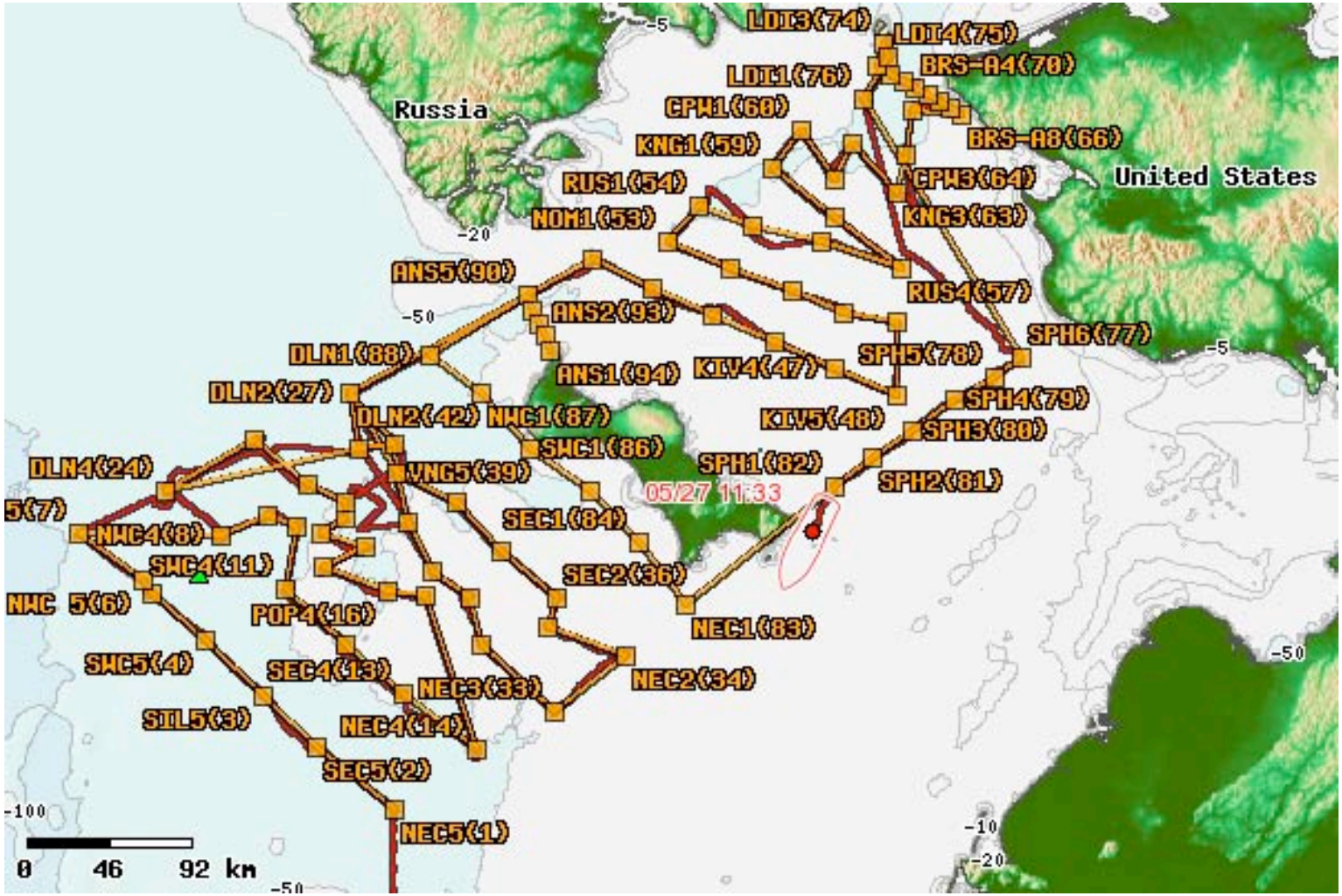
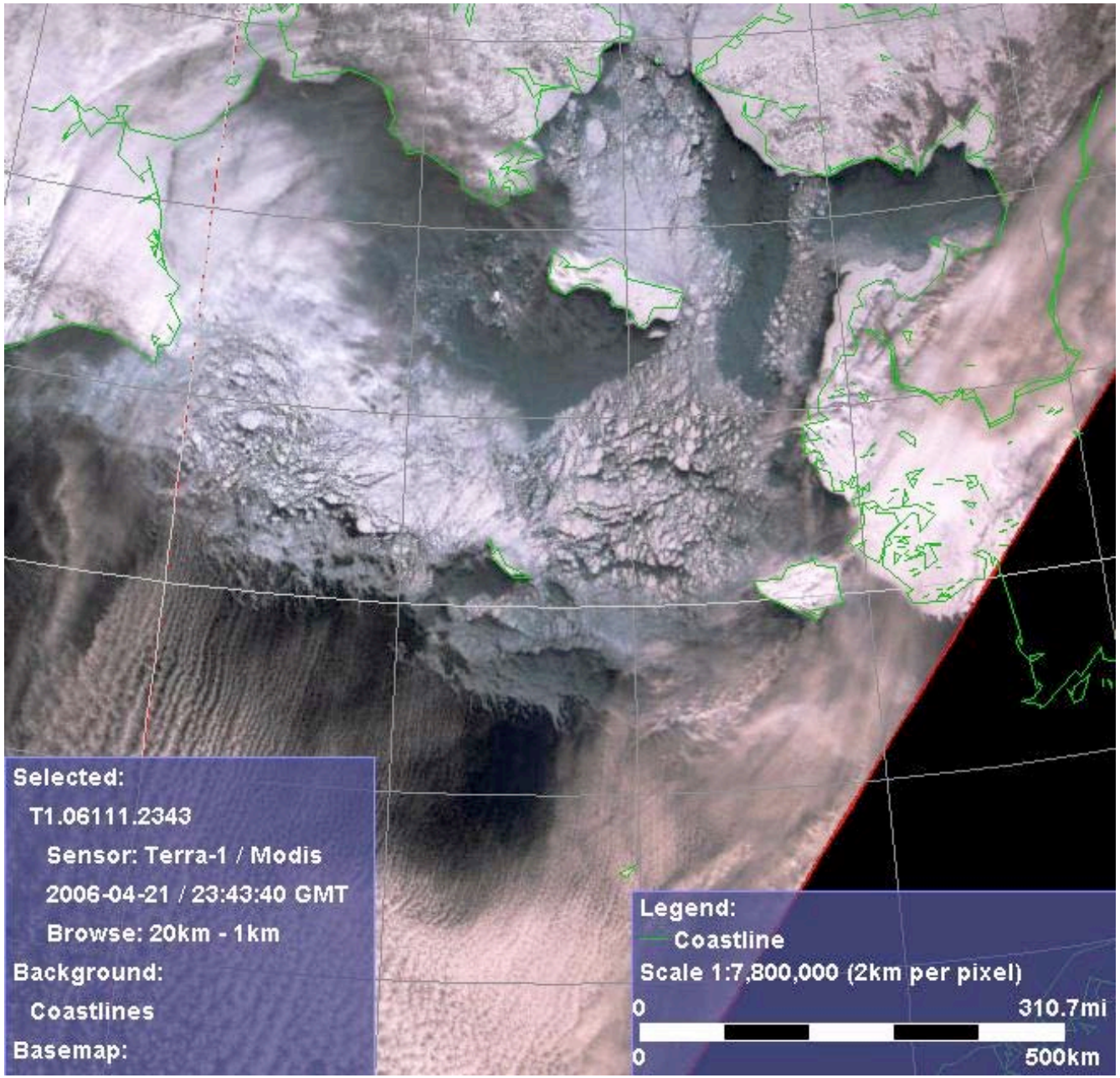
