April, 2003

HiLaTS Project: The Global Significance

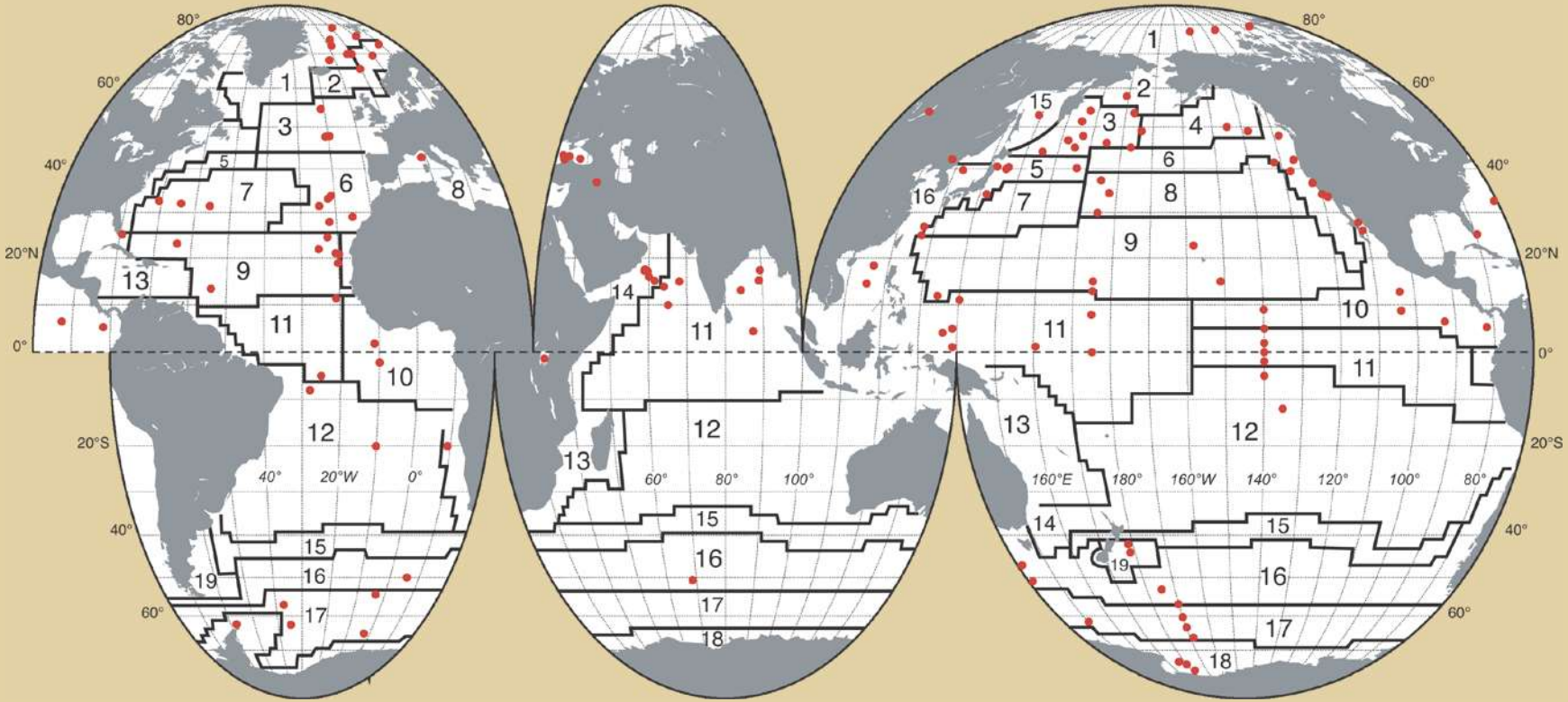
High Latitude Time-Series Ocean Observatory In the Northwestern Pacific

Mutsu Institute for Oceanography

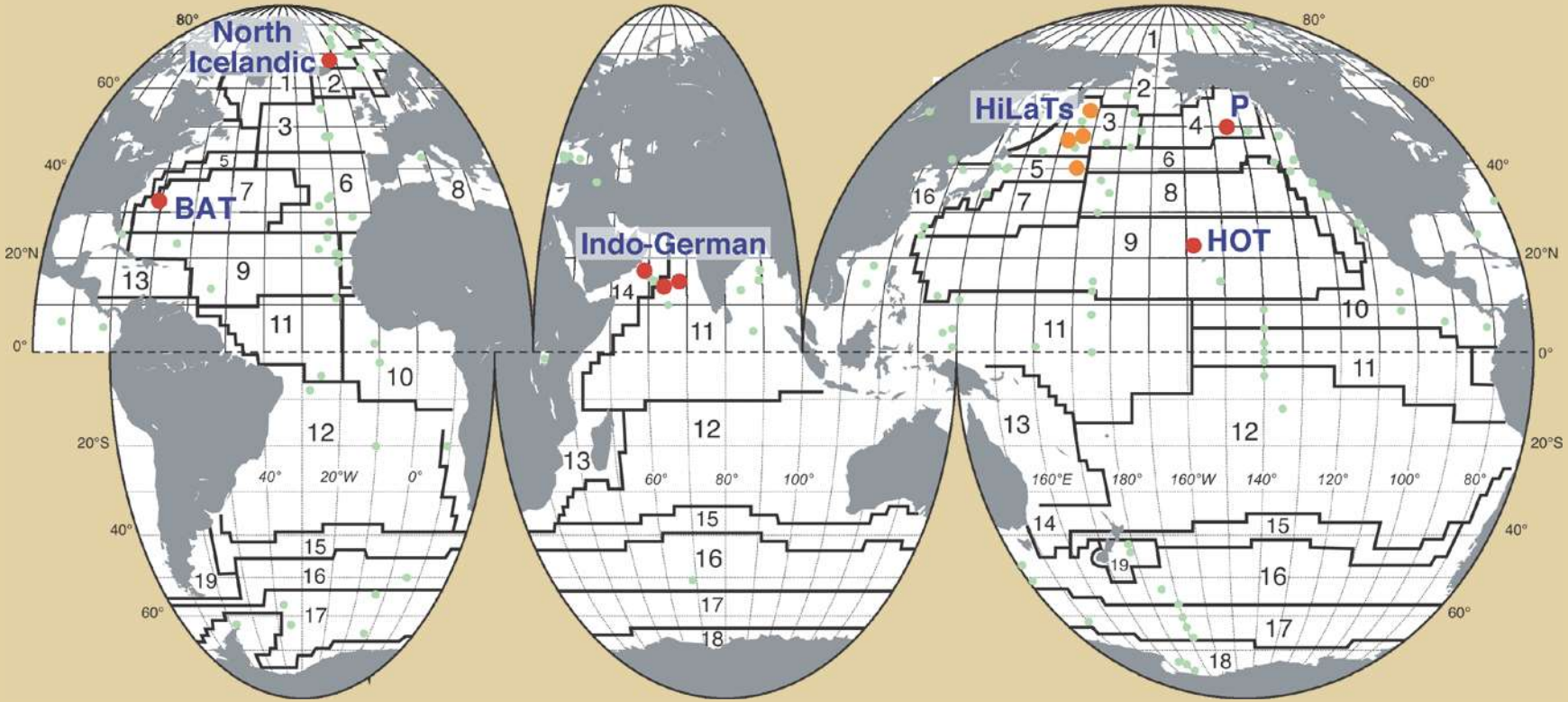
http://jpac.whoi.edu/hilats/

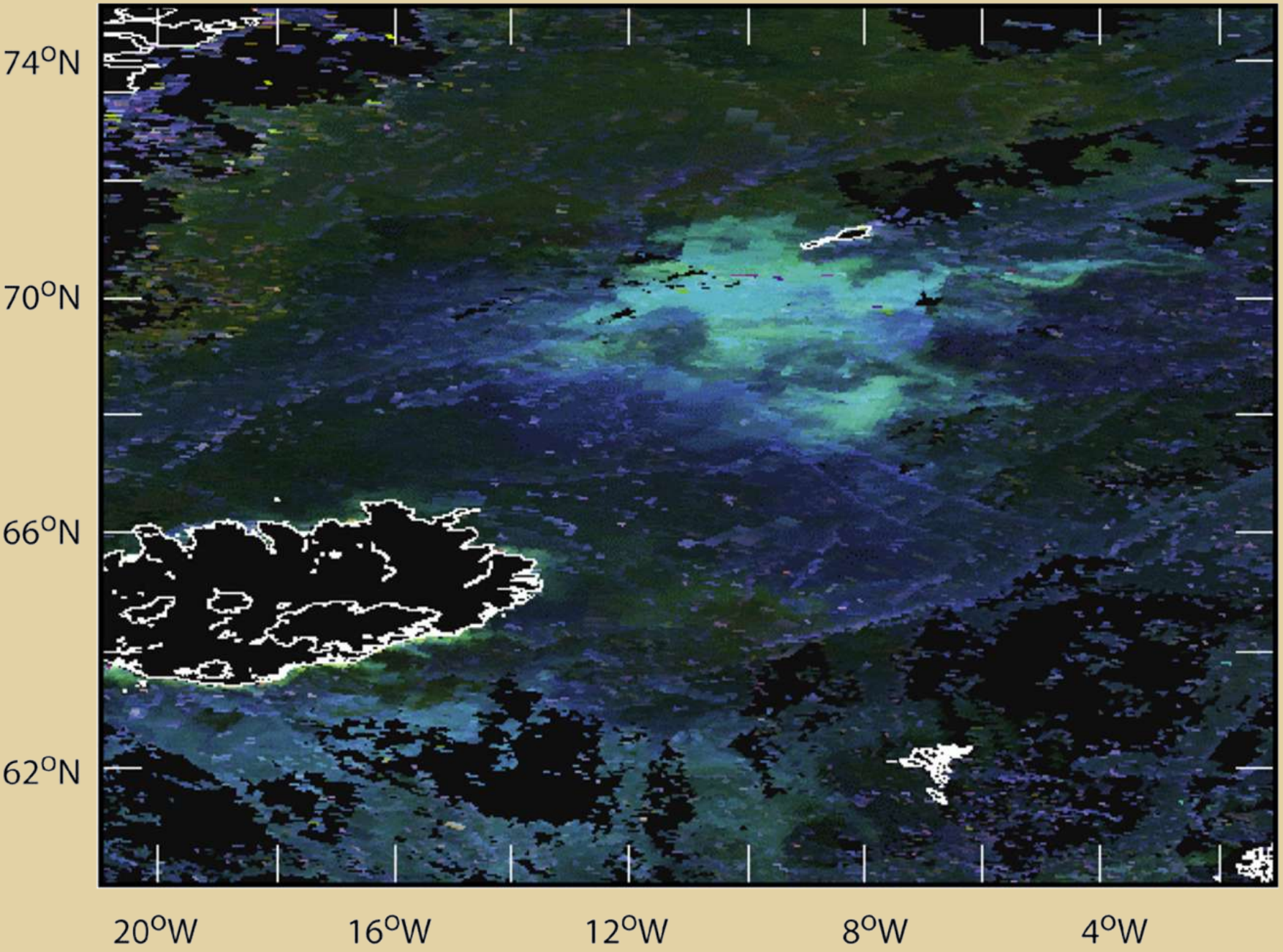

Why the Northwest Pacific?

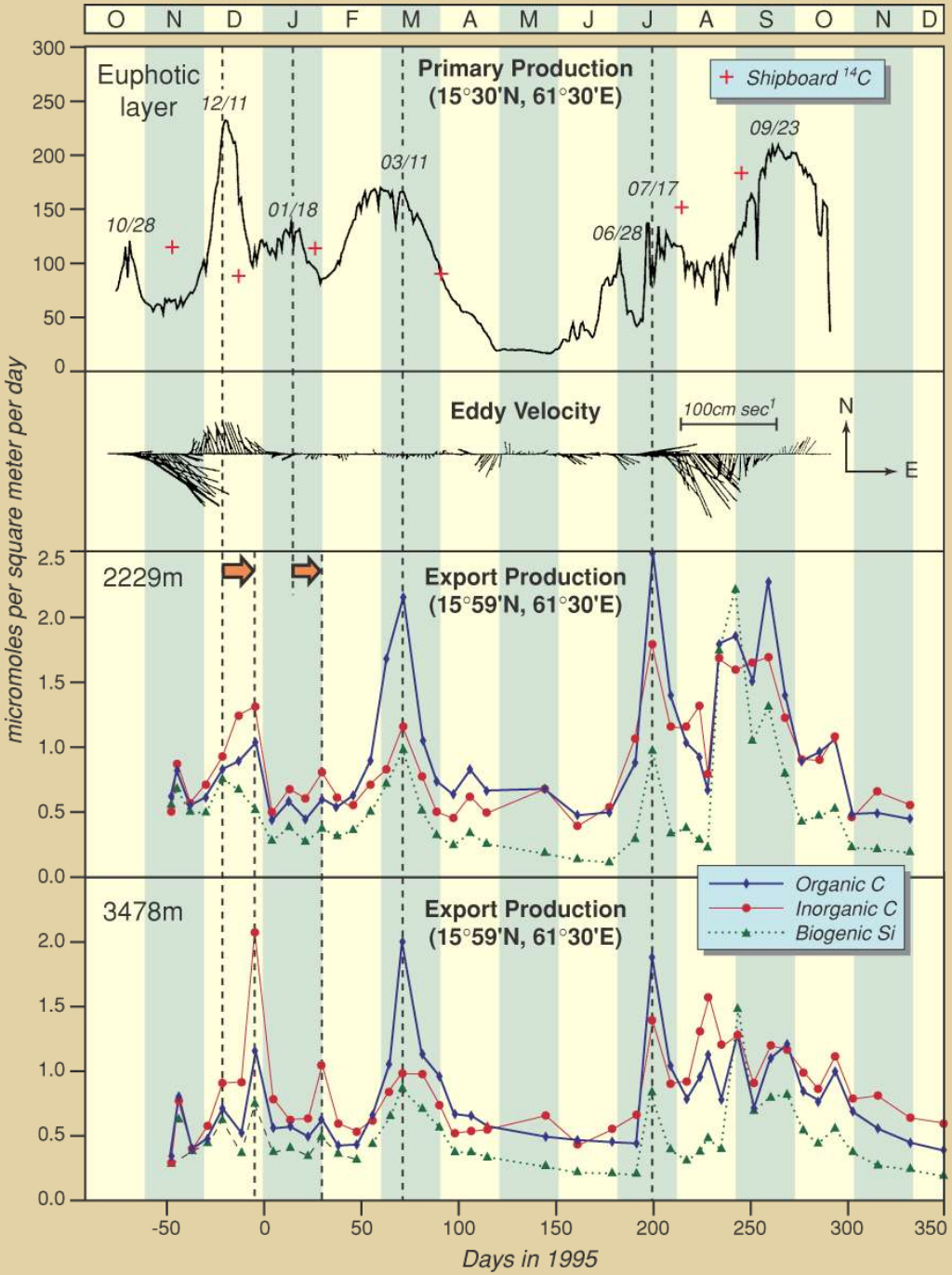
Sediment Trap Stations 1986-2002
Projected on the Oceanic Provinces; Longhurst, et al., 1994