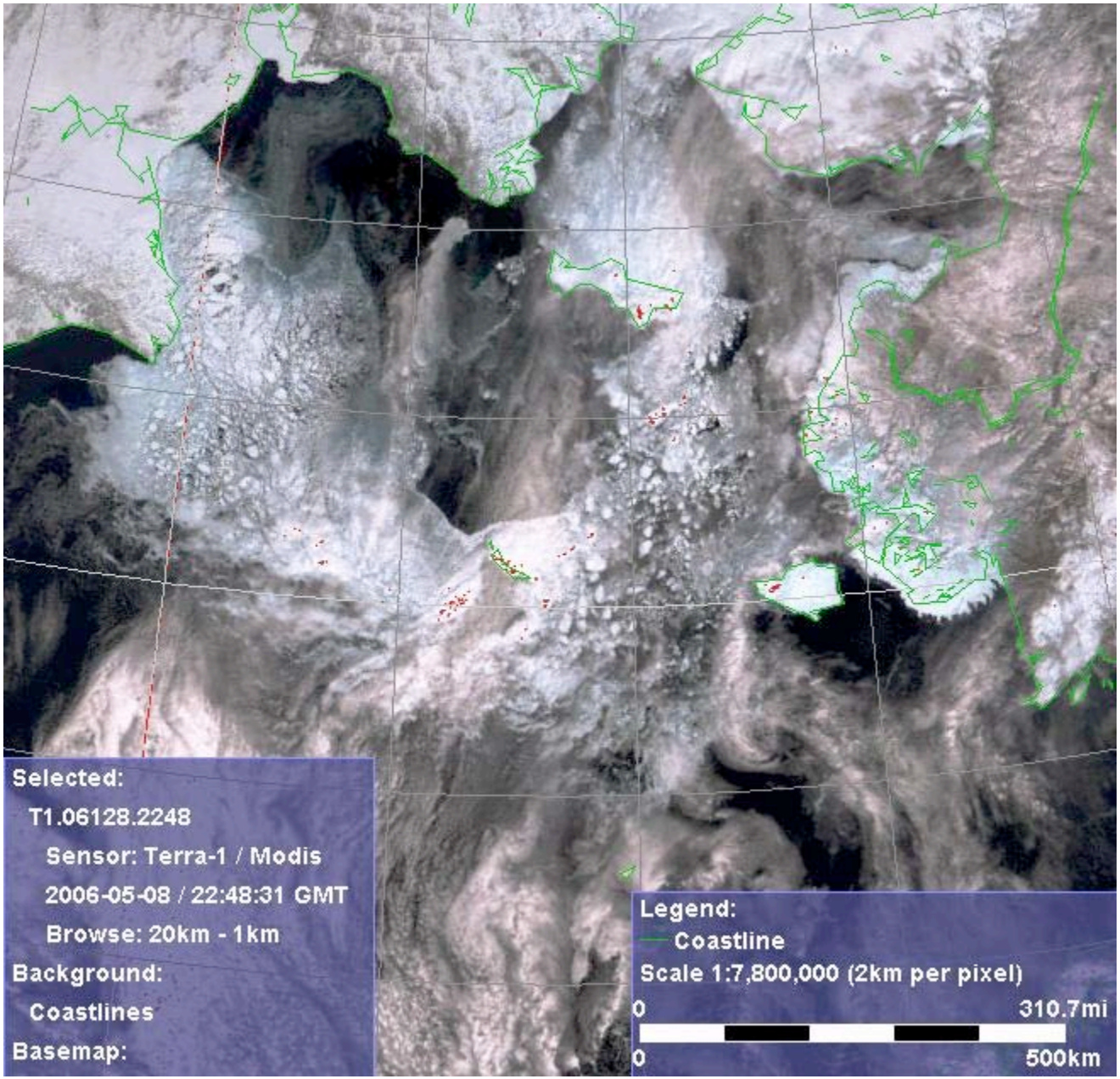


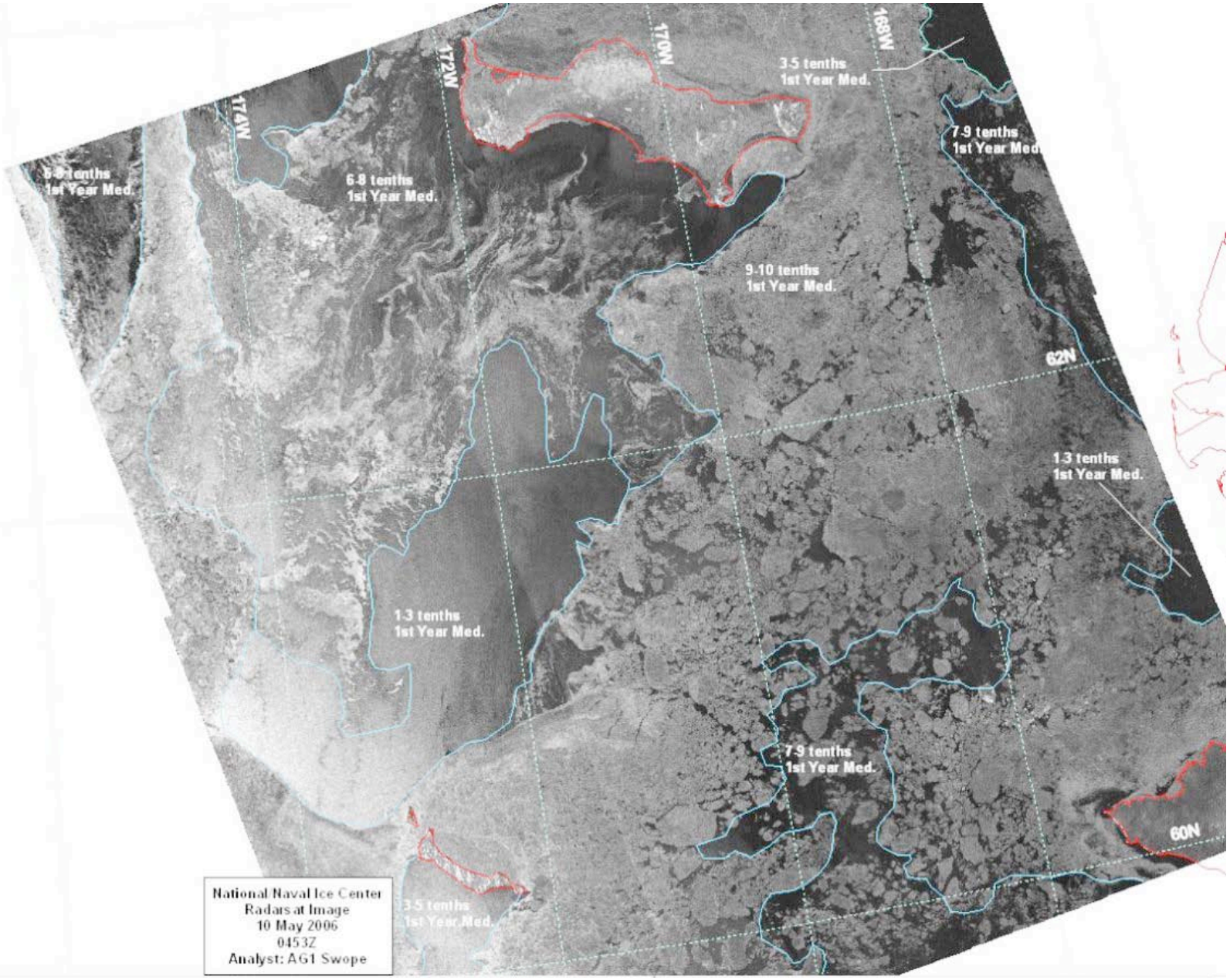
Fig. 2. Annual cycles of primary production in the southeastern Bering Sea. (A: middle shelf, B: outer shelf, and C: shelf break; Rho and Whitledge, in press, Prog. Ocn.)