Long-Term Time-Series Stations

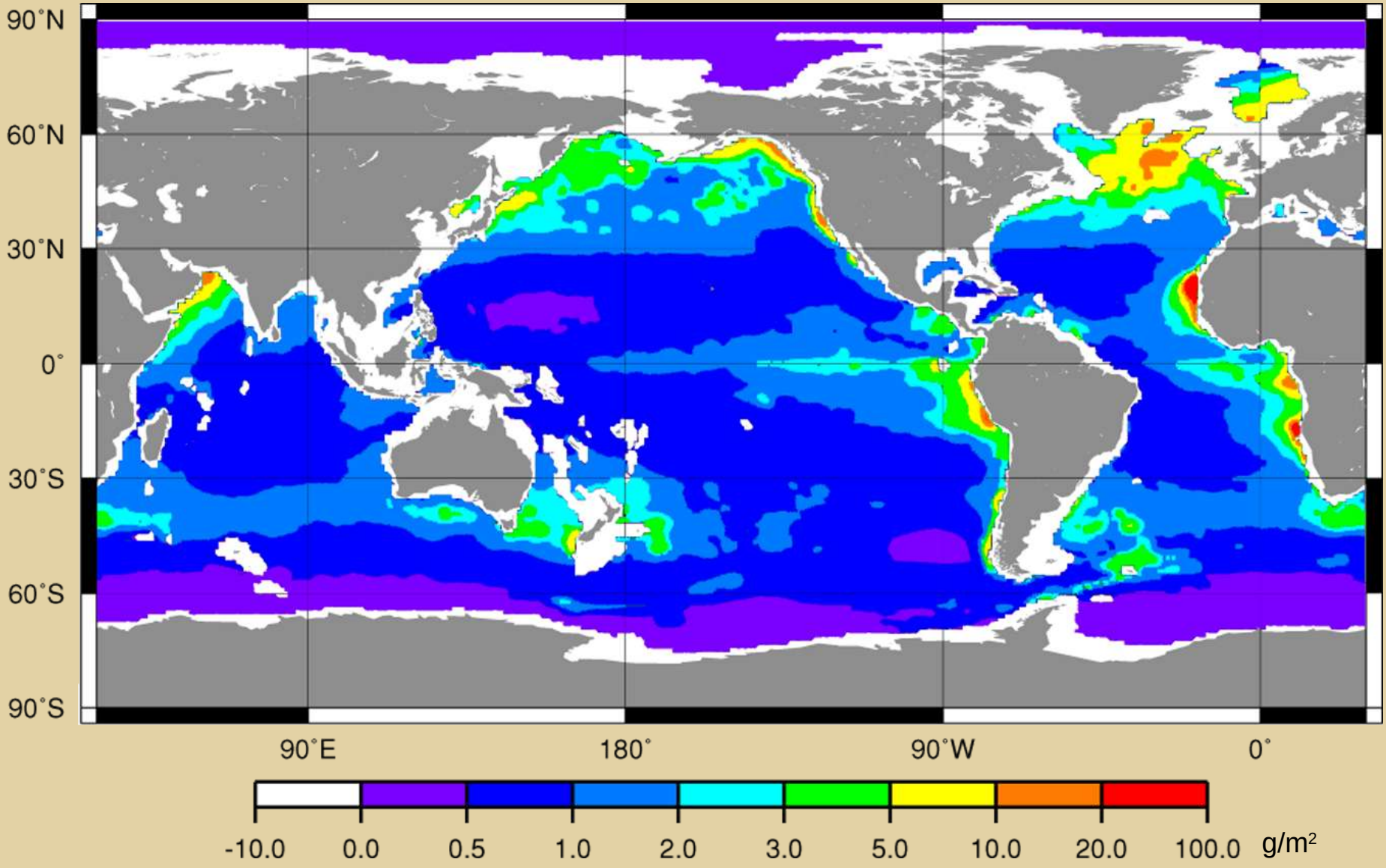



74°N
70°N
66°N
62°N
20°W
16°W
12°W
8°W
4°W

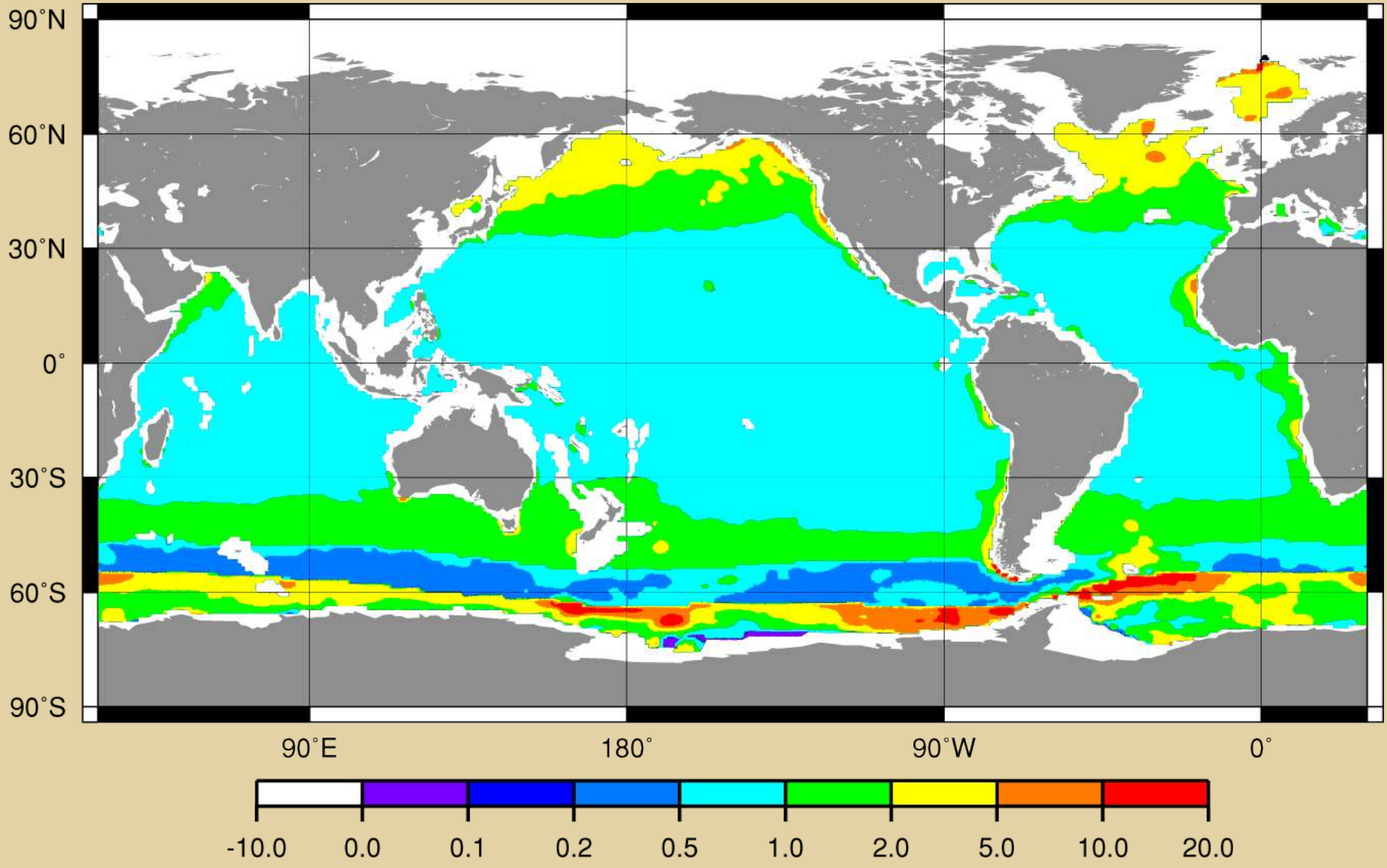


Honjo, Weller and Dickey, 1997

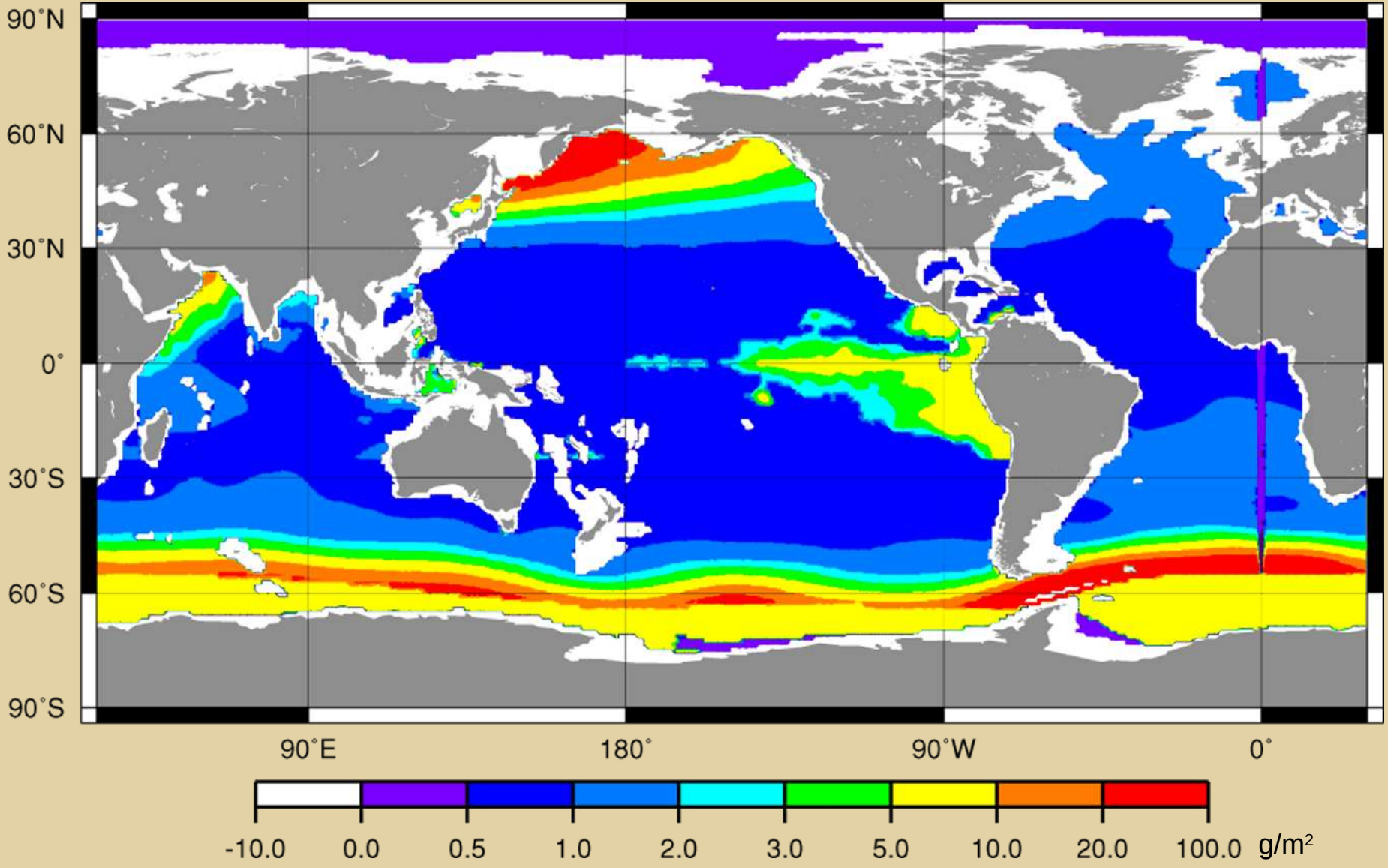
Mean Annual Organic Carbon Export Flux at 2000m



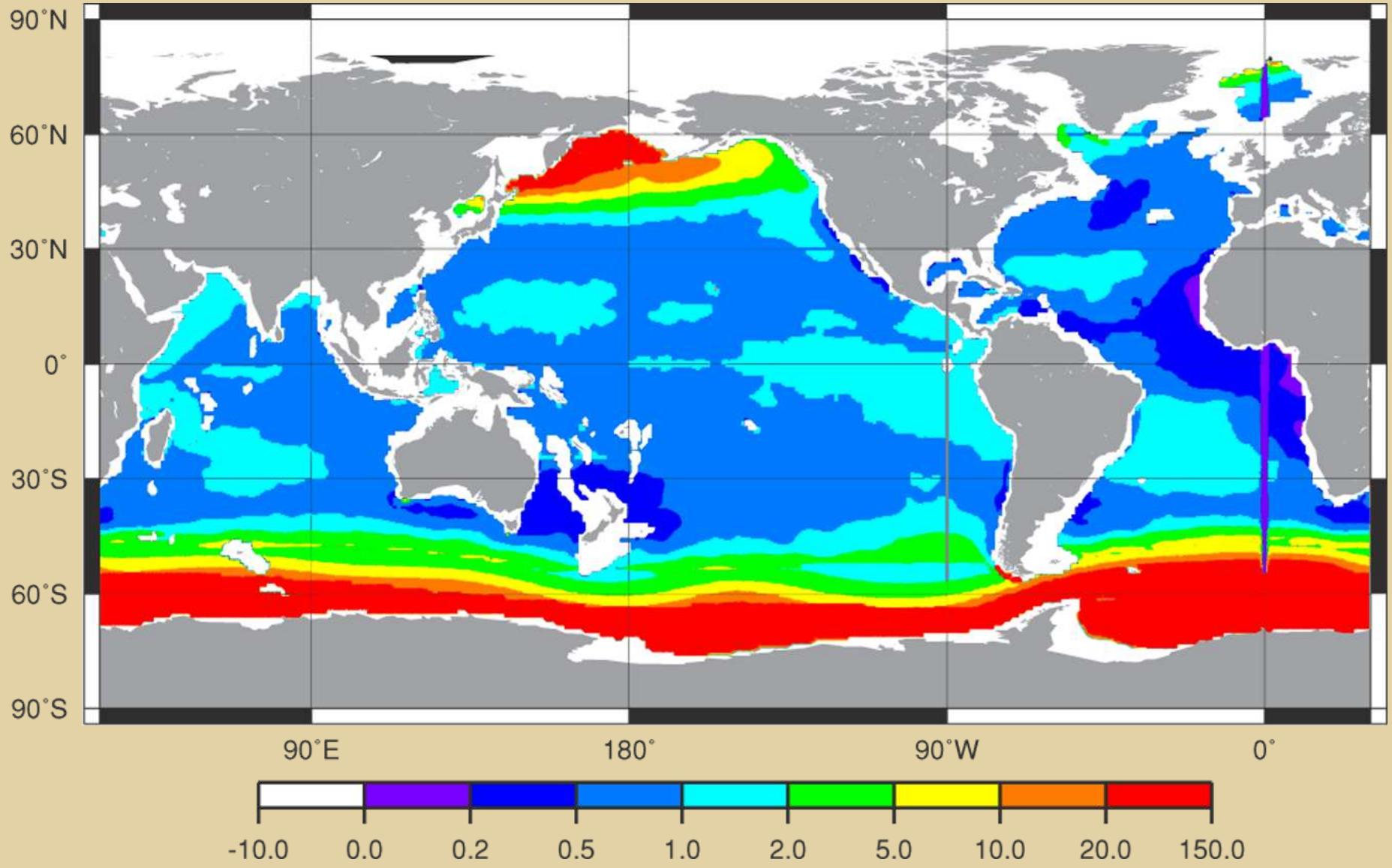
Organic/Inorganic Carbon Export Ratio



Mean Annual Silica Export Flux

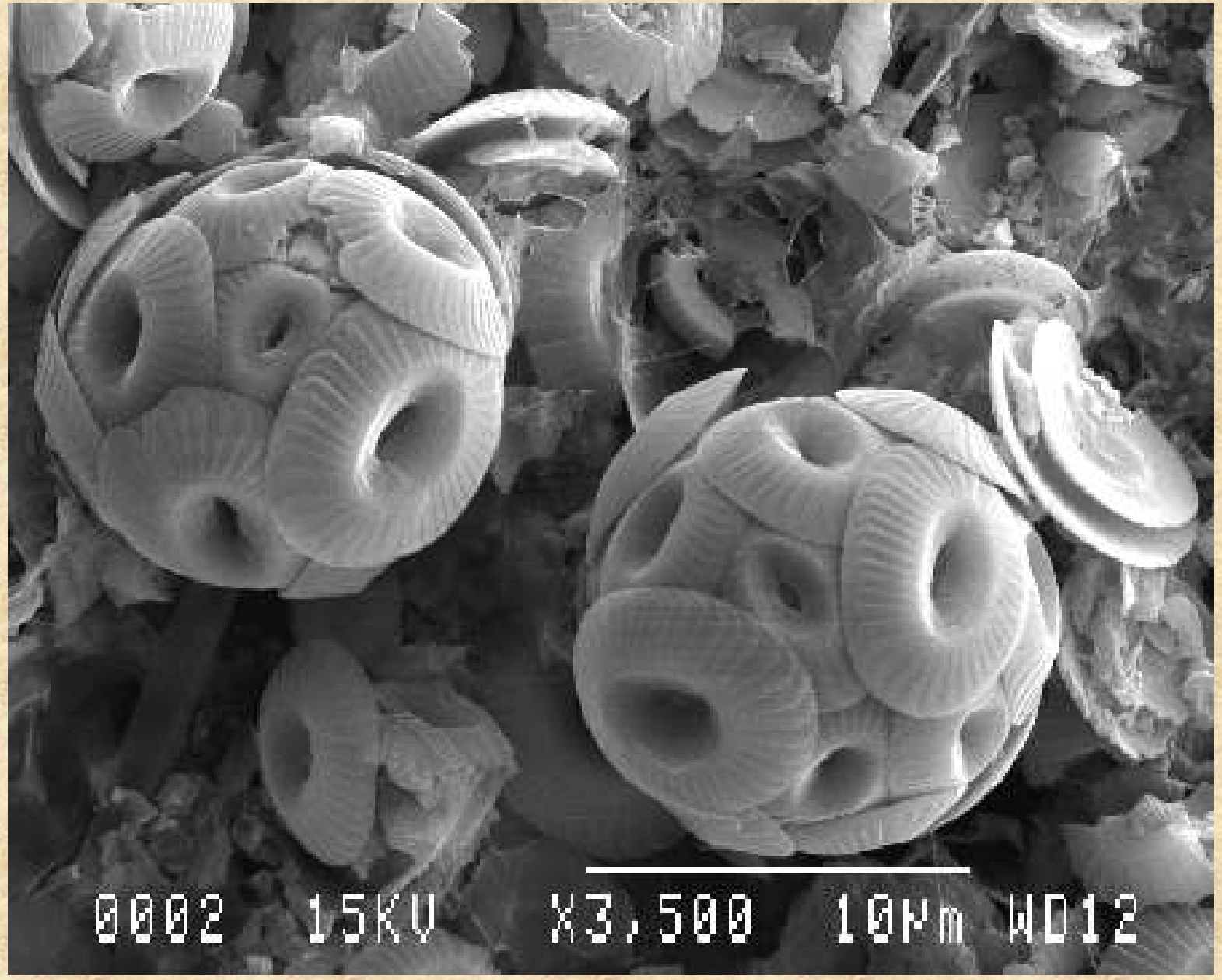


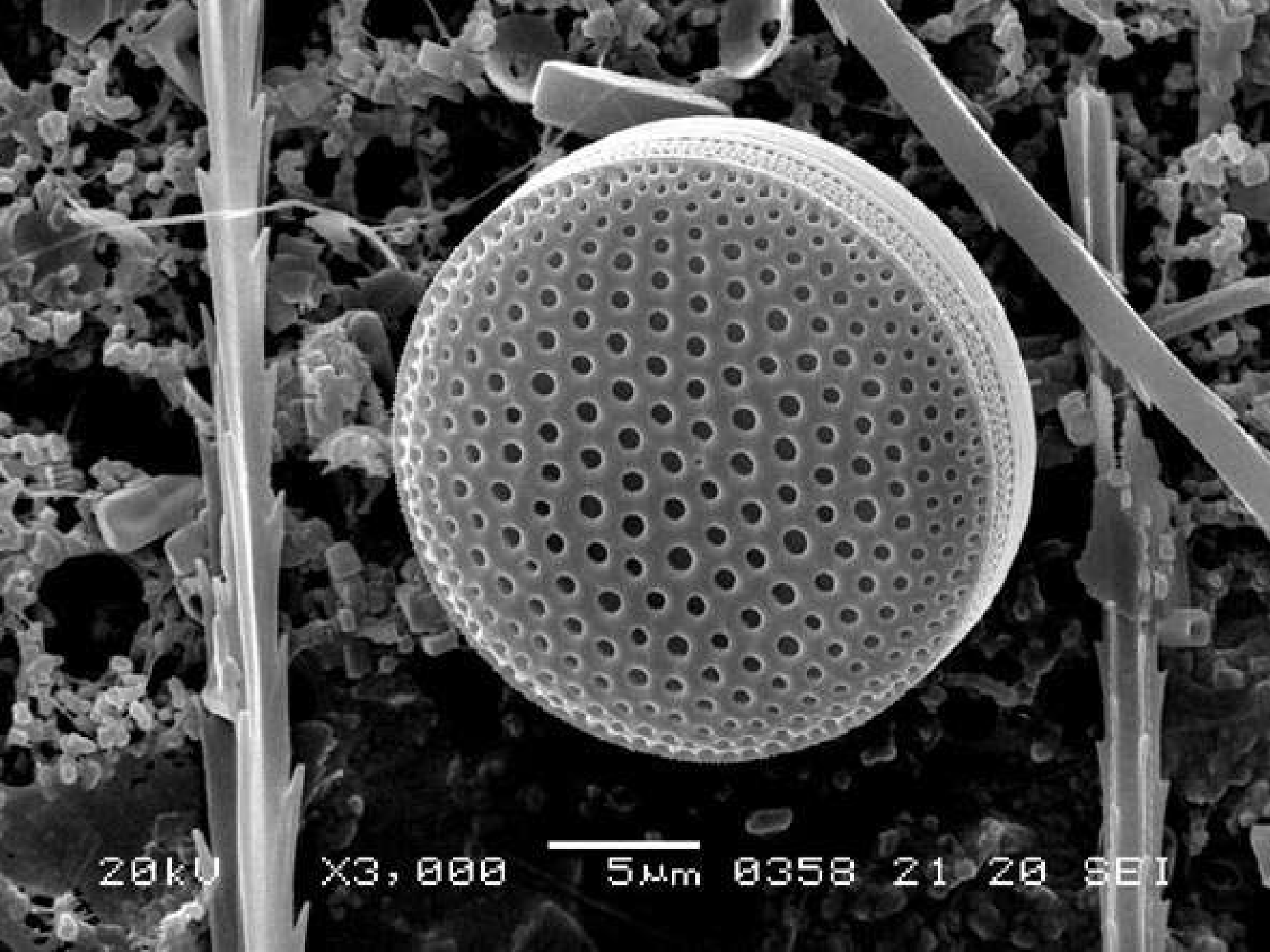
Mean Annual Export Silica/Inorganic Carbon Ratio



Biogenic Si vs. $CaCO_3$-C (Mole/Mole)

Movie removed for PDF conversion


0002 15KV X3,500 10μm WD12


20kV X3,000 5µm 0358 21 20 SEI

STATION

74 72 69 68 67 66 64 61 60 59 58 57 56 55 54 53 49 48 46 42 40 39 37 36 34 33 32 31 30 29 28 27 1 2 3 4 5 8 11 14 15 16 17

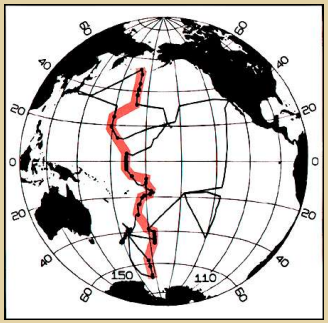
0 200 400 600 800 1000

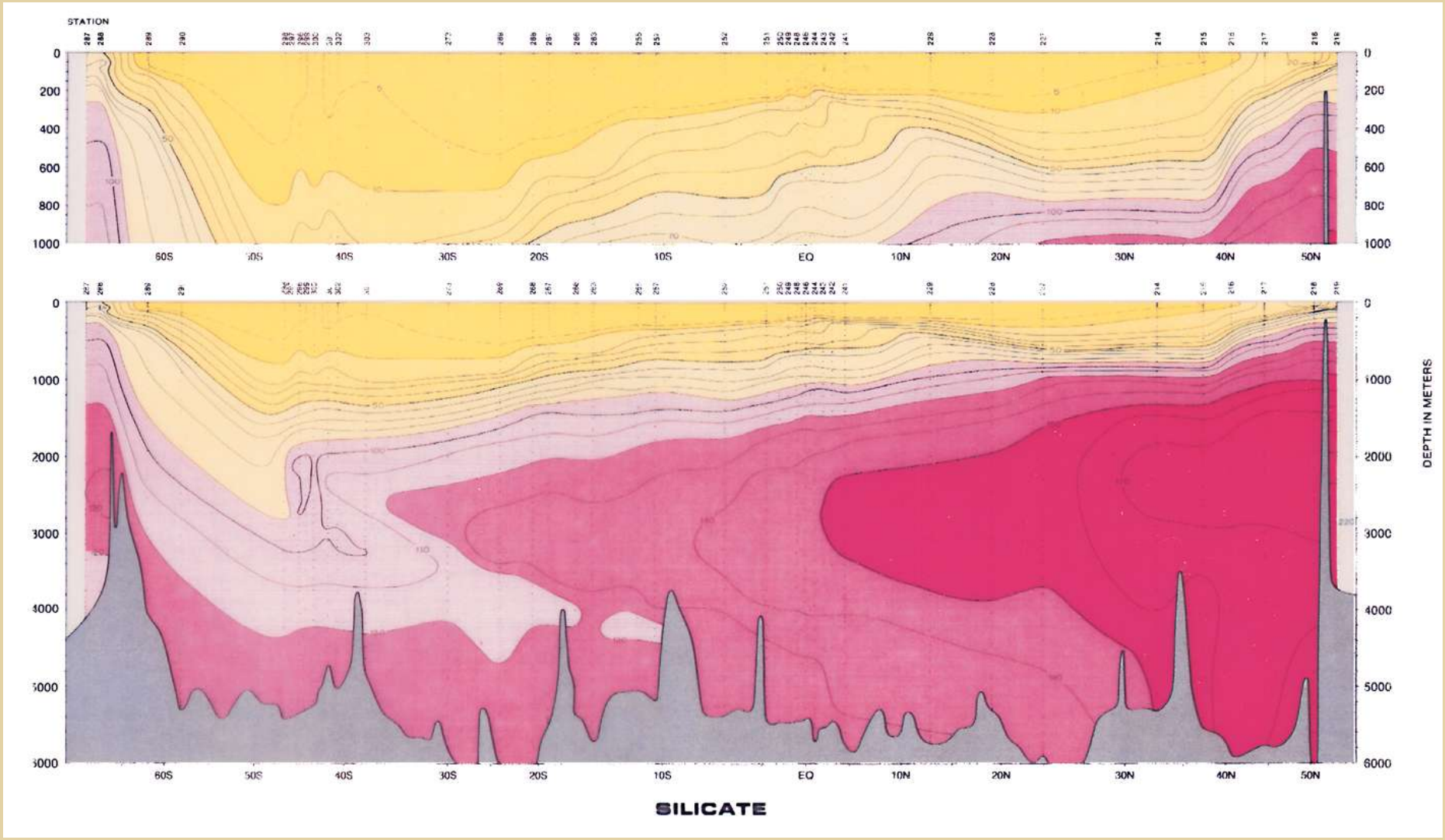
50S 40S 30S 20S 10S EQ 10N 20N 30N 40N 50N 60N 70N