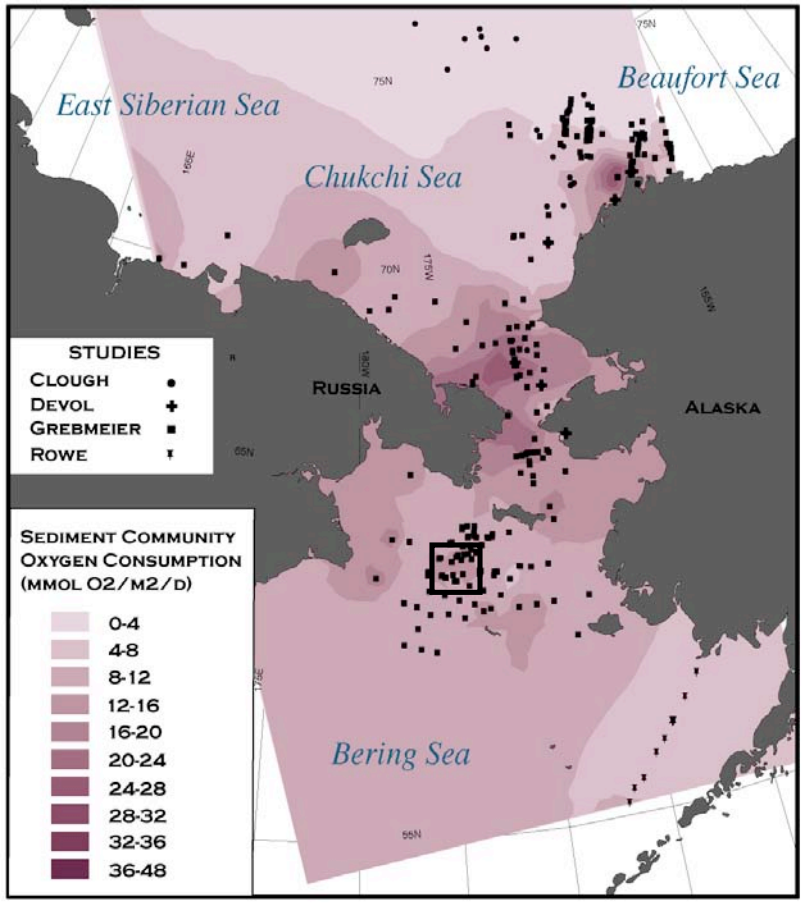

Russia
United States
LDI1(76)
LDI4(75)
BRS-A7(67)
RUS1(54)
DLN1(108)
SPH6(77)
DLN4(24)
SPH5(78)
DBS-C(115)
SPH1(82)
DBS1(backup)(118)
NEC1(83)
DBS-E(117)
NEC5(86)
06/03 20:28
(waypoint)
DBS2(?)(119)
(waypoint)
(the end)
0 160 320 km

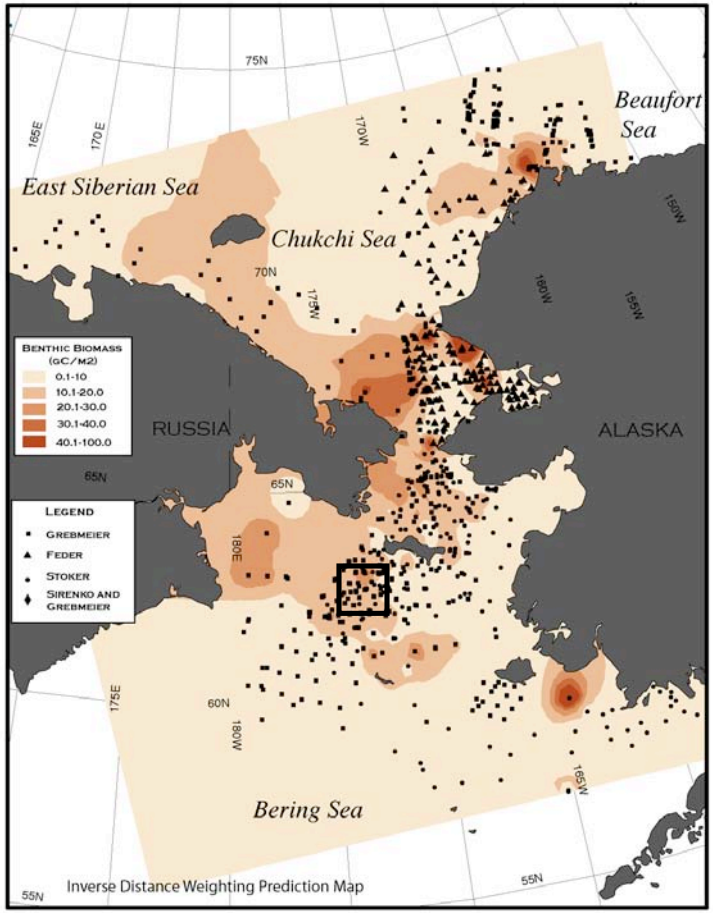

LDI3(74)
LDI4(75)
BRS-A4(70)
LDI1(76)
CPW1(60)
Russia
KNG1(59)
BRS-A8(66)
CPW3(64)
United States
RUS1(54)
NOH1(53)
KNG3(63)
ANS5(90)
RUS4(57)
ANS2(93)
SPH6(77)
SPH5(78)
DLN1(88)
ANS1(94)
KIV4(47)
DLN2(27)
SPH4(79)
DLN2(42)
NWC1(87)
KIV5(48)
SPH3(80)
SWC1(86)
DLN4(24)
VNG5(39)
SPH1(82)
SPH2(81)
05/27 11:33
5(7)
SEC1(84)
NWC4(8)
SWC4(11)
SEC2(36)
NWC 5(6)
POP4(16)
NEC1(83)
SWC5(4)
SEC4(13)
NEC3(33)
NEC2(34)
SIL5(3)
NEC4(14)
SEC5(2)
NEC5(1)
0 46 92 km

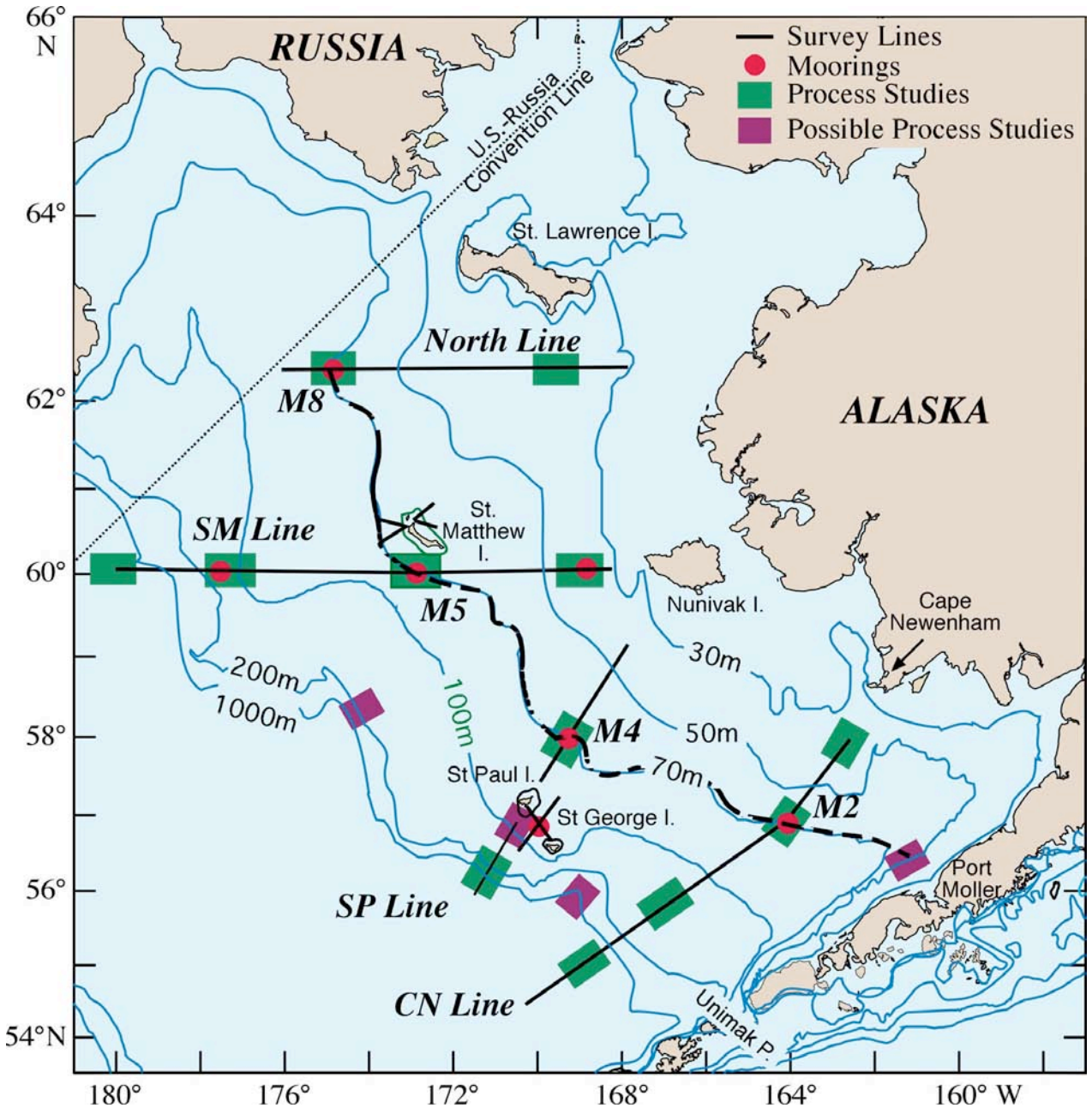

Selected:
T1.06111.2343
Sensor: Terra-1 / Modis
2006-04-21 / 23:43:40 GMT
Browse: 20km - 1km
Background:
Coastlines
Basemap:
Legend:
Coastline
Scale 1:7,800,000 (2km per pixel)
0
310.7mi
0
500km