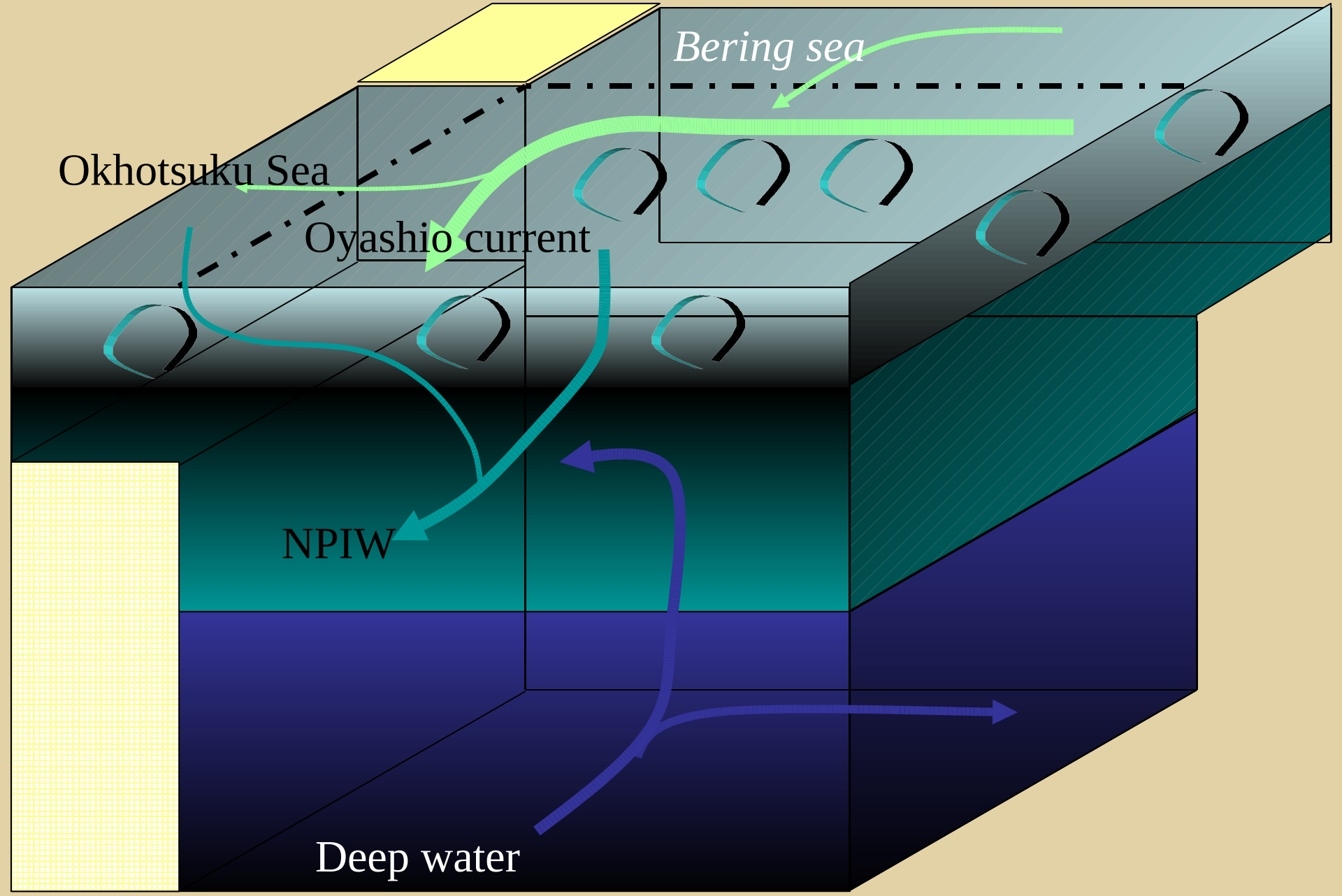
DEPTH IN METERS

0 1000 2000 3000 4000 5000 6000

SILICATE

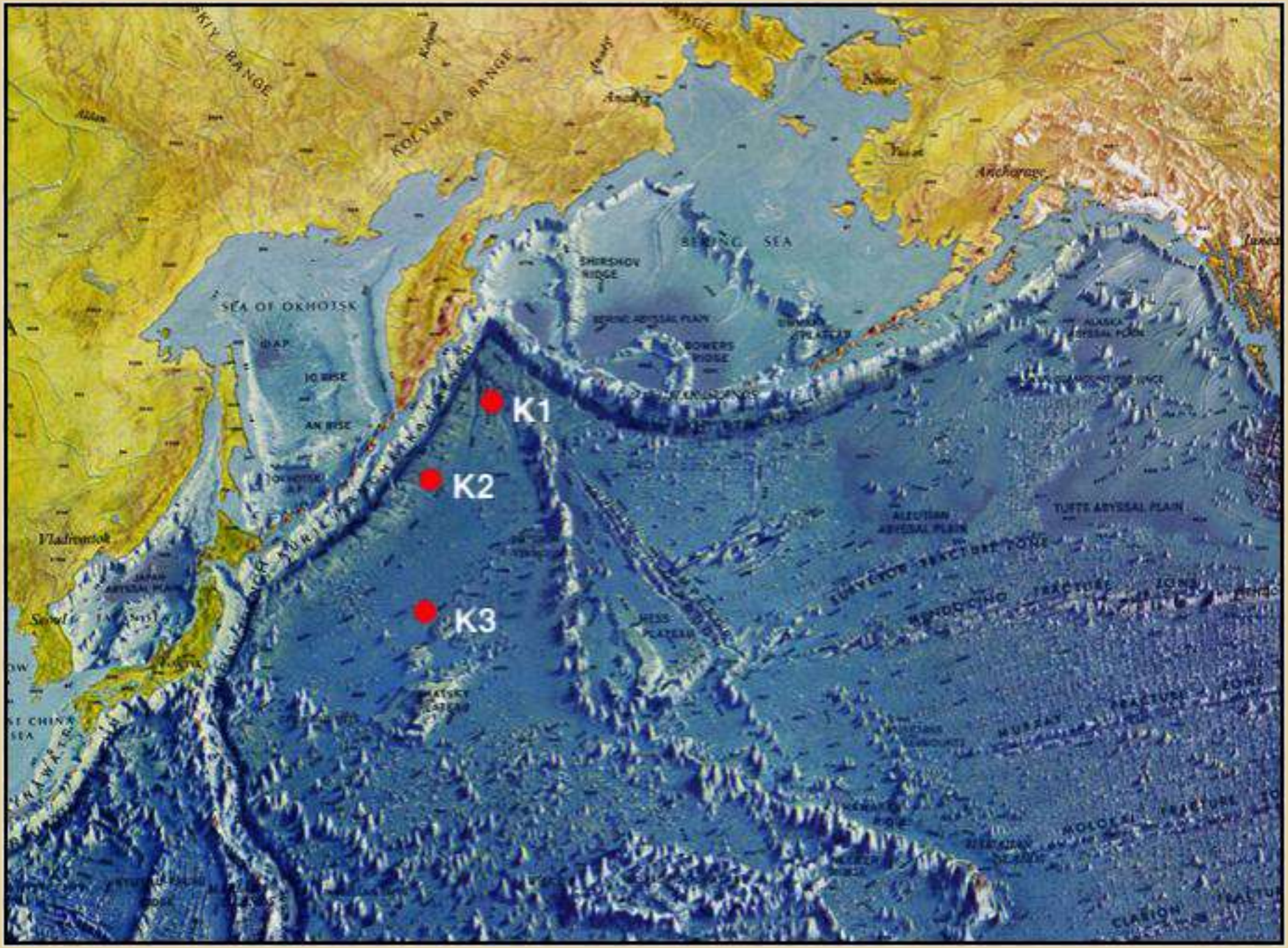

150
110


STATION
0
200
400
600
800
1000
60S
50S
40S
30S
20S
10S
EQ
10N
20N
30N
40N
50N
1000
2000
3000
4000
5000
6000
DEPTH IN METERS
SILICATE

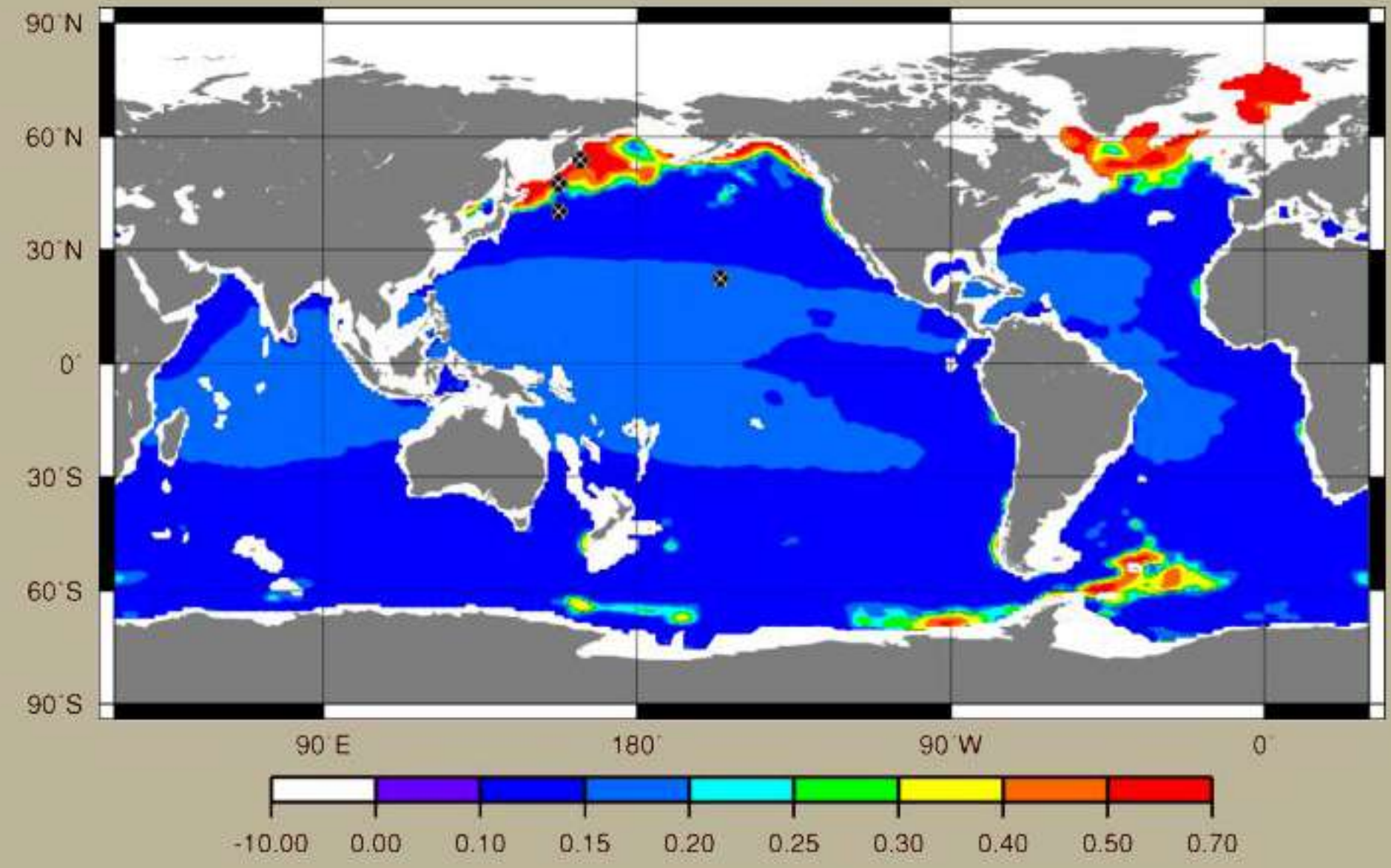

Bering sea
Okhotsuku Sea
Oyashio current
NPIW
Deep water

Movie removed for PDF conversion

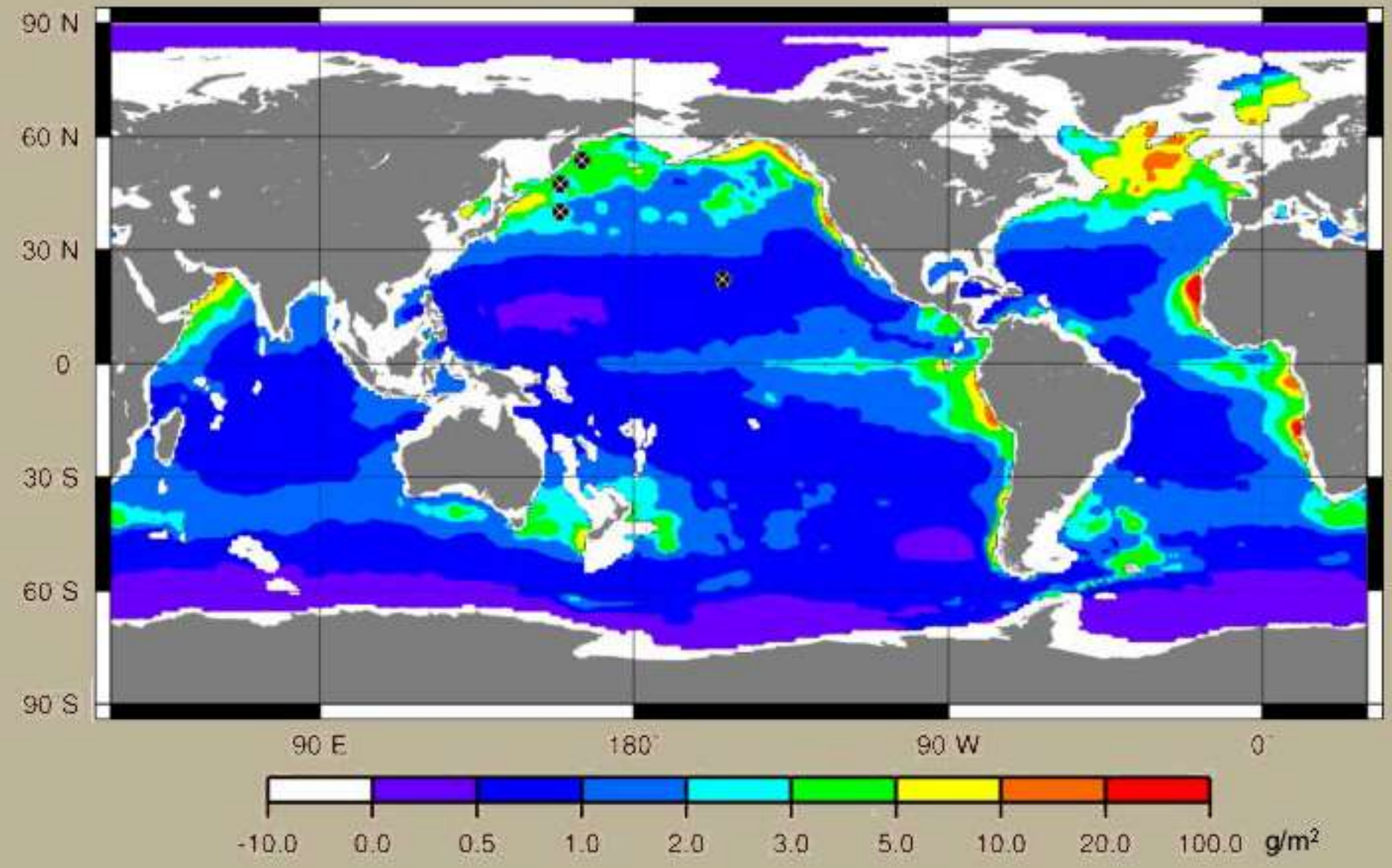
Strategy


K1
K2
K3
SEA OF OKHOTSK
BERING SEA
KOLYMA RANGE
Vladivostok
Anchorage

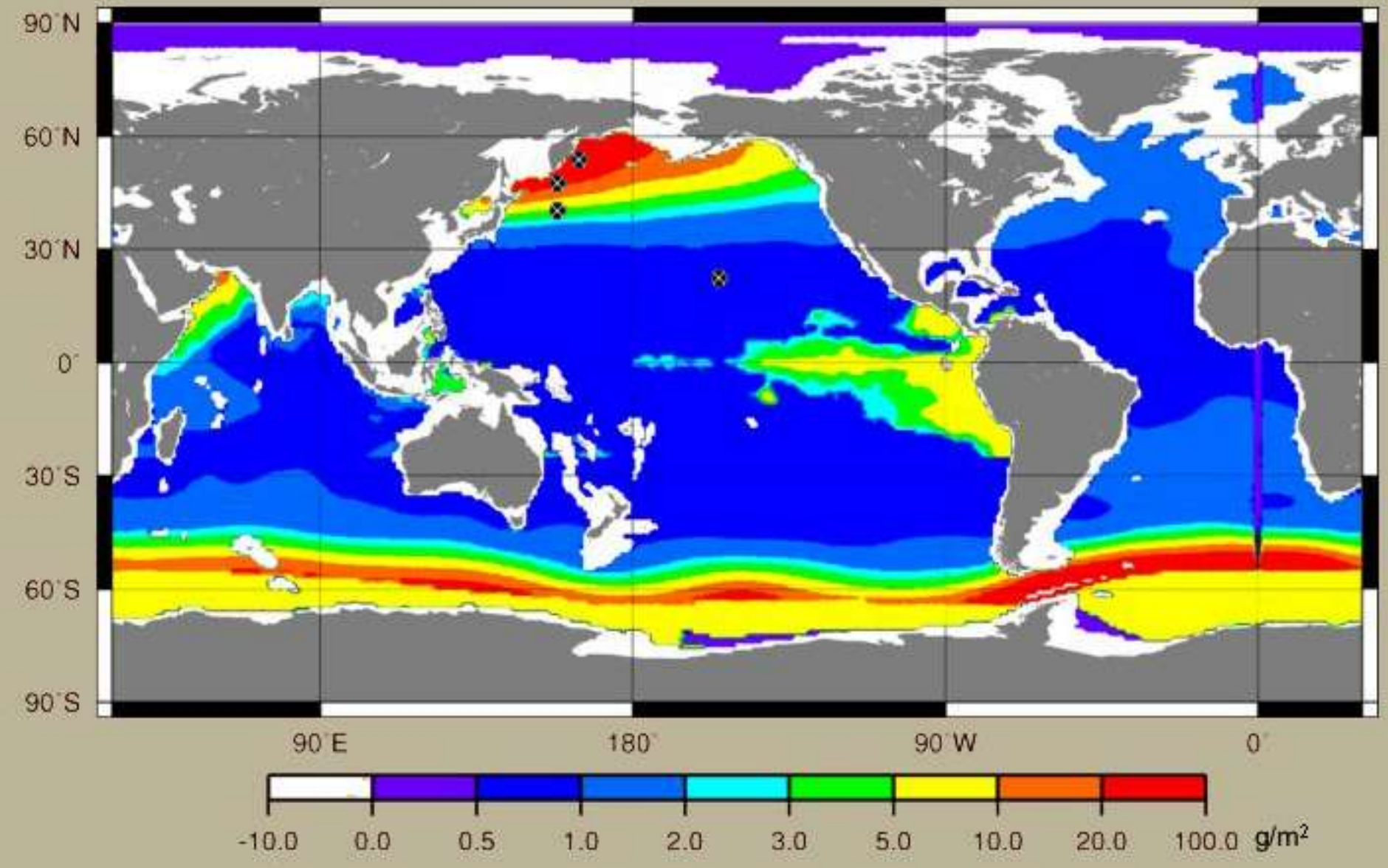
f-ratio (EP/PP)


90°N
60°N
30°N
0°
30°S
60°S
90°S
90° E
180°
90° W
0°
-10.00
0.00
0.10
0.15
0.20
0.25
0.30
0.40
0.50
0.70

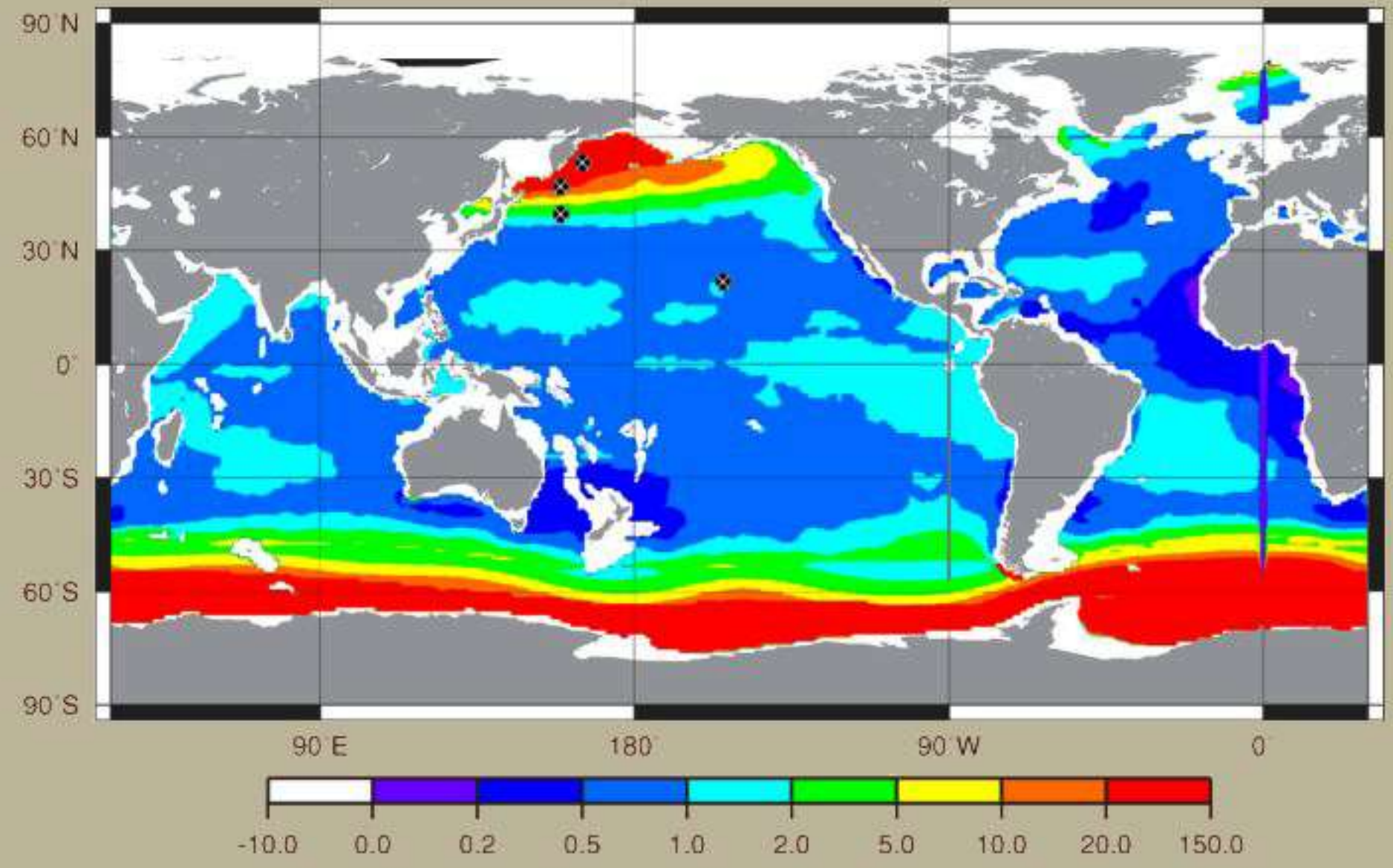
Mean Annual Organic Carbon Export Flux at 2000m

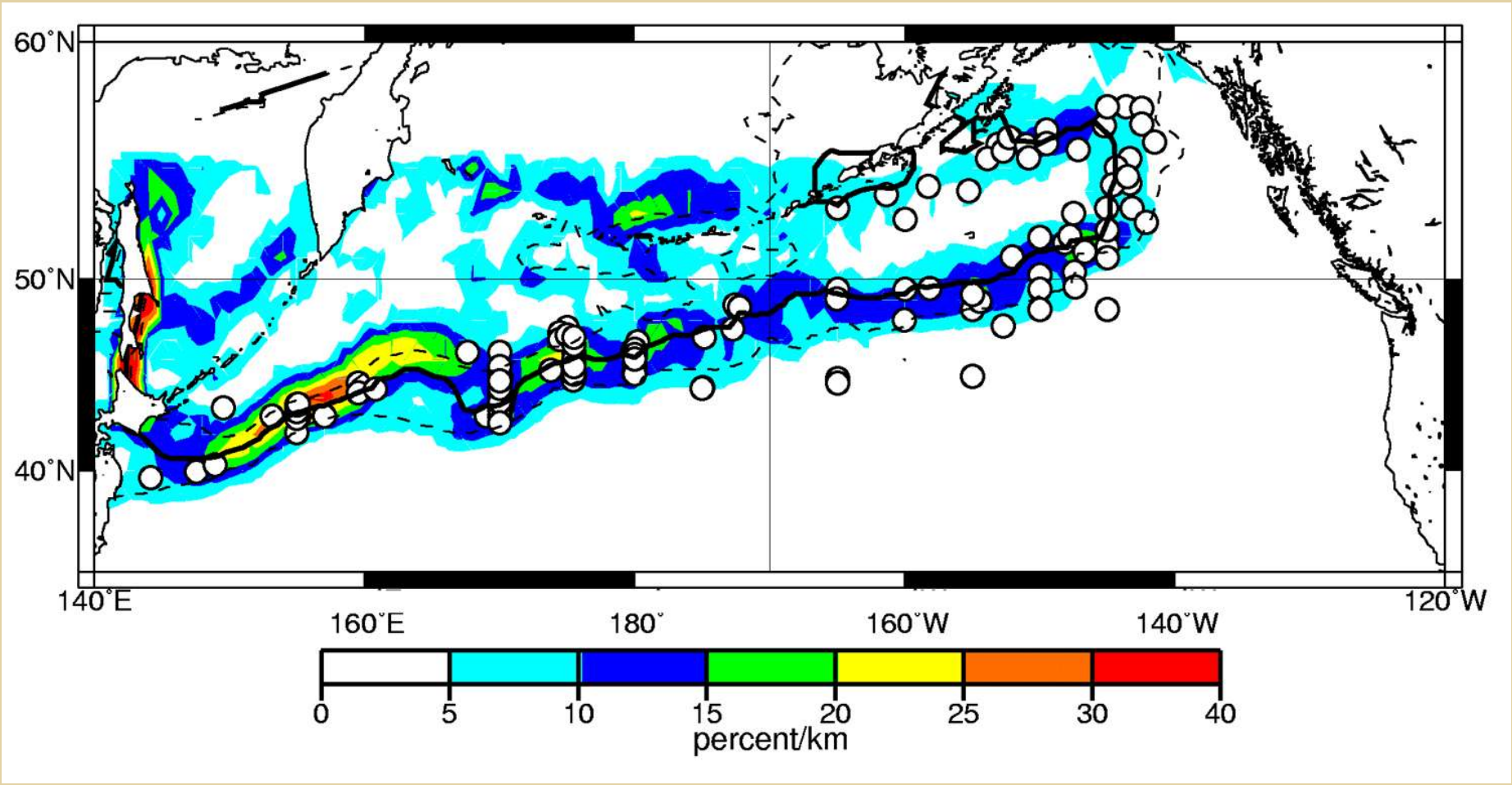


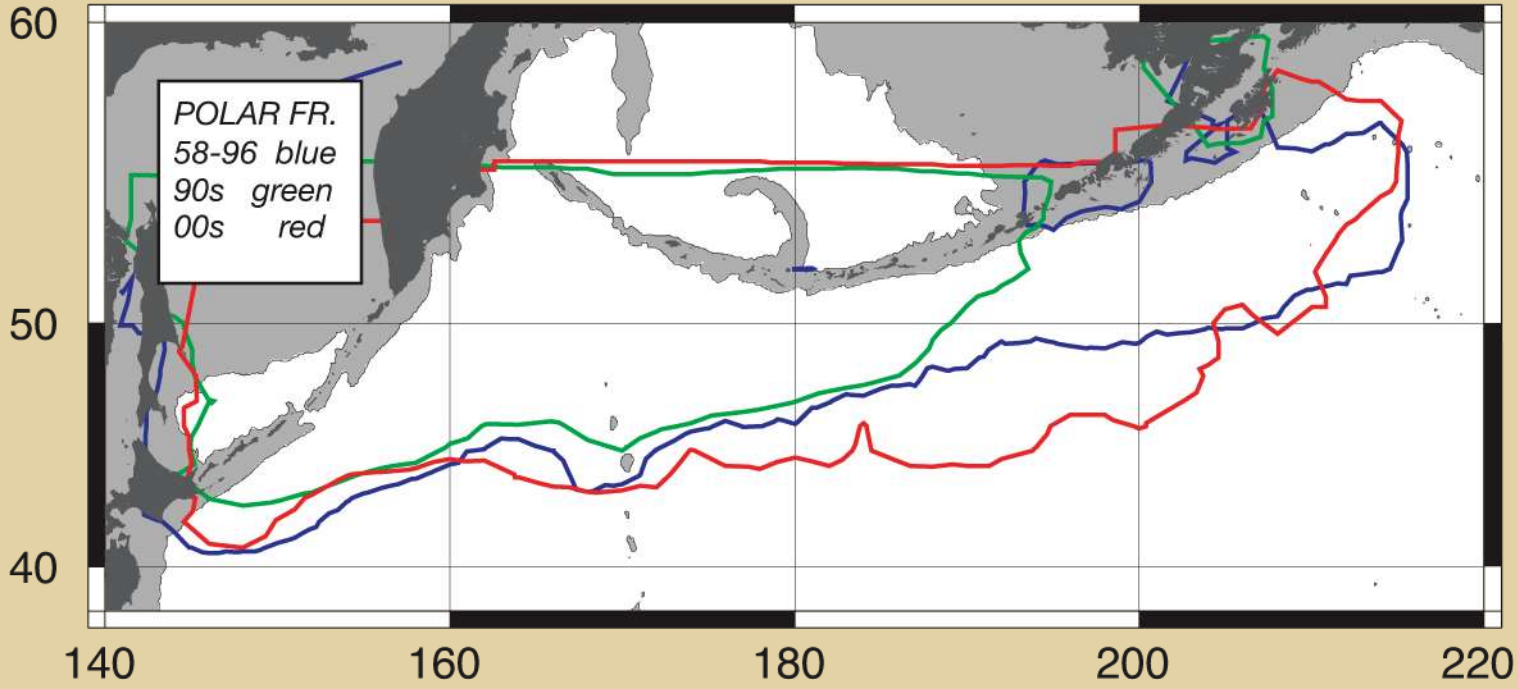
Mean Annual Silica Export Flux



Mean Annual Export Silica/Inorganic Carbon Ratio




60˚N
50˚N
40˚N
140˚E
160˚E
180˚
160˚W
140˚W
120˚W
0
5
10
15
20
25
30
40
percent/km


POLAR FR.
58-96 blue
90s green
00s red
60
50
40
140
160
180
200
220

MIO's **HiLaTS Observatory** Project

- ***The Questions:***

Who drives the NW Pacific Biological Pump and How?
Why Biogeochemical Providences?

- ***The Objective:***

To Model the process, the rate and quantity of the NW Pacific Biological Pump based upon the time-series observation.

HIGH LATITUDE TIME SERIES OBSERVATORY
IN THE NORTHWEST PACIFIC
MUTSU INSTITUTE FOR OCEANOGRAPHY, JAPAN MARINE SCIENCE AND TECHNOLOGY CENTER

The Challenge

- The Challenge: Why Now?
- Time Series Research
- The Biological Pump
- Investigation
- Why the Pacific Subarctic Zone?
- Immediate Questions

JAMSTEC Home
JPAC Home
Contact Information

Credits and Acknowledgements

SEARCH GO

The Challenge: Why Now?

Oceanic processes occurring at high latitudes are increasingly recognized as crucial for regulating the global carbon cycle and climate. With increasing societal concerns about greenhouse warming and possible climate change, there is an urgent need to rigorously study these processes, but relative inaccessibility and frequent adverse weather conditions render high latitude oceanography particularly challenging. The Mutsu Institute for Oceanography (MIO) is poised to meet this challenge and has initiated a multidisciplinary program to investigate the unique biogeochemical and physical characteristics of the Northwestern Pacific Ocean. The program relies primarily on regular research cruises with the R/V *Mirai* and the deployment of an array of advanced instrumental moorings equipped with newly-developed, long term, water column time-series sampling and measuring instruments that will continuously monitor the temporal variability of key biogeochemical and physical parameters.

A better understanding of the interaction between ocean physics and biogeochemistry at high latitudes is essential for improving our ability to predict and mitigate man-induced changes in the earth's climate. We urge international scientists interested in furthering the understanding of the biogeochemical cycles in the Northwest Pacific to join MIO in this endeavor. MIO scientists welcome additional scientific collaborations, which will enhance their long-term time-series program and will provide unprecedented insights into the role that this strategically difficult oceanic region plays in controlling atmospheric CO2.

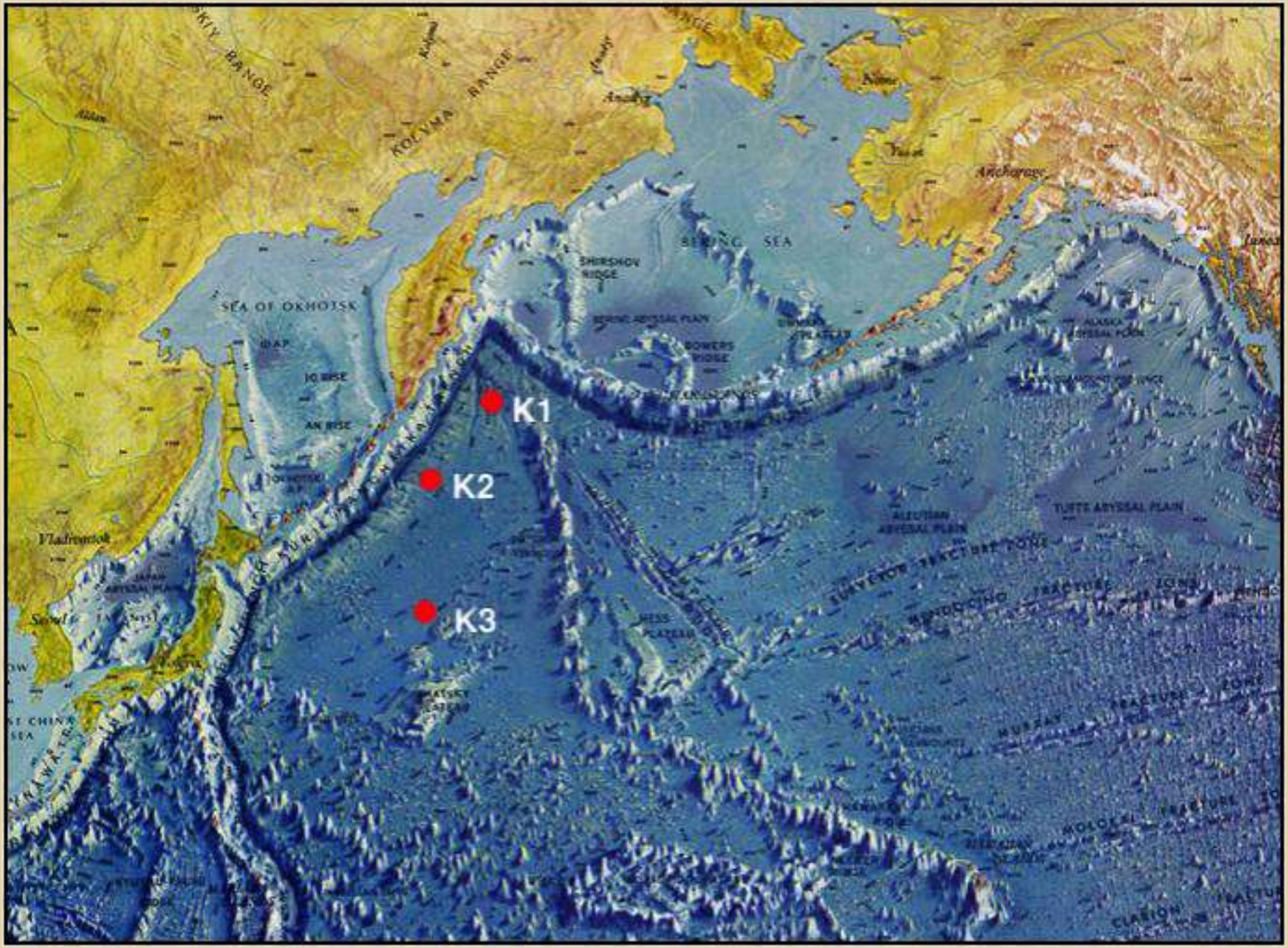
The Mutsu Institute for Oceanography joins the leaders of the world's premiere oceanographic institutions in their commitment to furthering the knowledge, understanding and collaboration that is needed to predict environmental changes. (See the Yokosuka Agreement signed at the 30th anniversary Round Table Discussion of the Japan Marine Science and Technology Center.) MIO expects to expand our current collaborations with scientists and technicians from the Woods Hole Oceanographic Institution through the Joint North Pacific Research Center (J-Pac) to other international scientists interested in our mission.

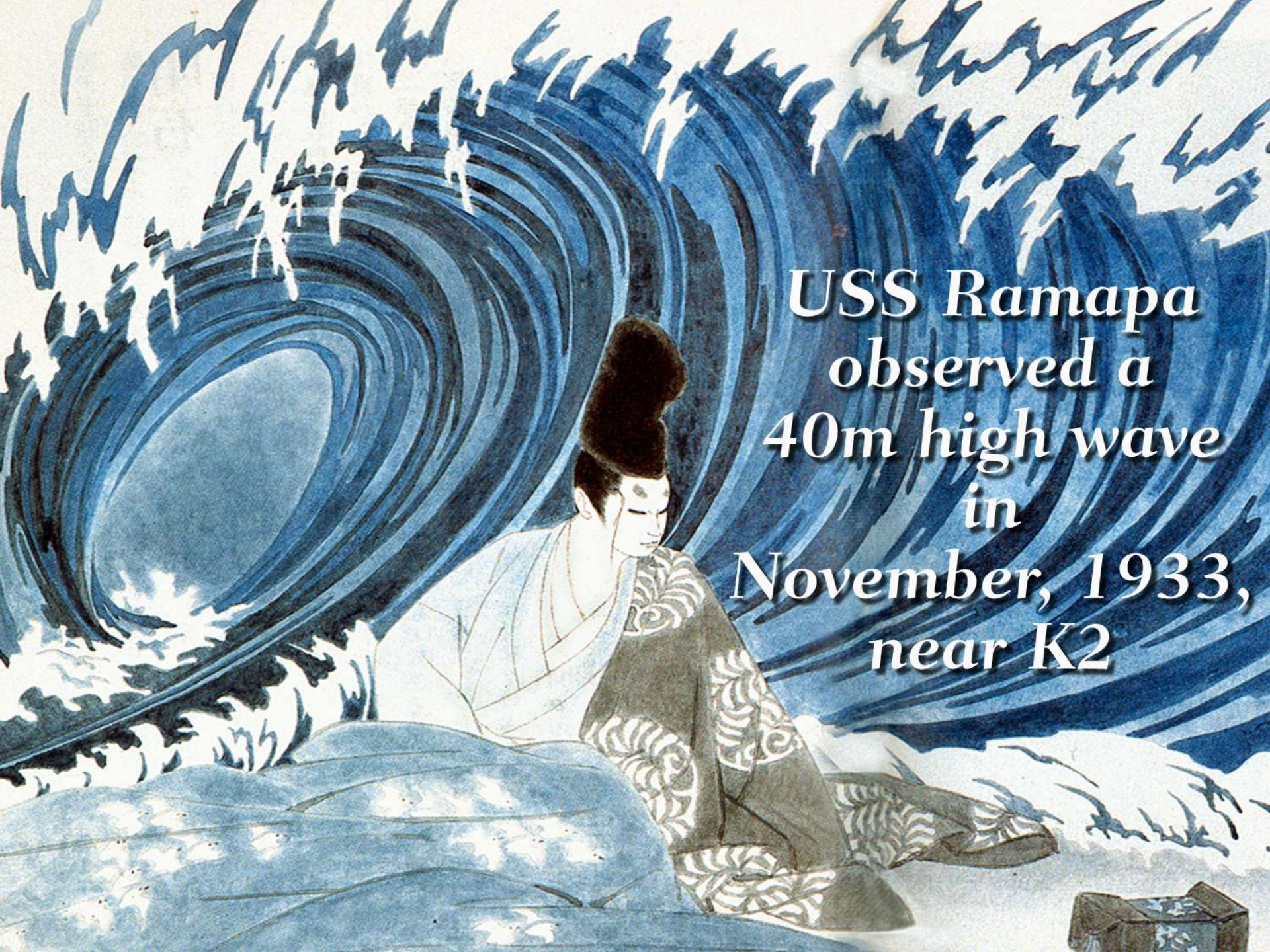
Click here for PROPOSAL

WHAT'S NEW?
2002 R/V Mirai North West Pacific Cruise Summary

http://jpac.whoi.edu/hilats/


The Challenge


K1
K2
K3
SEA OF OKHOTSK
BERING SEA
KOLYMA RANGE
Vladivostok
Anchorage


USS Ramapa
observed a
40m high wave
in
November, 1933,
near K2


海洋
SEP 15 2001

R/V Mirai

R/V Thompson

R/V Knorr

R/V Revelle

R/V Atlantis

R/V Melville

R/V Ewing

SEP 8 2001

R/V Natsushima
JAMSTEC

1,550 tons


Autonomous Instruments and
Advanced Platform Array

Sensors/Samplers onboard MIO arrays

Sep. 2001-Oct. 2002

Instrument	Nick Name	Ref.	Depth	Objective	Intervals	Resolution
Moored Ocean Profiler	MMP	J. Toole	32-4950m	CTD, 3D current	continuous	3 days
Auto. C-14 Incubator	SID	C. Taylor	35m	Primary Production	48 times	3 to 30 dys.
Bio-Optical Package	BLOOMS	T. Dickey	35m	Ocean Optics	conti.	1 hour
TS-Phytoplankton Collector	WTS	S. Honjo	36m	P-plankton Comm.	25 times	3 to 60 dys.
TS-Water Sampler	RAS	S. Honjo	37m	Nutrients	48 times	3 to 30 dys.
TS-Zooplankton Collector	ZPS	K. Doherty	39m	Meso Z-plankton	50 times	6 to 12 dys.
TS-Sediment Traps	TTST	S. Honjo	1km, 2km 0.4km AB	Export Flux	13 times	Monthly
Large Volume Pump	LVP	J. Bishop	16 depths	Parti. Th, Pa, Ra	Shipboard	Yearly

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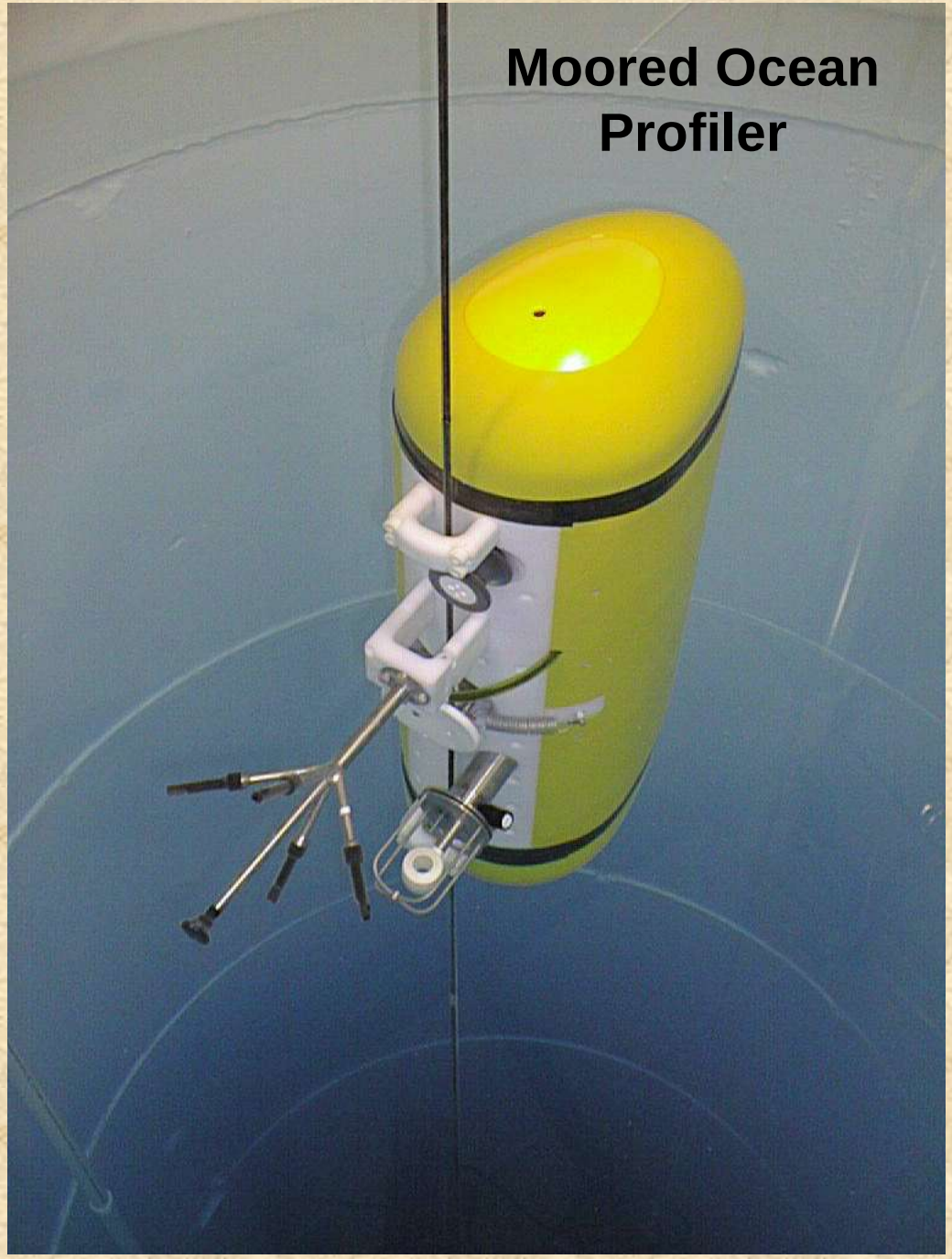
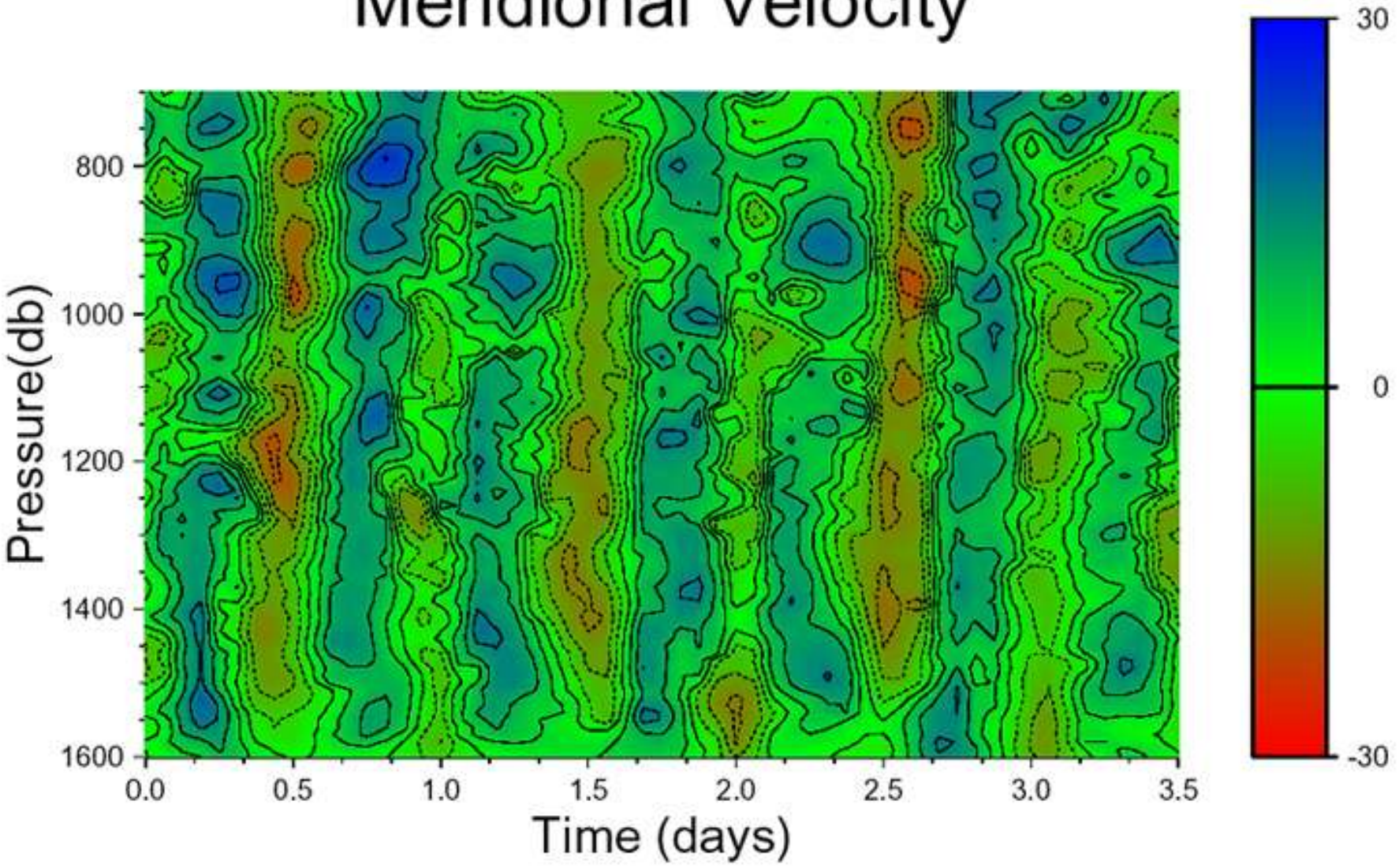
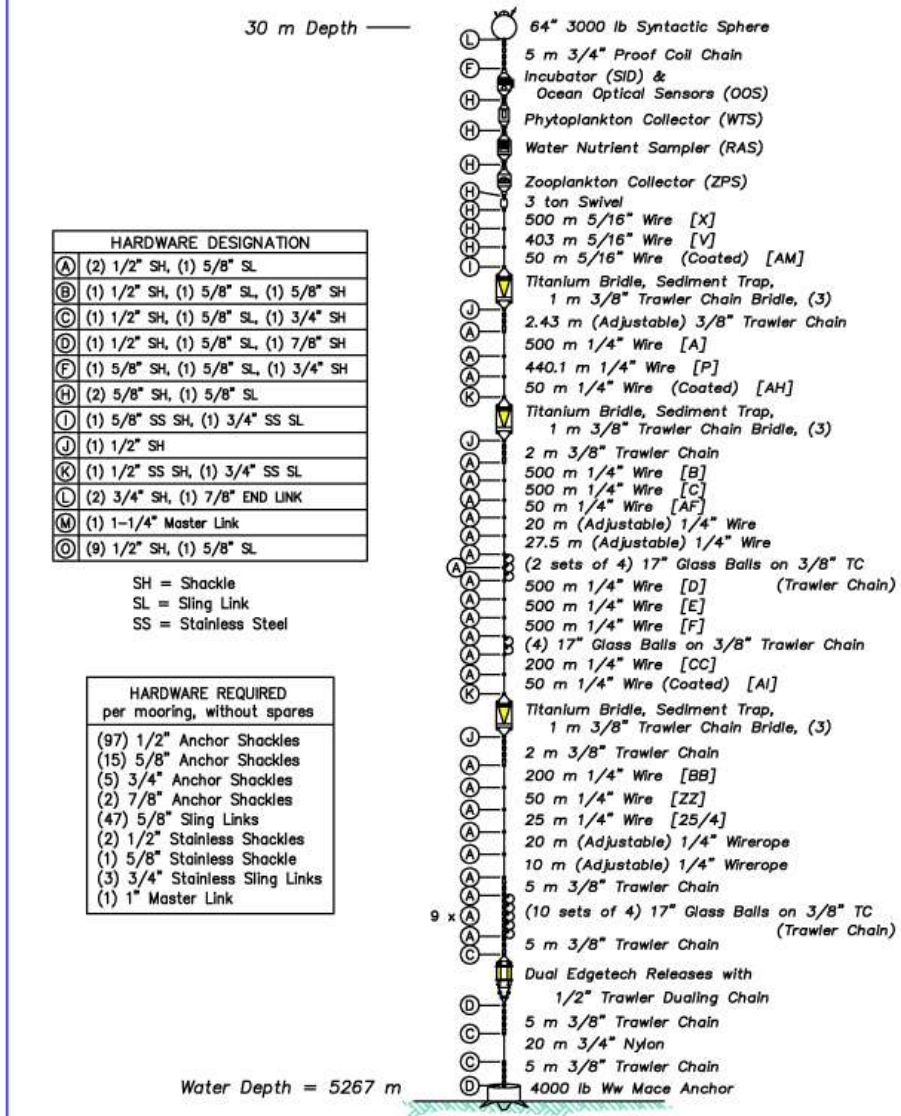