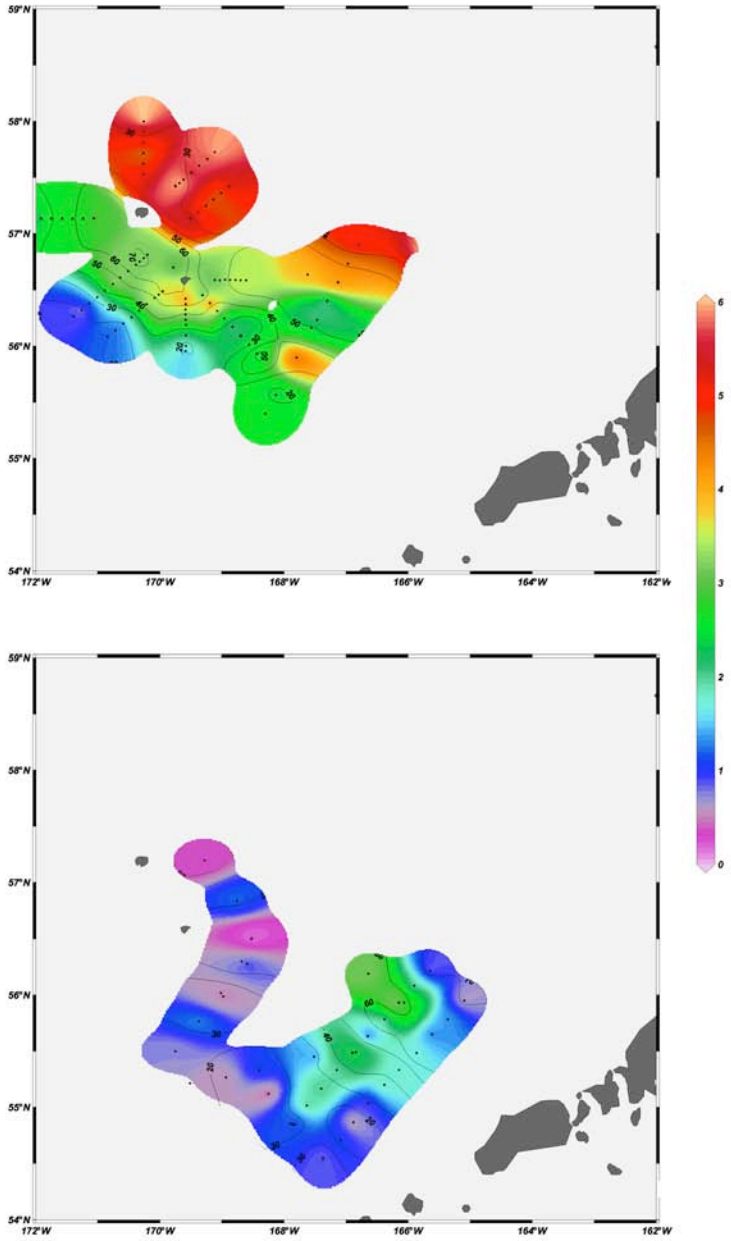

Selected:
T1.06128.2248
Sensor: Terra-1 / Modis
2006-05-08 / 22:48:31 GMT
Browse: 20km - 1km
Background:
Coastlines
Basemap:
Legend:
Coastline
Scale 1:7,800,000 (2km per pixel)
0
310.7mi
0
500km


176W
172W
170W
168W
3-5 tenths
1st Year Med.
7-9 tenths
1st Year Med.
6-8 tenths
1st Year Med.
9-10 tenths
1st Year Med.
62N
1-3 tenths
1st Year Med.
1-3 tenths
1st Year Med.
7-9 tenths
1st Year Med.
60N
3-5 tenths
1st Year Med.
National Naval Ice Center
Radarsat Image
10 May 2006
0453Z
Analyst: AG1 Swope


East Siberian Sea
Beaufort Sea
Chukchi Sea
Bering Sea
RUSSIA
ALASKA
STUDIES
CLOUGH
DEVOL
GREBMEIER
ROWE
SEDIMENT COMMUNITY OXYGEN CONSUMPTION (MMOL O2/M2/D)
0-4
4-8
8-12
12-16
16-20
20-24
24-28
28-32
32-36
36-48


East Siberian Sea
Beaufort Sea
Chukchi Sea
Bering Sea
RUSSIA
ALASKA
BENTHIC BIOMASS (GC/M2)
0.1-10
10.1-20.0
20.1-30.0
30.1-40.0
40.1-100.0
LEGEND
GREBMEIER
FEDER
STOKER
SIRENKO AND GREBMEIER
Inverse Distance Weighting Prediction Map


RUSSIA
ALASKA
Survey Lines
Moorings
Process Studies
Possible Process Studies
U.S.-Russia Convention Line
St. Lawrence I.
North Line
M8
SM Line
St. Matthew I.
M5
Nunivak I.
Cape Newenham
30m
200m
1000m
100m
M4
50m
70m
St Paul I.
St George I.
M2
SP Line
Port Moller
CN Line
Unimak P.
66° N
64°
62°
60°
58°
56°
54°N
180°
176°
172°
168°
164°
160° W