Moored Ocean
Profiler

Meridional Velocity





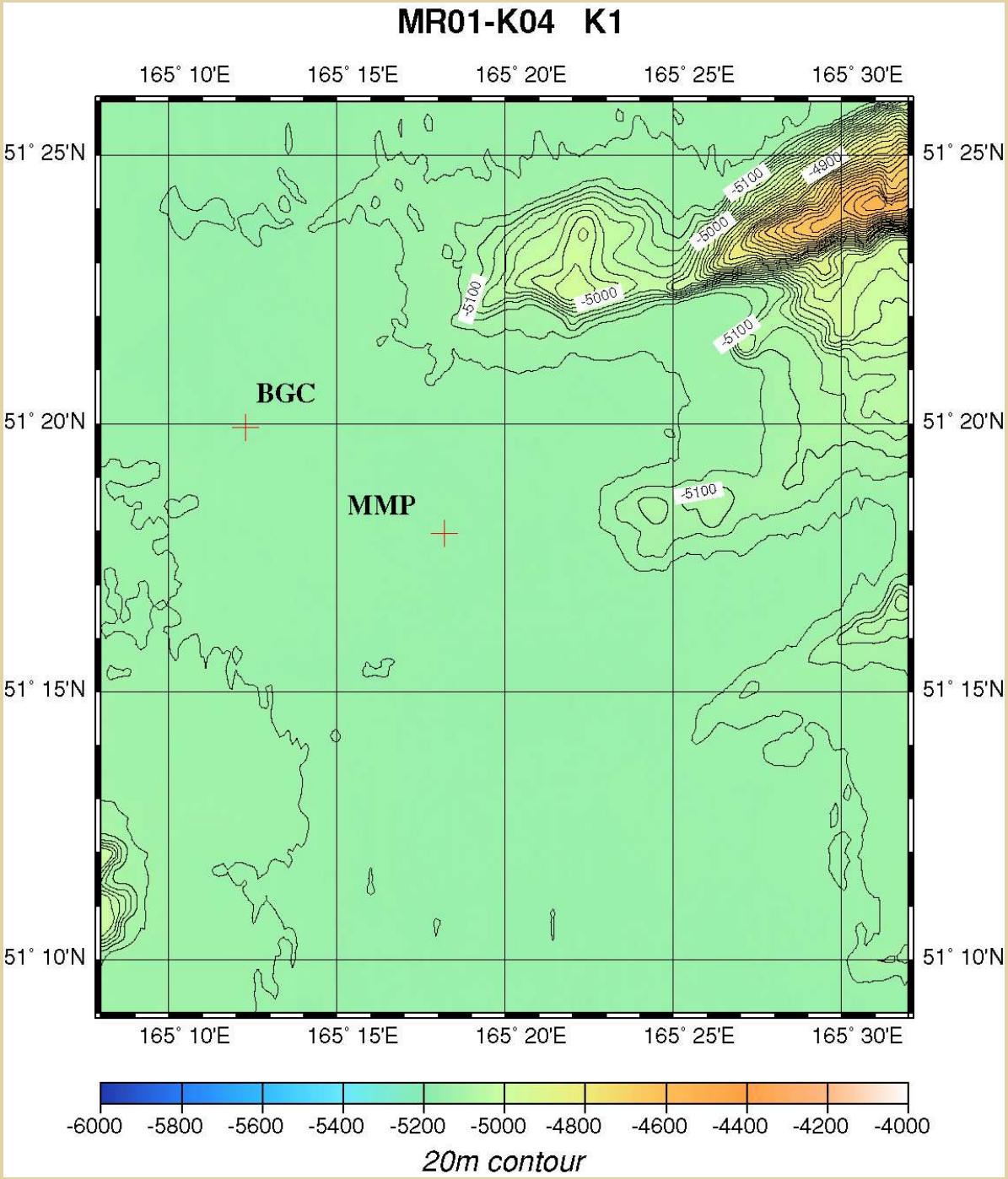
HARDWARE DESIGNATION	
A	(2) 1/2" SH, (1) 5/8" SL
B	(1) 1/2" SH, (1) 5/8" SL, (1) 5/8" SH
C	(1) 1/2" SH, (1) 5/8" SL, (1) 3/4" SH
D	(1) 1/2" SH, (1) 5/8" SL, (1) 7/8" SH
F	(1) 5/8" SH, (1) 5/8" SL, (1) 3/4" SH
H	(2) 5/8" SH, (1) 5/8" SL
I	(1) 5/8" SS SH, (1) 3/4" SS SL
J	(1) 1/2" SH
K	(1) 1/2" SS SH, (1) 3/4" SS SL
L	(2) 3/4" SH, (1) 7/8" END LINK
M	(1) 1-1/4" Master Link
O	(9) 1/2" SH, (1) 5/8" SL

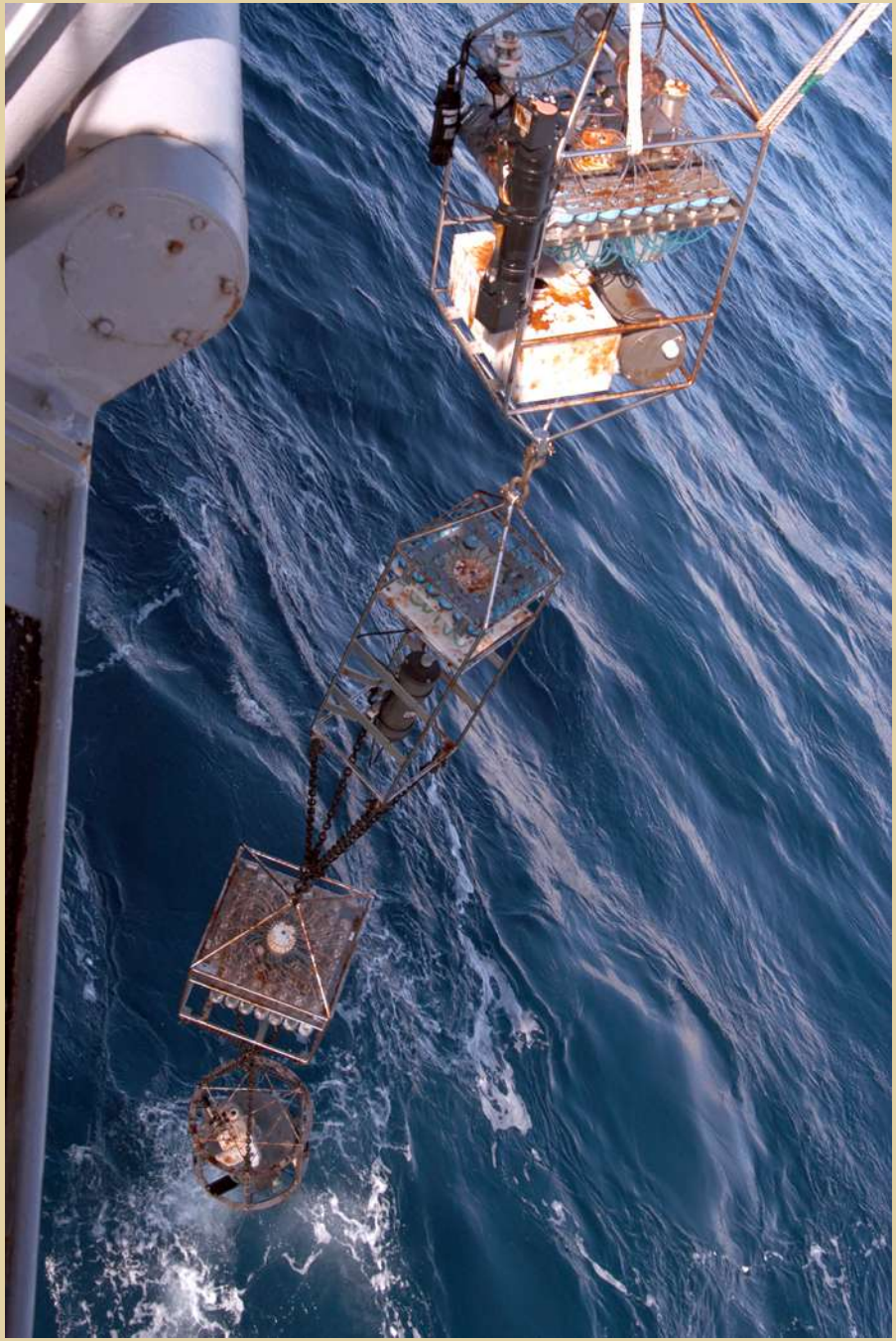
SH = Shackle
SL = Sling Link
SS = Stainless Steel

HARDWARE REQUIRED per mooring, without spares
(97) 1/2" Anchor Shackles
(15) 5/8" Anchor Shackles
(5) 3/4" Anchor Shackles
(2) 7/8" Anchor Shackles
(47) 5/8" Sling Links
(2) 1/2" Stainless Shackles
(1) 5/8" Stainless Shackle
(3) 3/4" Stainless Sling Links
(1) 1" Master Link

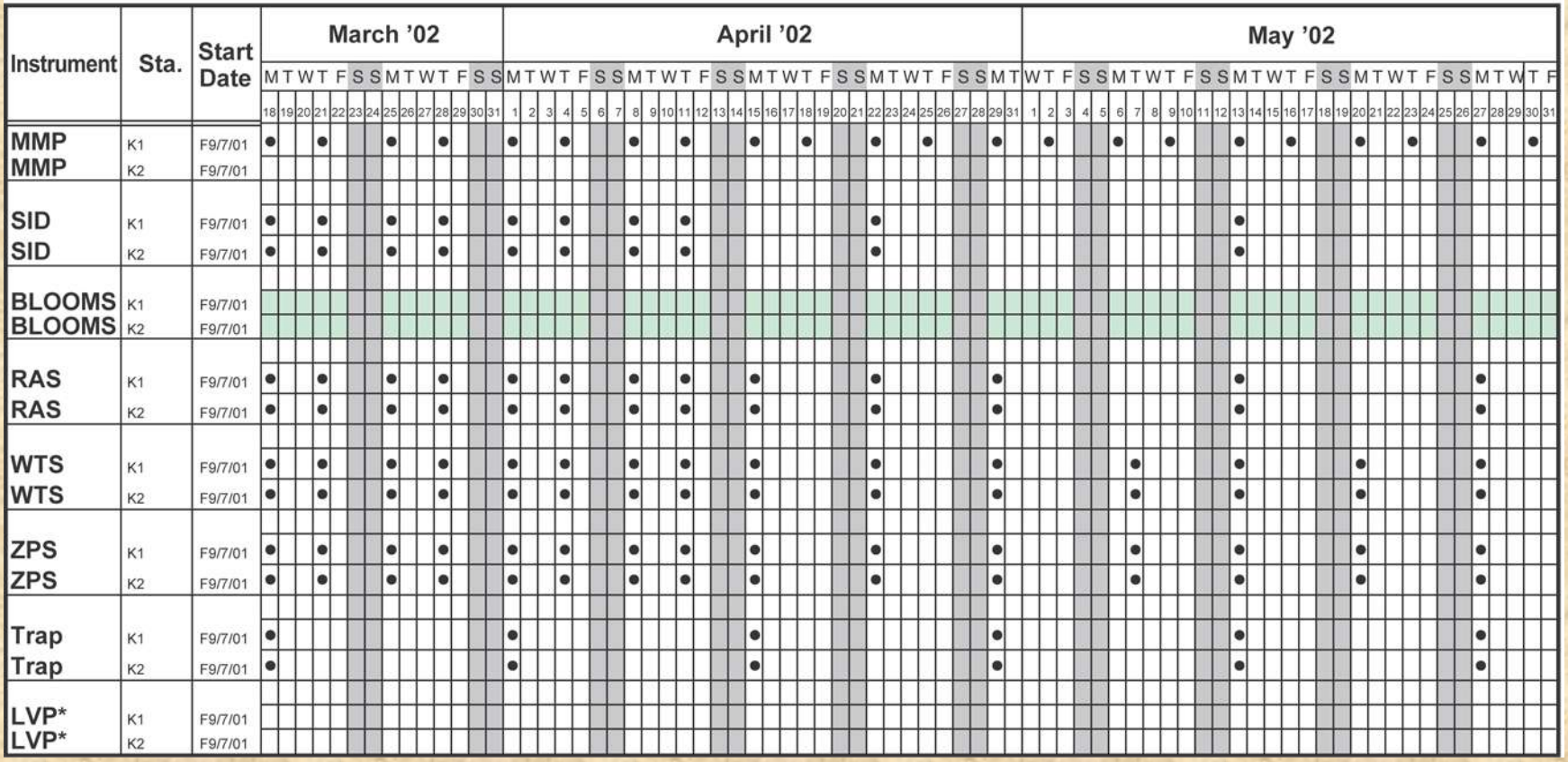
JPAC NW-PACIFIC MIO MOORING
Station K-2, 5267 m

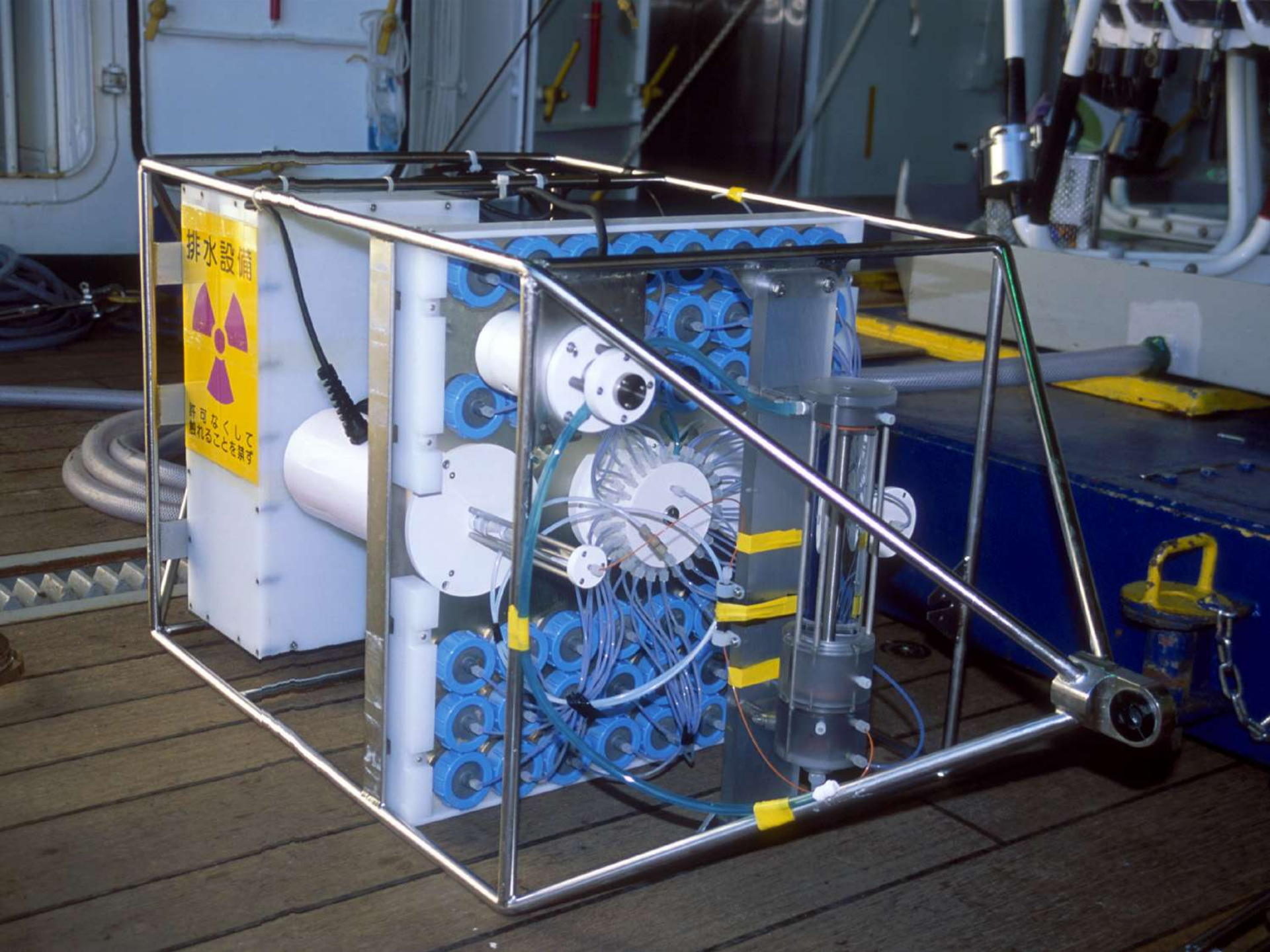
BETSEY DOHERTY date: 08/20/01
d:/dwg/oops/kemp/jpac.dwg

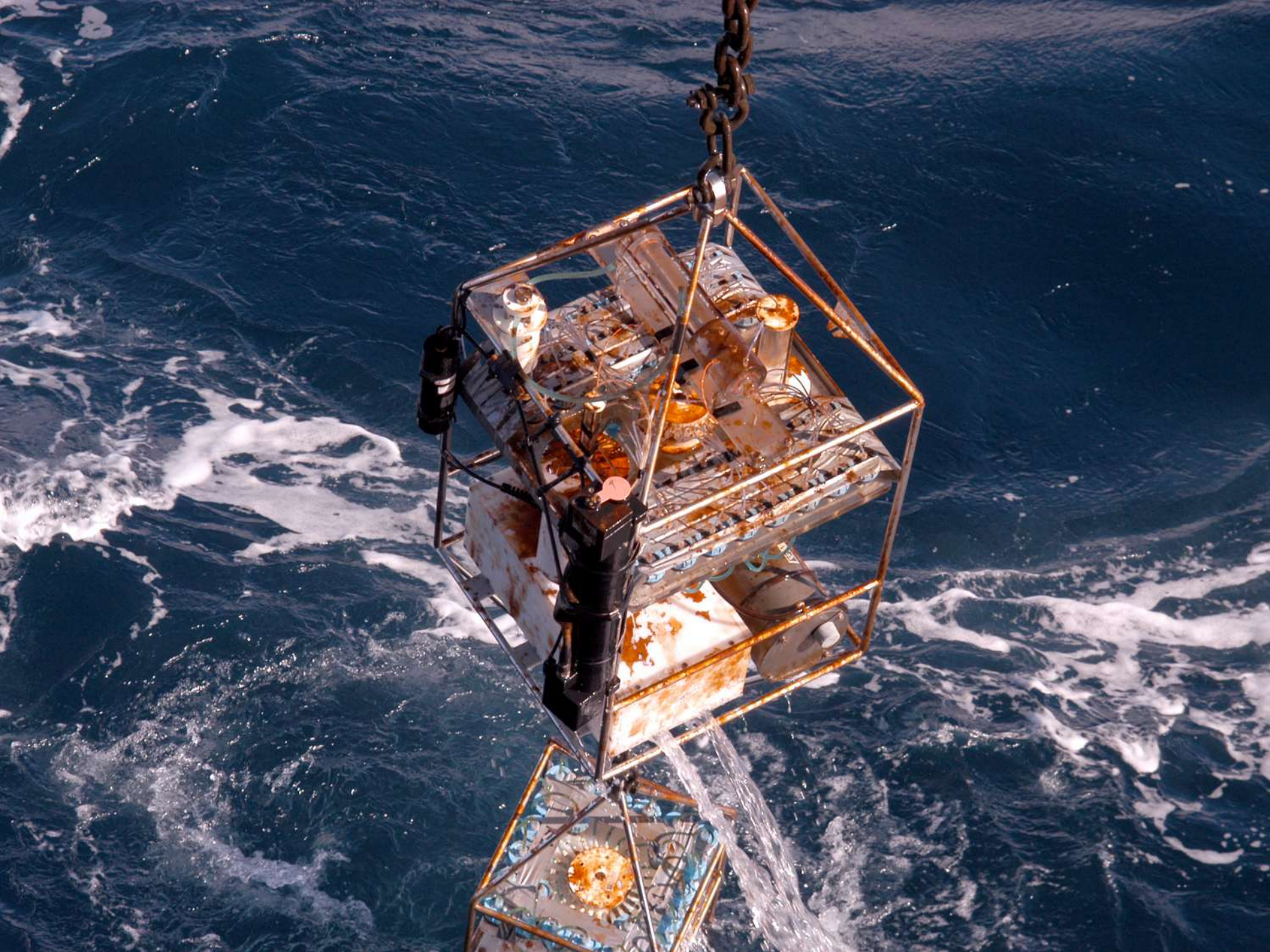

MR01-K04 K1
165° 10'E
165° 15'E
165° 20'E
165° 25'E
165° 30'E
51° 25'N
51° 20'N
51° 15'N
51° 10'N
BGC
MMP
-4900
-5000
-5100
-6000 -5800 -5600 -5400 -5200 -5000 -4800 -4600 -4400 -4200 -4000
20m contour

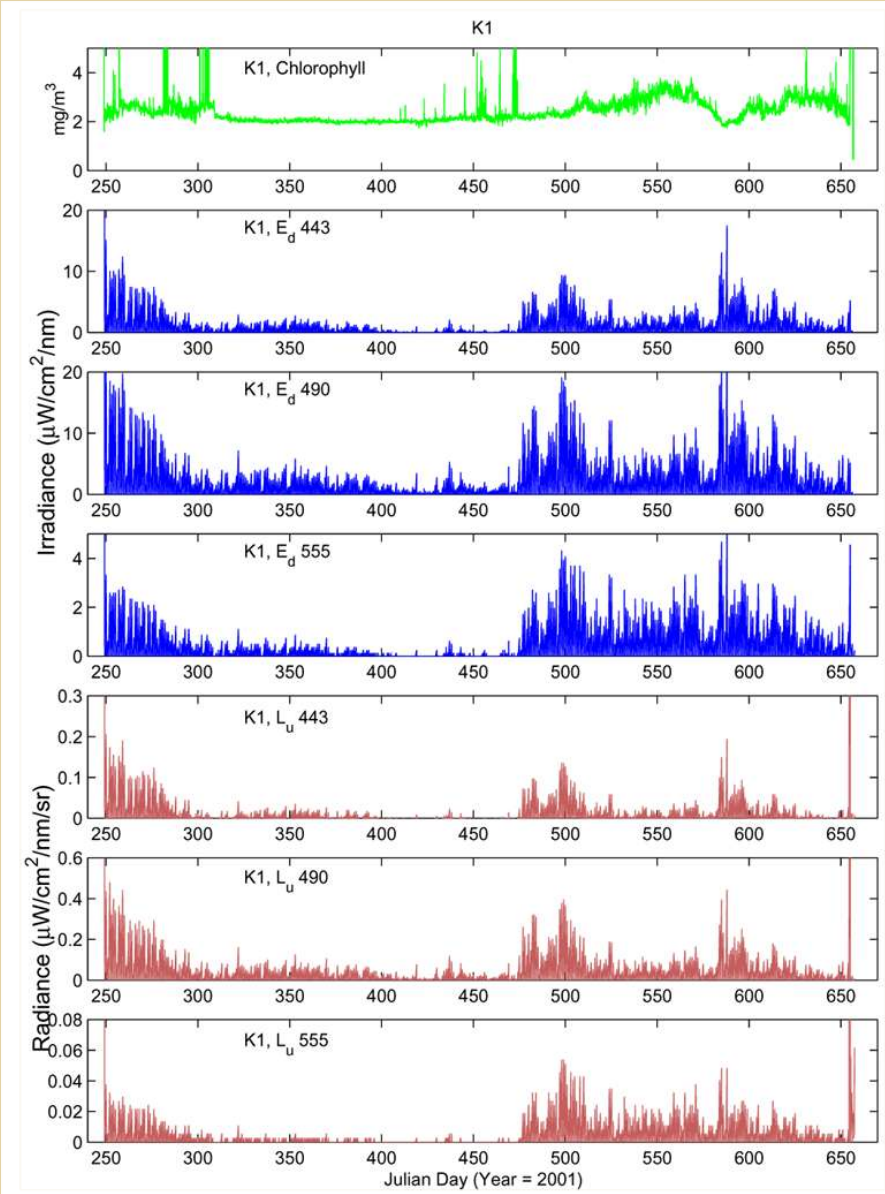


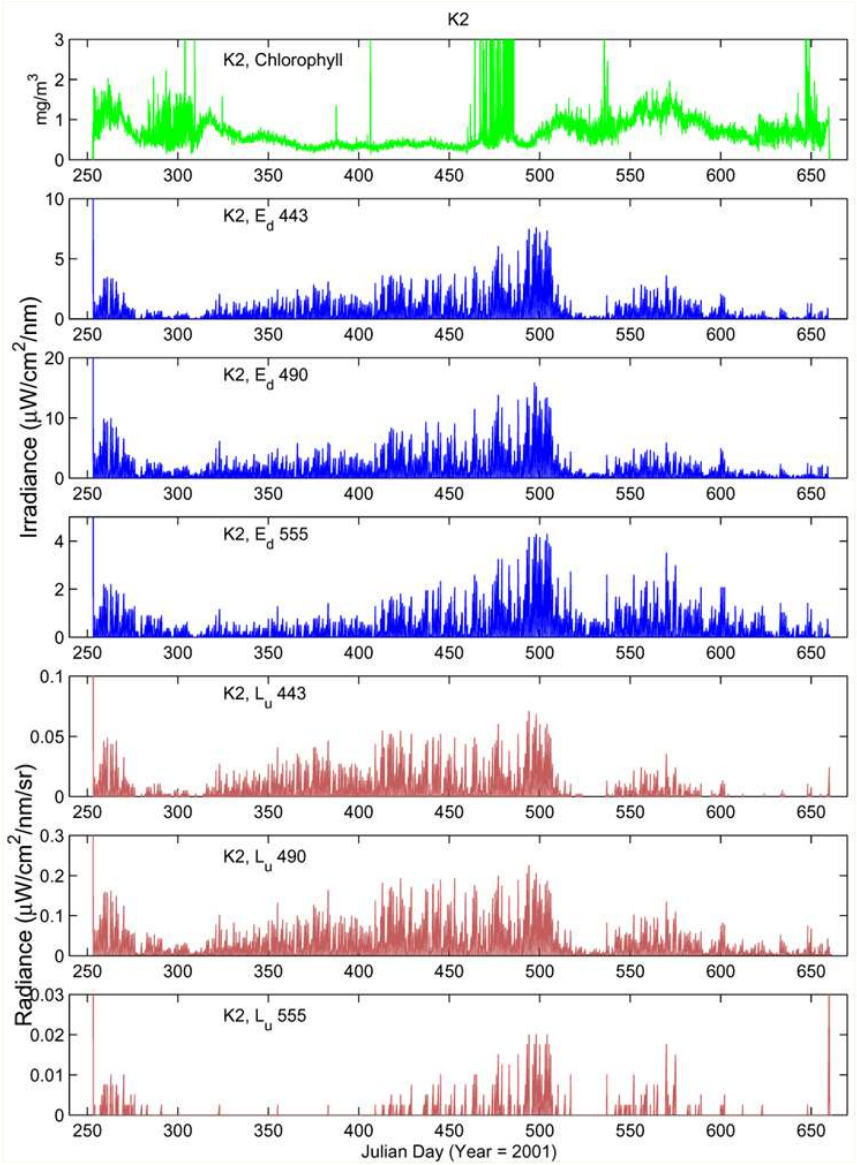
2001 - 2002 MIO NW Pacific Synchronization Schedule of Time Series Instrumentation March 18 - May 31