NH4

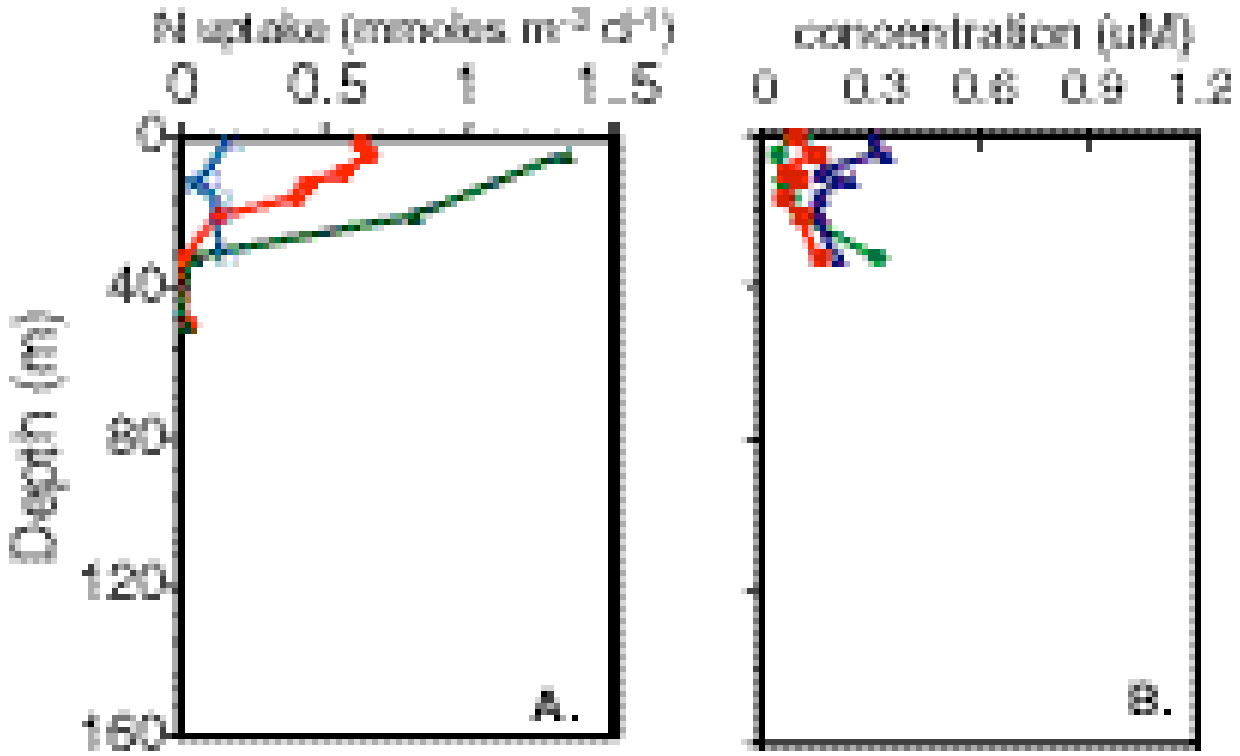
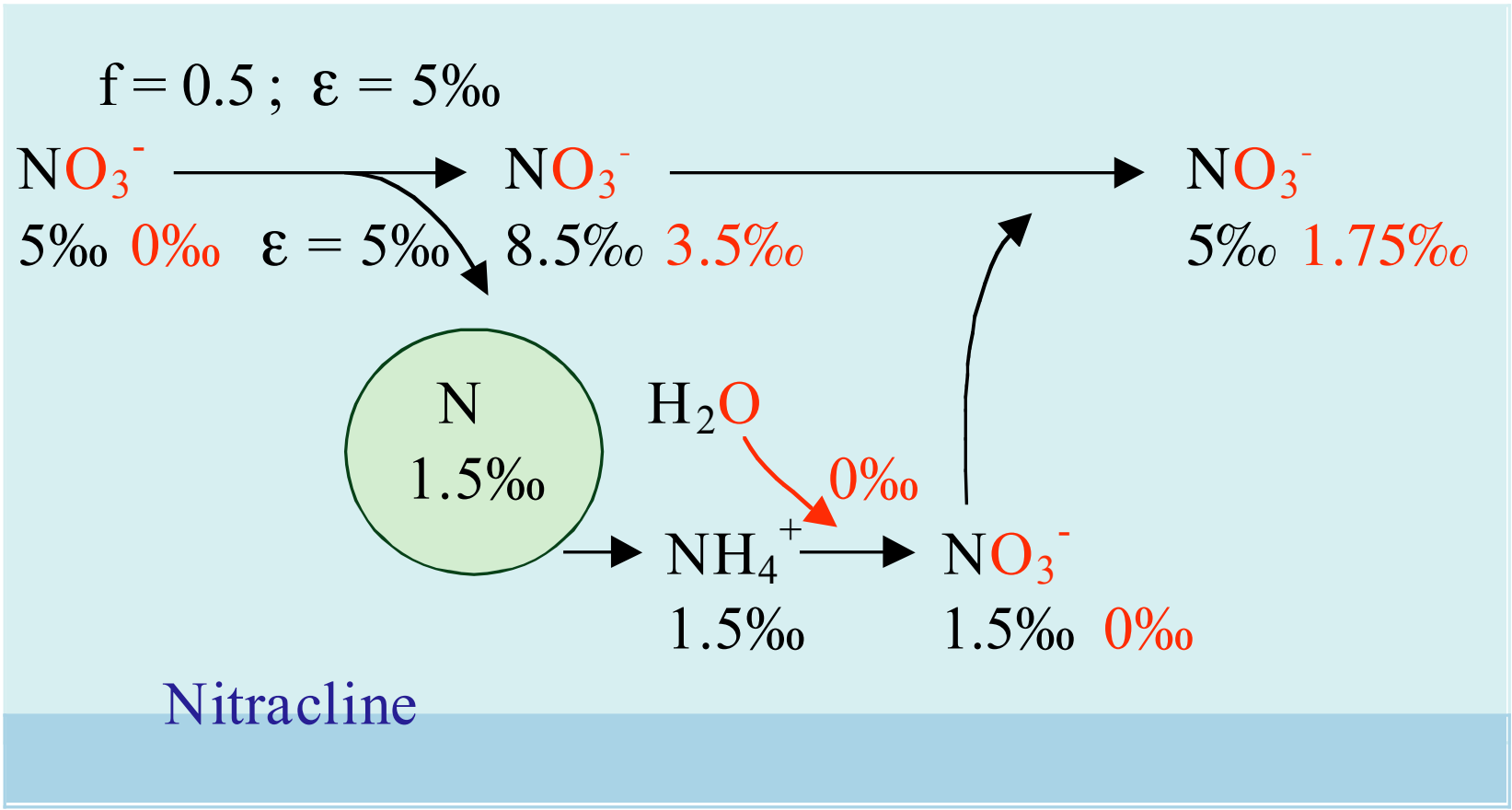
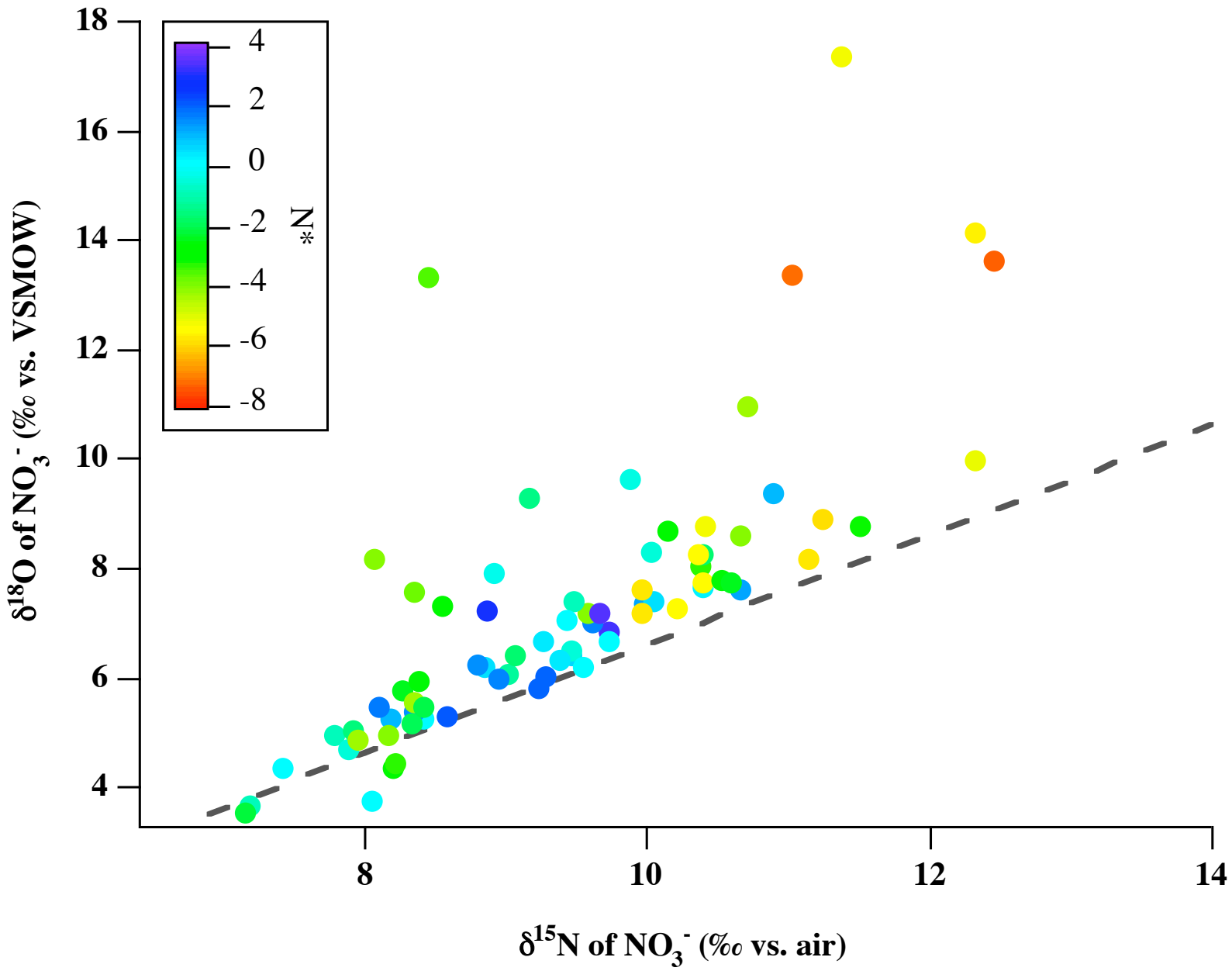


Fig. 4. Selected uptake and regenerated nutrient profiles from stations at the ice edge. A. December uptake profiles (all from St. 8): nitrate uptake (solid circles); ammonium uptake (solid triangles); and urea-N uptake (open squares). B. December regenerated nitrogen profiles (all from St. 8): ammonium - circles; urea-N – triangles; DFAAs – squares.


f = 0.5 ; ε = 5‰
NO3-
5‰ 0‰ ε = 5‰
NO3-
8.5‰ 3.5‰
NO3-
5‰ 1.75‰
N
1.5‰
H2O
0‰
NH4+
1.5‰
NO3-
1.5‰ 0‰
Nitracline


18
16
14
12
10
8
6
4
8
10
12
14
4
2
0
-2
-4
-6
-8
*N
δ18O of NO3- (‰ vs. VSMOW)
δ15N of NO3- (‰ vs. air)