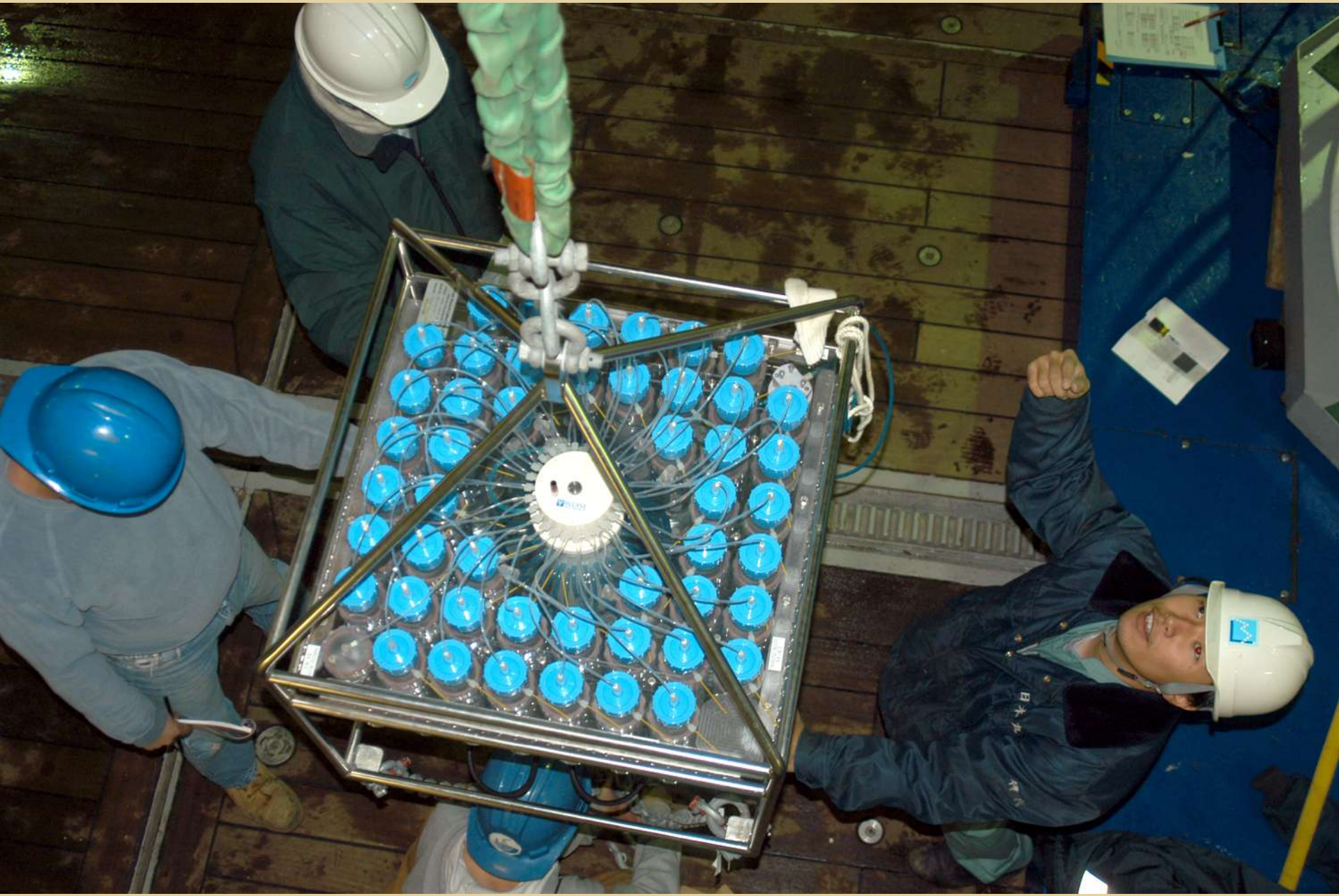

排水設備
許可なくして
触れることを禁ず

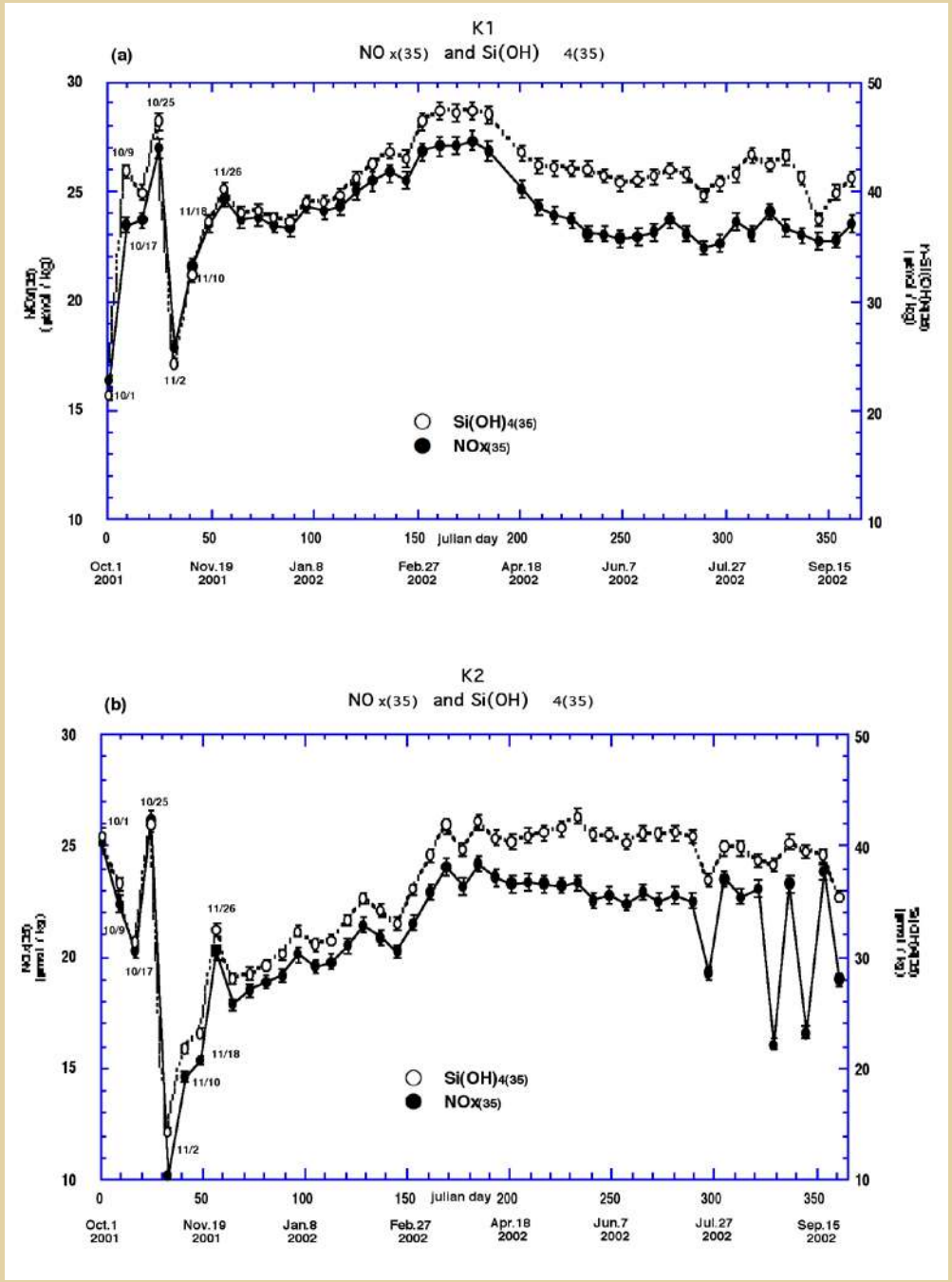


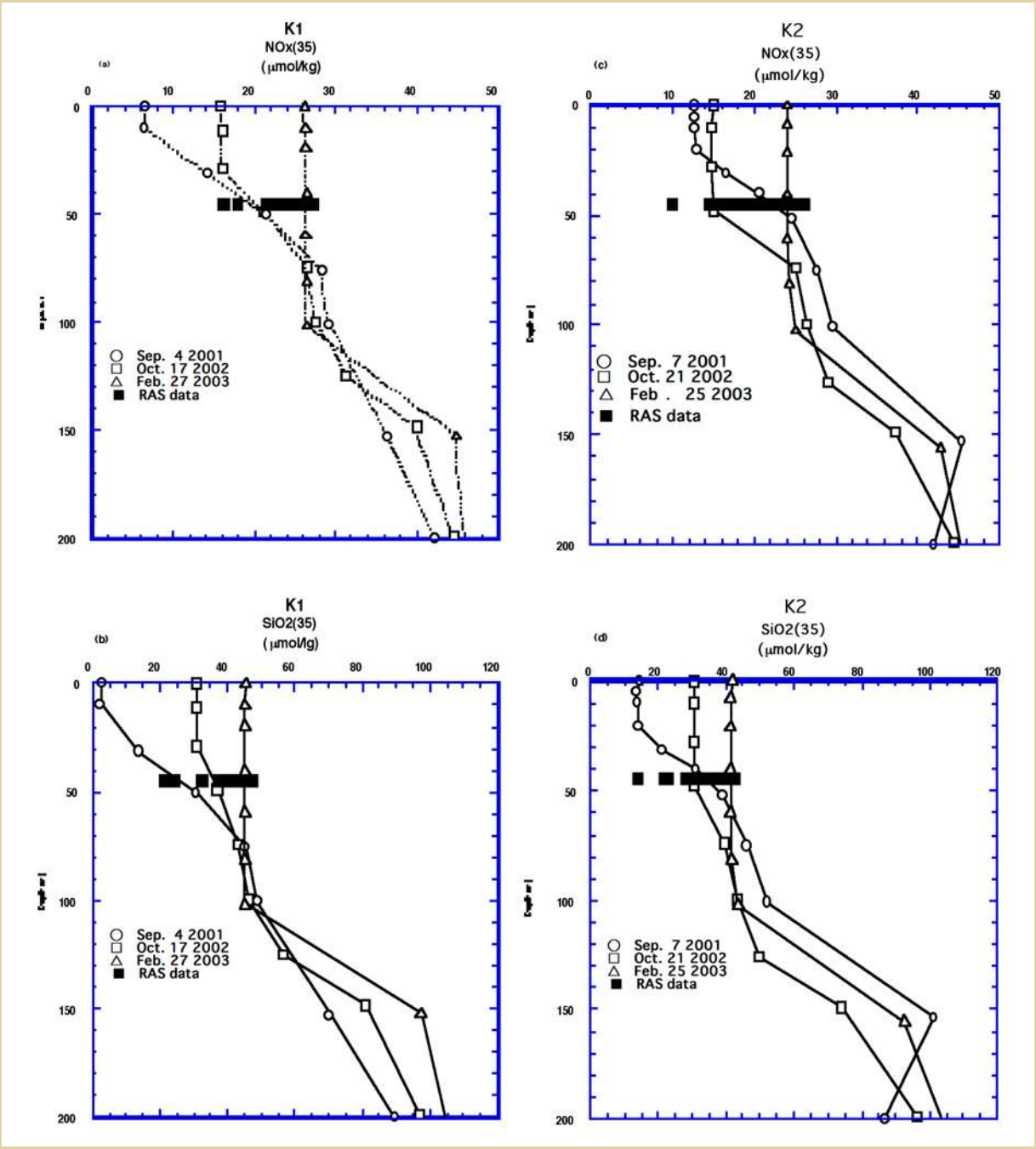


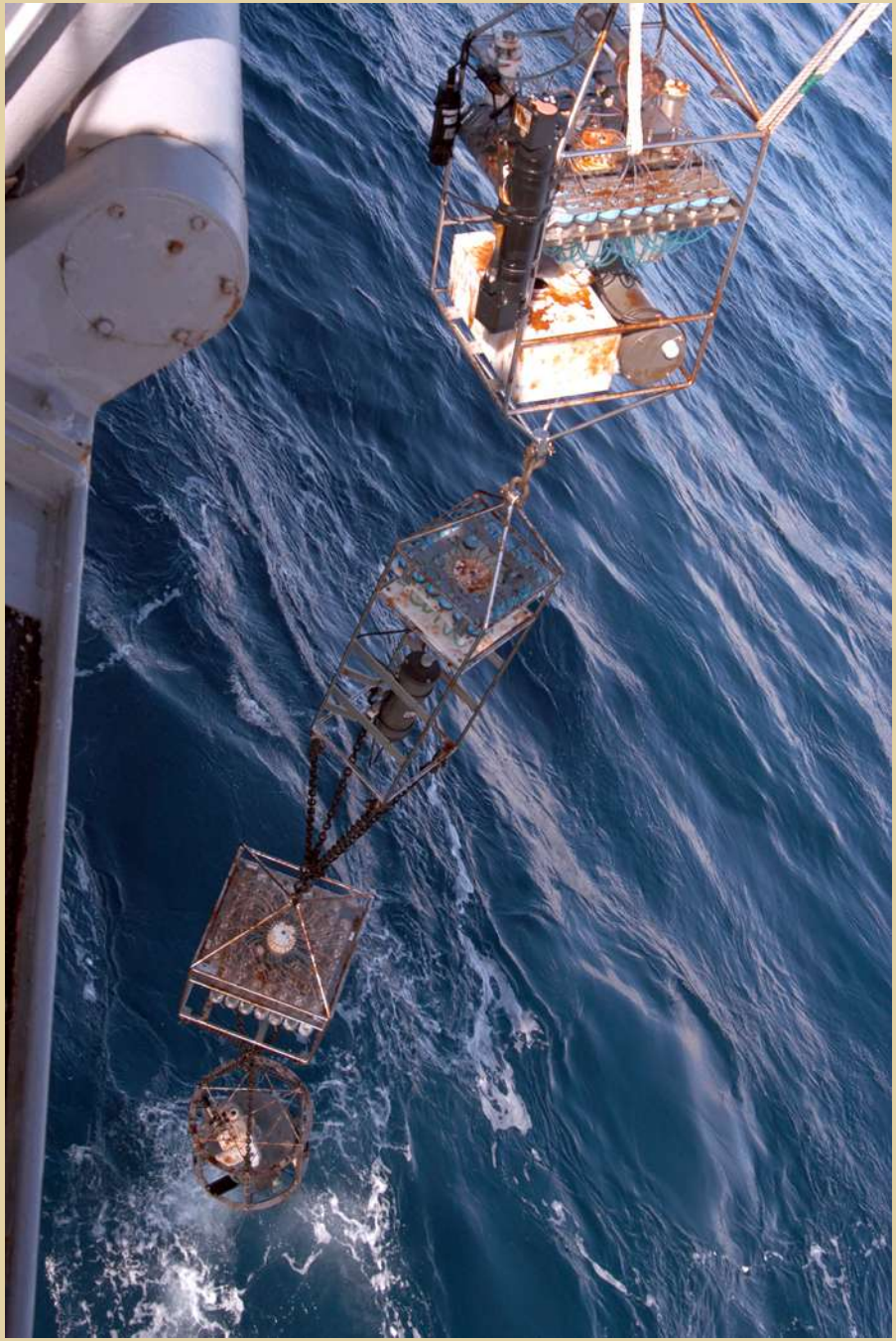


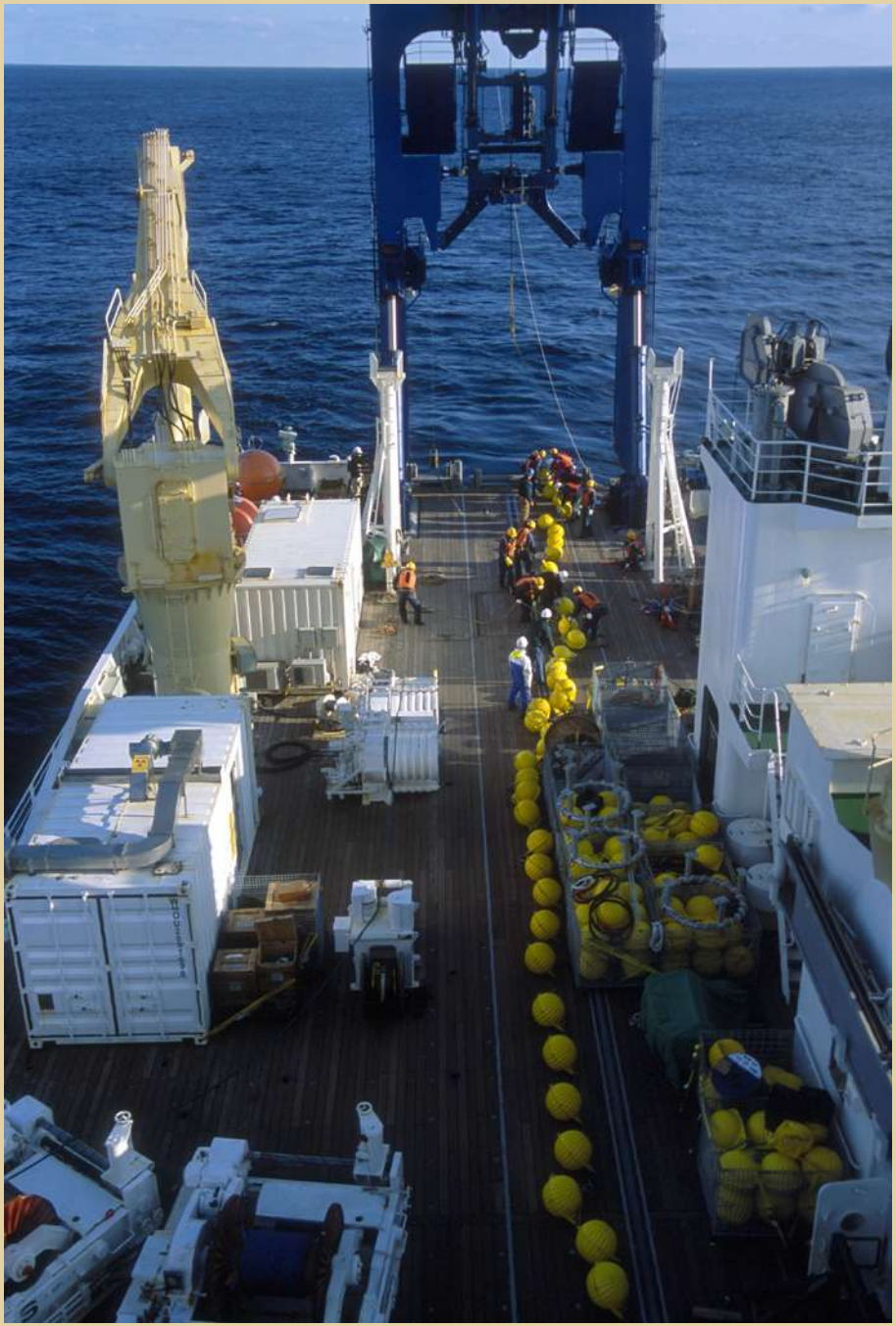
Data and Figure from T. Dickey, UCSB



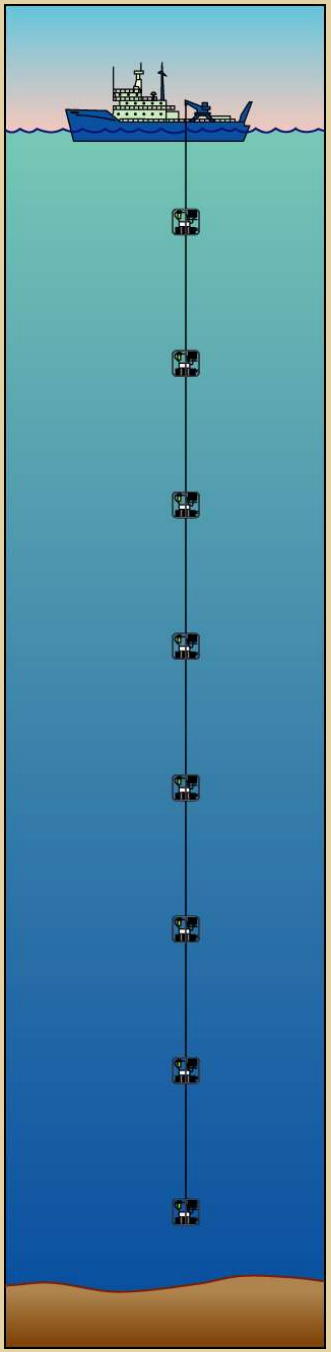

K1
(a)
NO x(35) and Si(OH) 4(35)
10/25
10/9
11/26
11/18
10/17
11/10
11/2
10/1
Si(OH)4(35)
NOx(35)
julian day
Oct.1 2001
Nov.19 2001
Jan.8 2002
Feb.27 2002
Apr.18 2002
Jun.7 2002
Jul.27 2002
Sep.15 2002
K2
(b)
NO x(35) and Si(OH) 4(35)
10/25
10/1
10/9
11/26
10/17
11/18
11/10
11/2
Si(OH)4(35)
NOx(35)
julian day
Oct.1 2001
Nov.19 2001
Jan.8 2002
Feb.27 2002
Apr.18 2002
Jun.7 2002
Jul.27 2002
Sep.15 2002

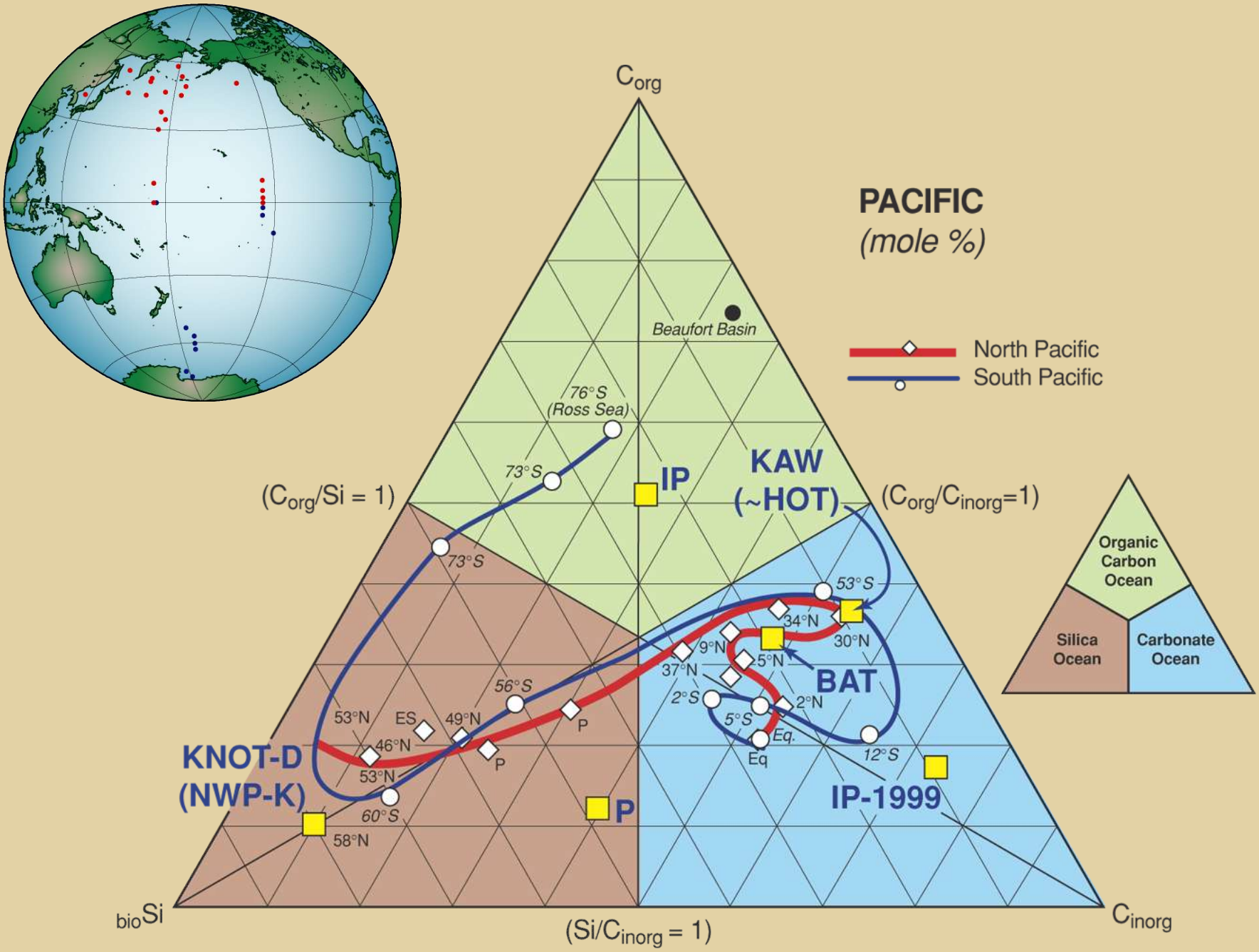

K1
NOx(35)
(μmol/kg)
(a)
Sep. 4 2001
Oct. 17 2002
Feb. 27 2003
RAS data
K2
NOx(35)
(μmol/kg)
(c)
Sep. 7 2001
Oct. 21 2002
Feb . 25 2003
RAS data
K1
SiO2(35)
(μmol/g)
(b)
Sep. 4 2001
Oct. 17 2002
Feb. 27 2003
RAS data
K2
SiO2(35)
(μmol/kg)
(d)
Sep. 7 2001
Oct. 21 2002
Feb. 25 2003
RAS data





Large Volume (to 1 ton)
Filter-cartridge Pump




PACIFIC
(mole %)
North Pacific
South Pacific
Corg
(Corg/Si = 1)
(Corg/Cinorg=1)
bioSi
(Si/Cinorg = 1)
Cinorg
Beaufort Basin
76°S
(Ross Sea)
73°S
IP
KAW
(~HOT)
53°S
34°N
30°N
9°N
5°N
37°N
BAT
2°S
2°N
5°S
Eq.
Eq
12°S
56°S
53°N
ES
49°N
P
46°N
53°N
60°S
58°N
KNOT-D
(NWP-K)
P
IP-1999
Organic
Carbon
Ocean
Silica
Ocean
Carbonate
Ocean

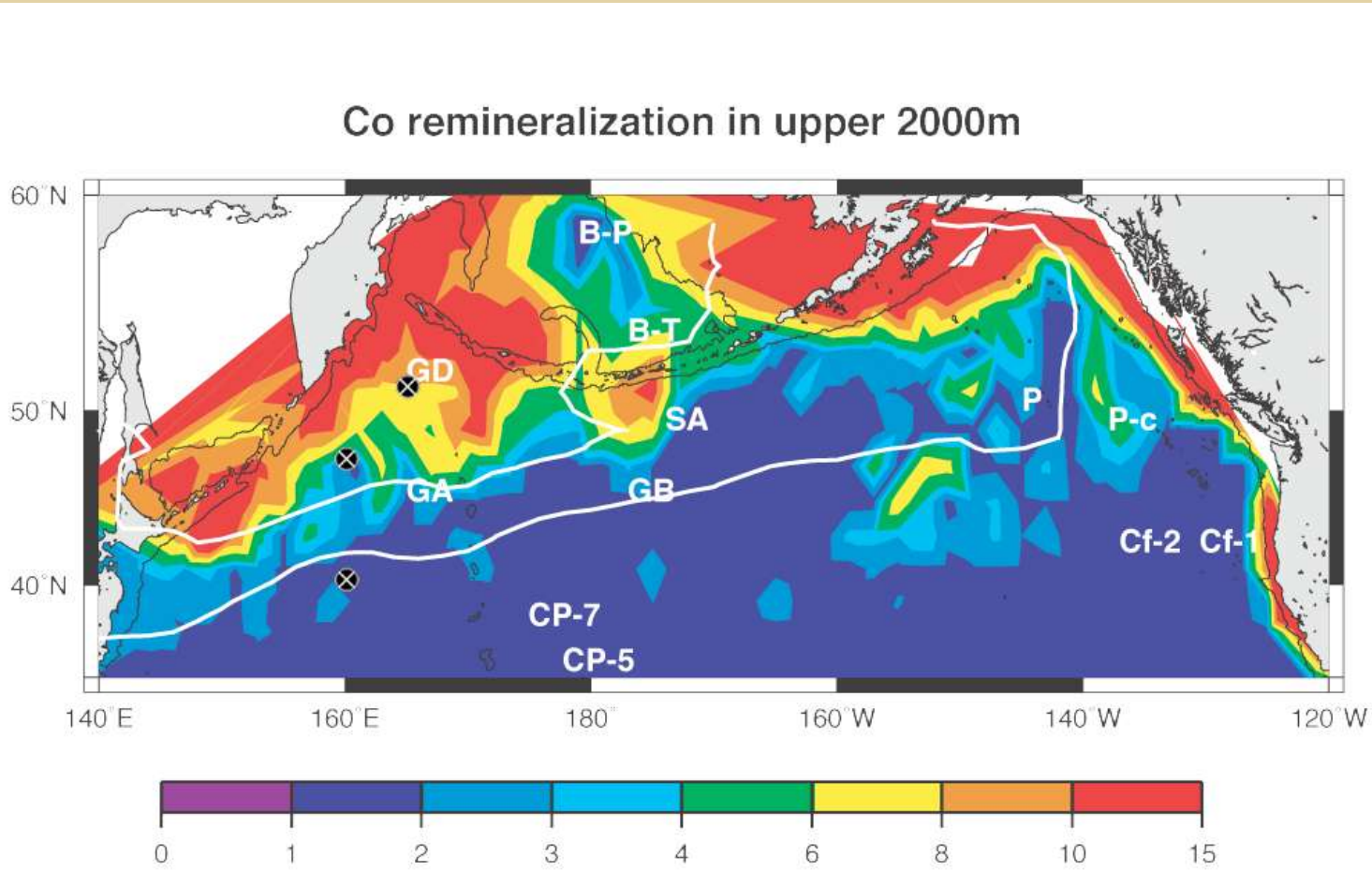
SUMMARY – *A Surviving Program Under Competitive Funding Air !*

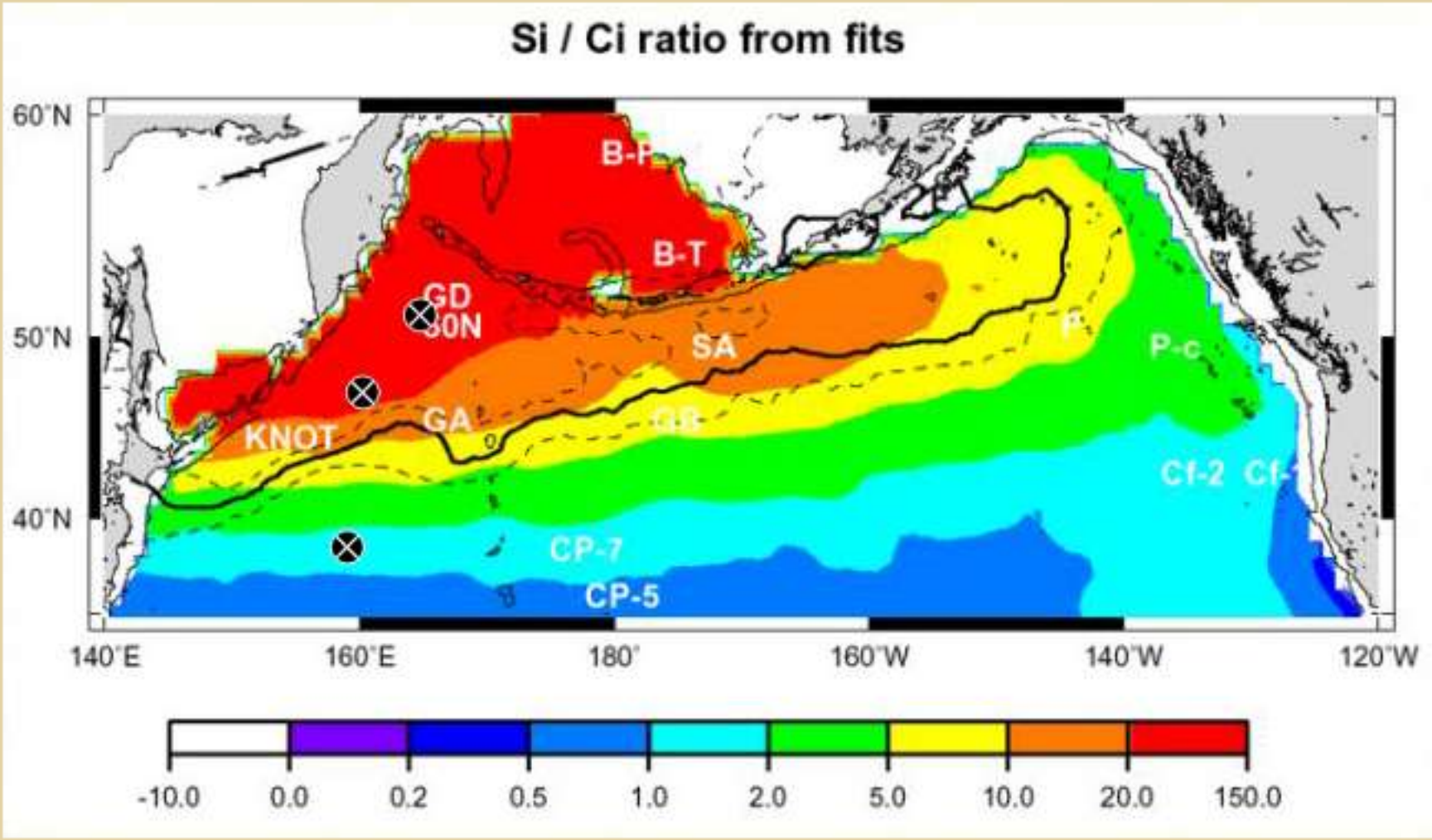
- MIO's HiLaTS Program at the Northwest Pacific is asking questions of global significance.

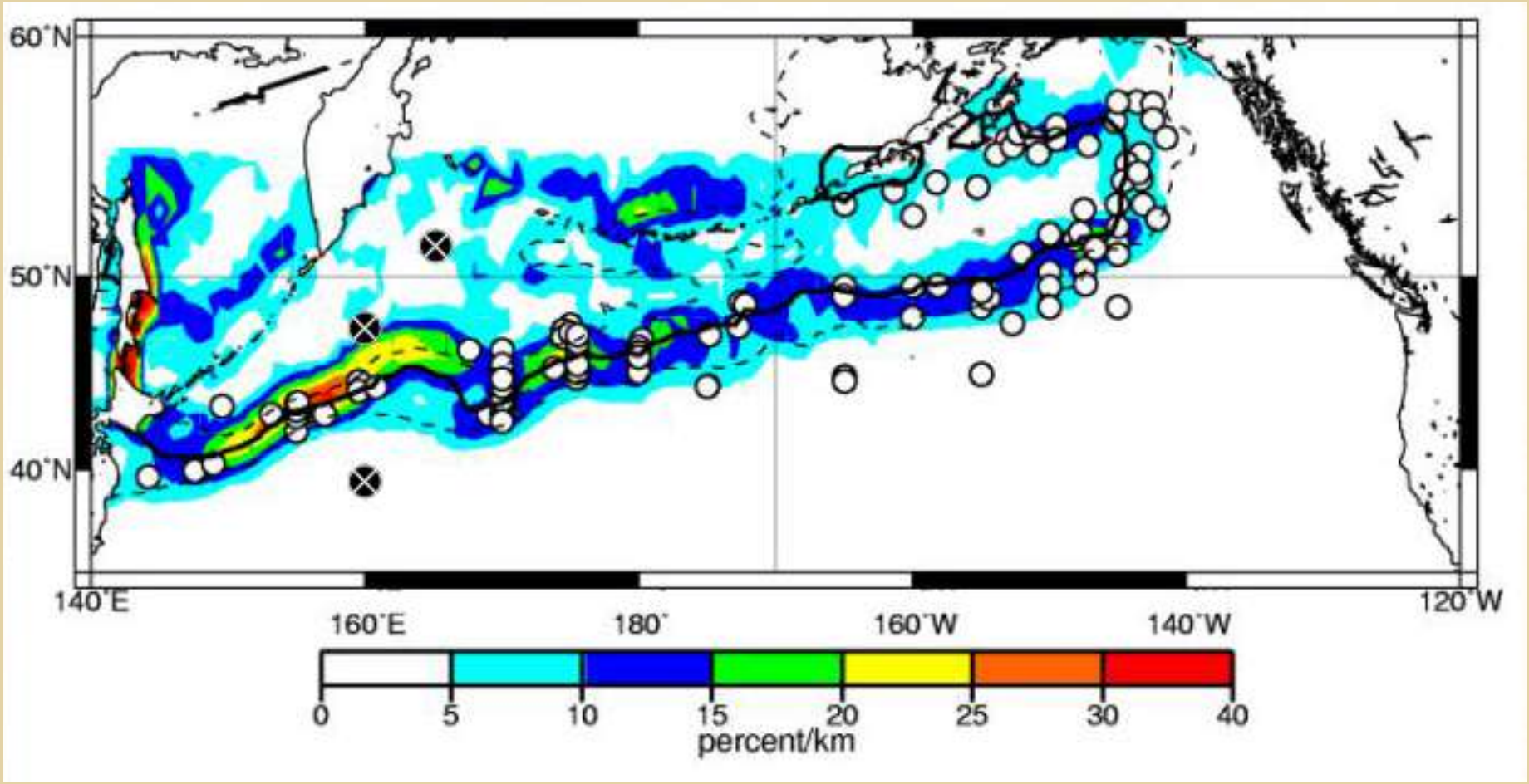
- The technological advances of this program leads the rest of the global BGC research and thus contribute to the world's carbon cycle studies.

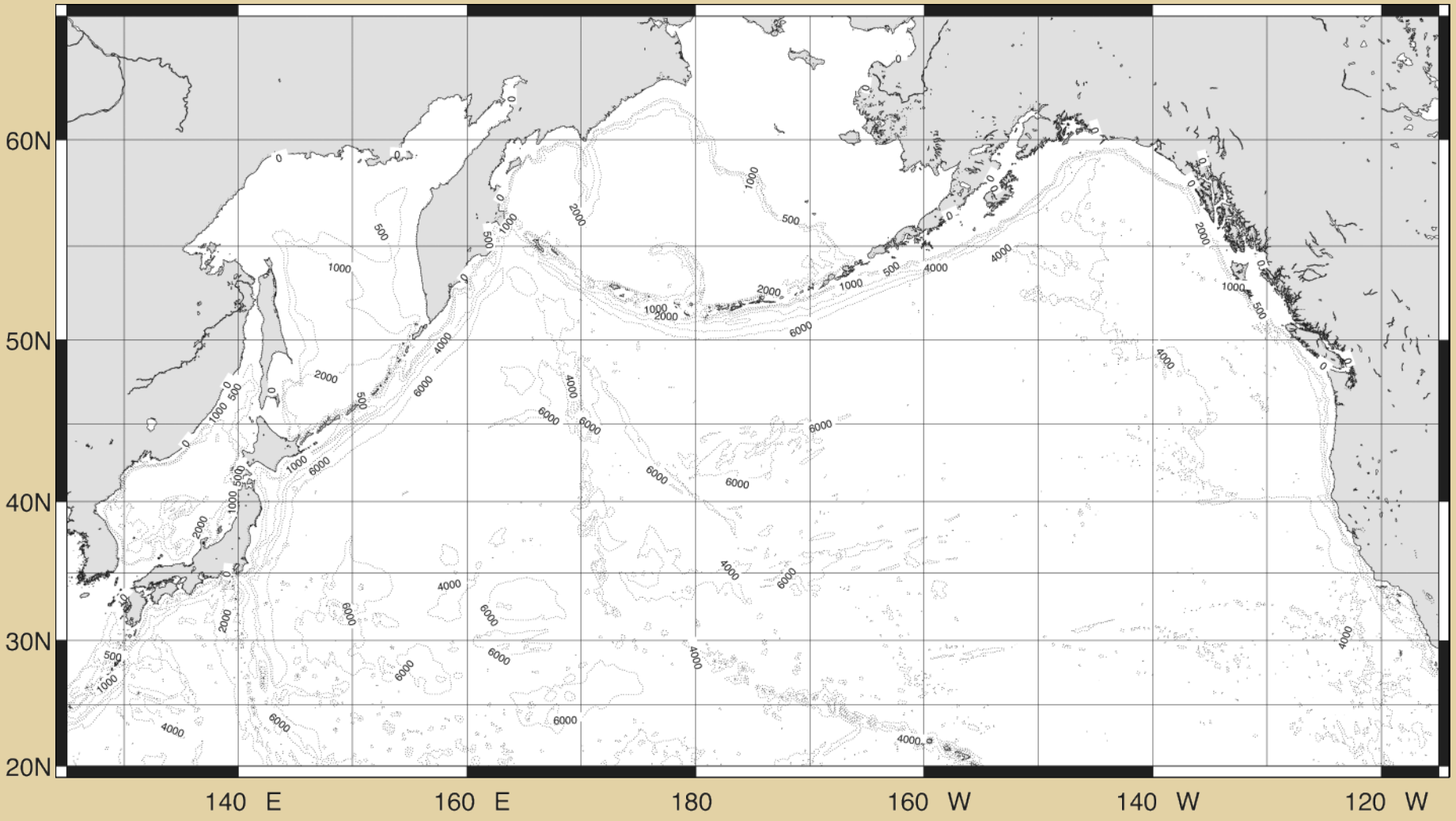
- Particularly, successful recovery and the turn-around for 2002-3 of MIO/J-Pac Mooring have already given a huge impact to the research community of Global Carbon Cycle in the ocean.

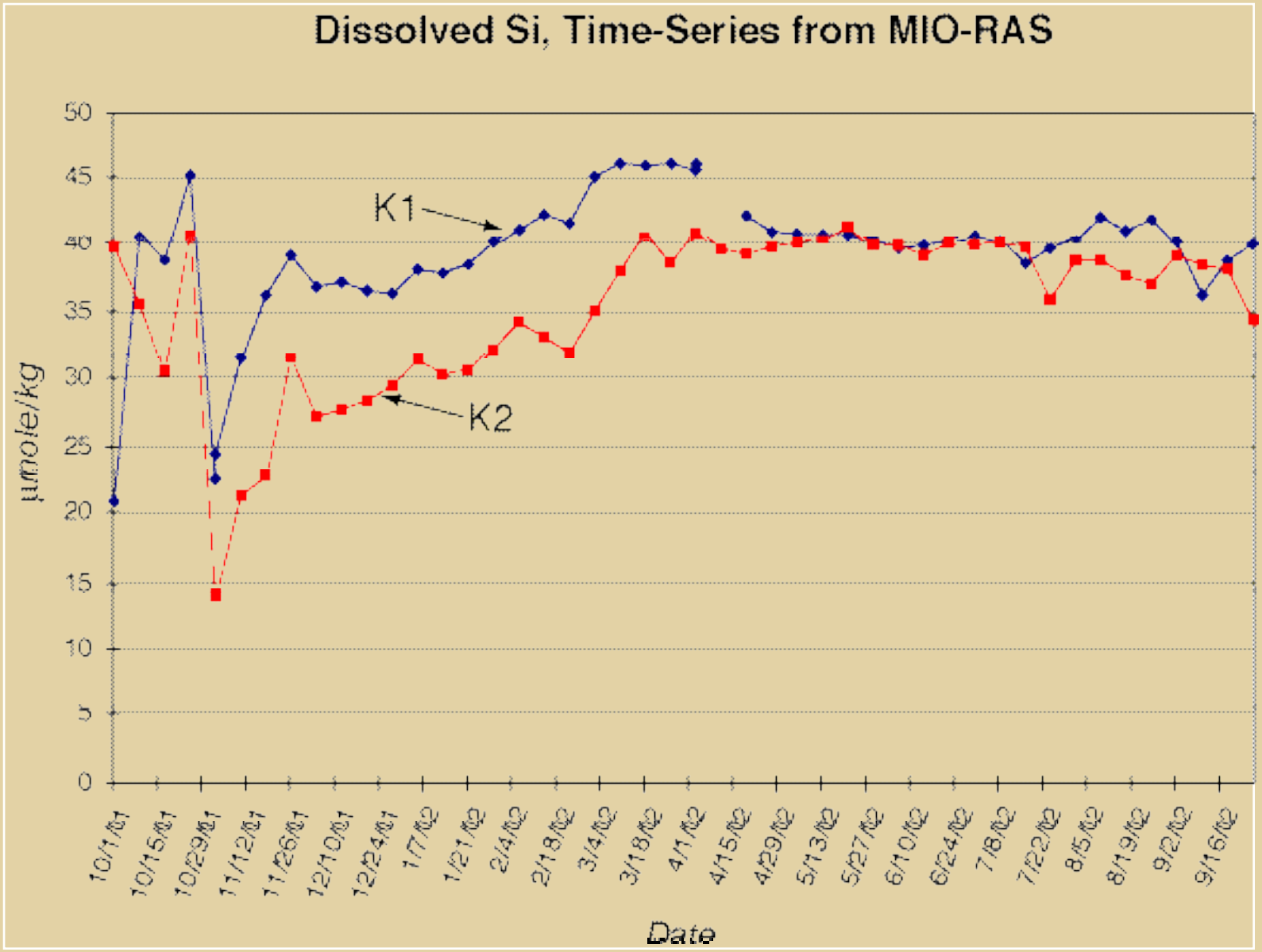
- All 34 autonomous time-series instruments in 6-kinds on boards K-series mooring array will work as we expected during the 2003 deployment and will generate a synchronized time-series data array of the Northwestern Pacific. This huge and complete data matrix will significantly assist the understanding of the global CO2 cycles in quality and quantity.

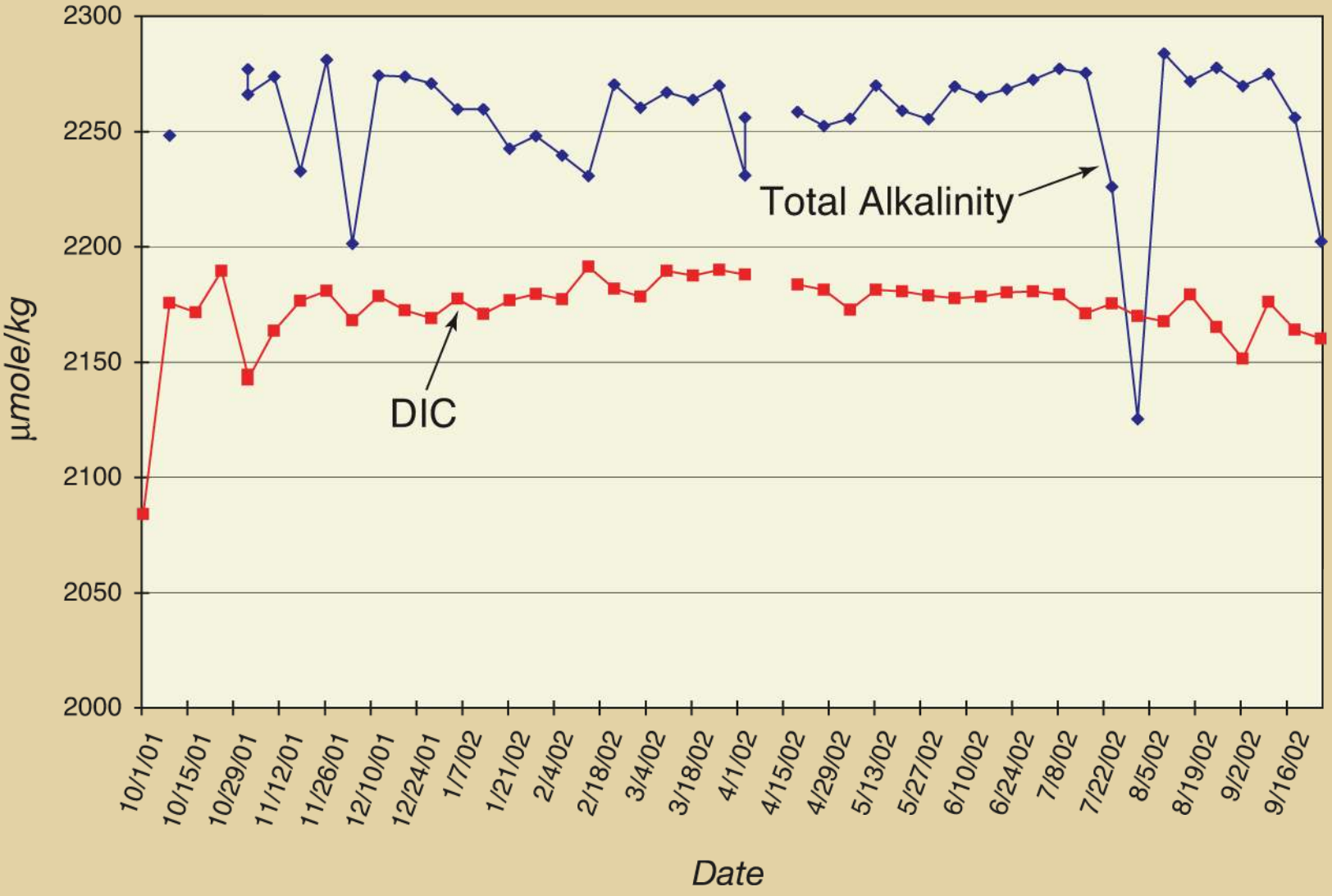

Co remineralization in upper 2000m
60°N
50°N
40°N
140°E
160°E
180°
160°W
140°W
120°W
B-P
B-T
GD
SA
P
P-c
GA
GB
Cf-2
Cf-1
CP-7
CP-5
0
1
2
3
4
6
8
10
15


Si / Ci ratio from fits
60°N
50°N
40°N
140°E
160°E
180°
160°W
140°W
120°W
B-P
B-T
GD
50N
SA
P
P-c
KNOT
GA
Cf-2
CP-7
CP-5
-10.0
0.0
0.2
0.5
1.0
2.0
5.0
10.0
20.0
150.0

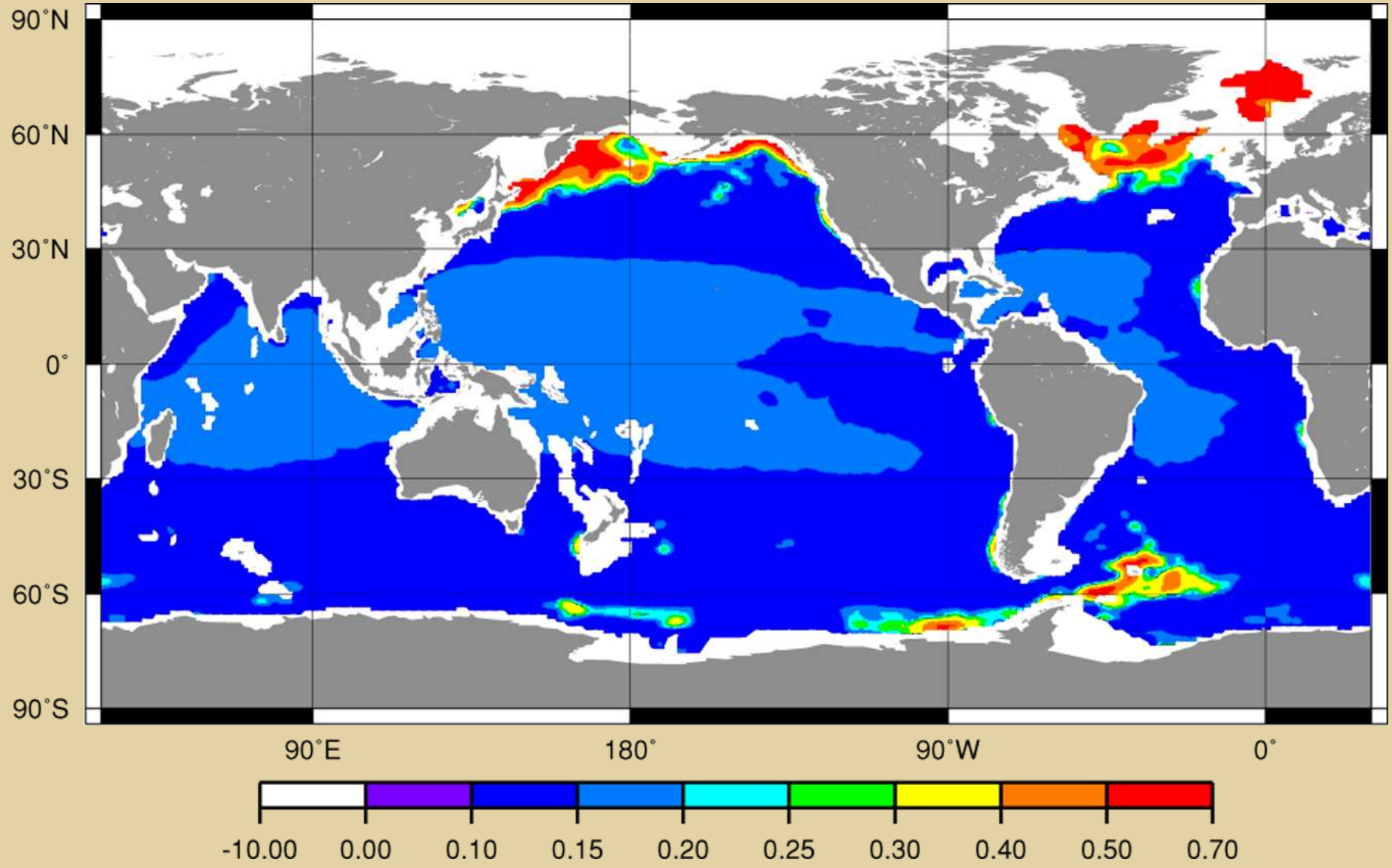

60˚N
50˚N
40˚N
140˚E
160˚E
180˚
160˚W
140˚W
120˚W
0
5
10
15
20
25
30
40
percent/km


60N
50N
40N
30N
20N
140 E
160 E
180
160 W
140 W
120 W

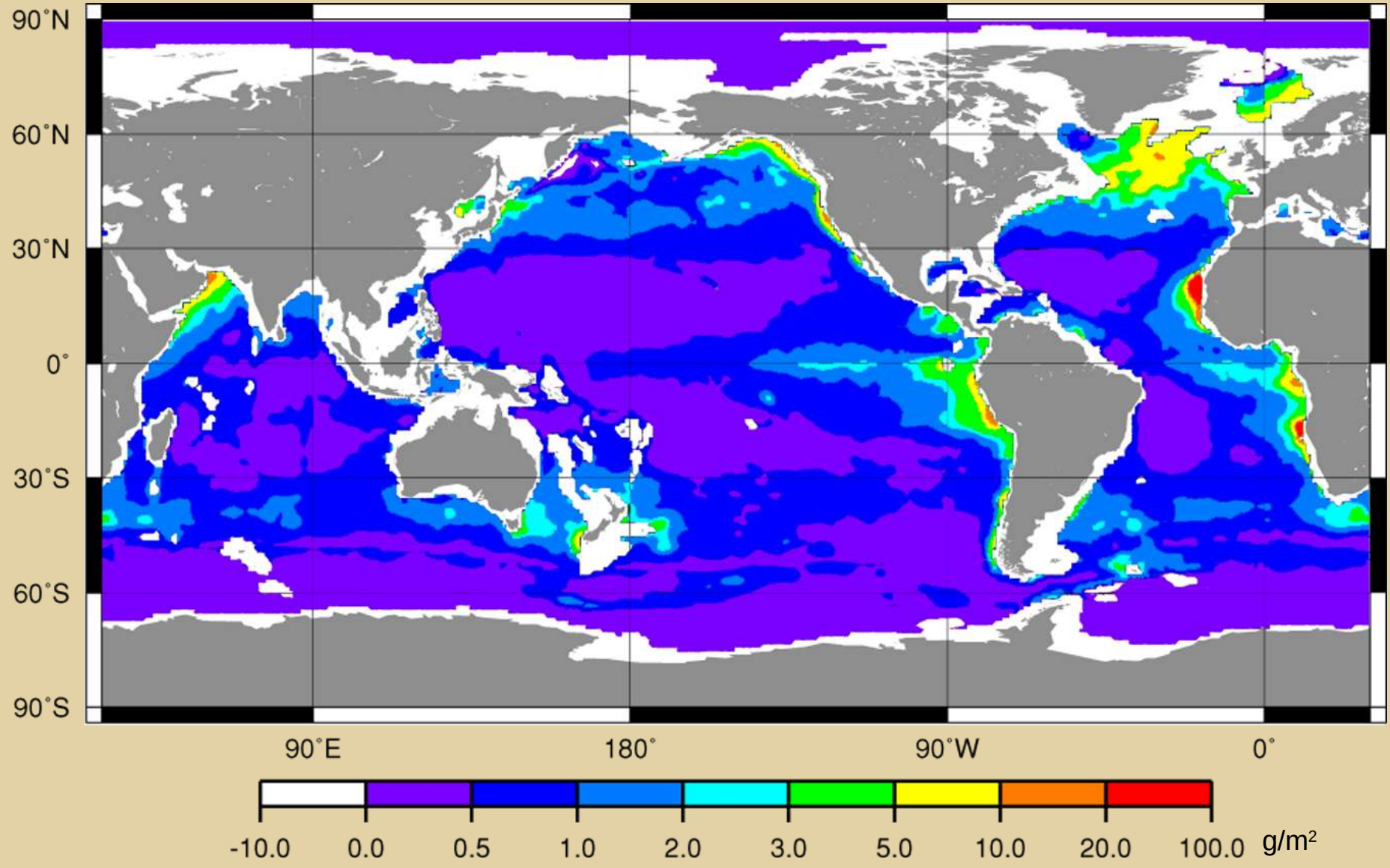

Dissolved Si, Time-Series from MIO-RAS
μmole/kg
Date
K1
K2
50
45
40
35
30
25
20
15
10
5
0
10/1/01
10/15/01
10/29/01
11/12/01
11/26/01
12/10/01
12/24/01
1/7/02
1/21/02
2/4/02
2/18/02
3/4/02
3/18/02
4/1/02
4/15/02
4/29/02
5/13/02
5/27/02
6/10/02
6/24/02
7/8/02
7/22/02
8/5/02
8/19/02
9/2/02
9/16/02


2300
2250
2200
2150
2100
2050
2000
µmole/kg
Total Alkalinity
DIC
10/1/01
10/15/01
10/29/01
11/12/01
11/26/01
12/10/01
12/24/01
1/7/02
1/21/02
2/4/02
2/18/02
3/4/02
3/18/02
4/1/02
4/15/02
4/29/02
5/13/02
5/27/02
6/10/02
6/24/02
7/8/02
7/22/02
8/5/02
8/19/02
9/2/02
9/16/02
Date

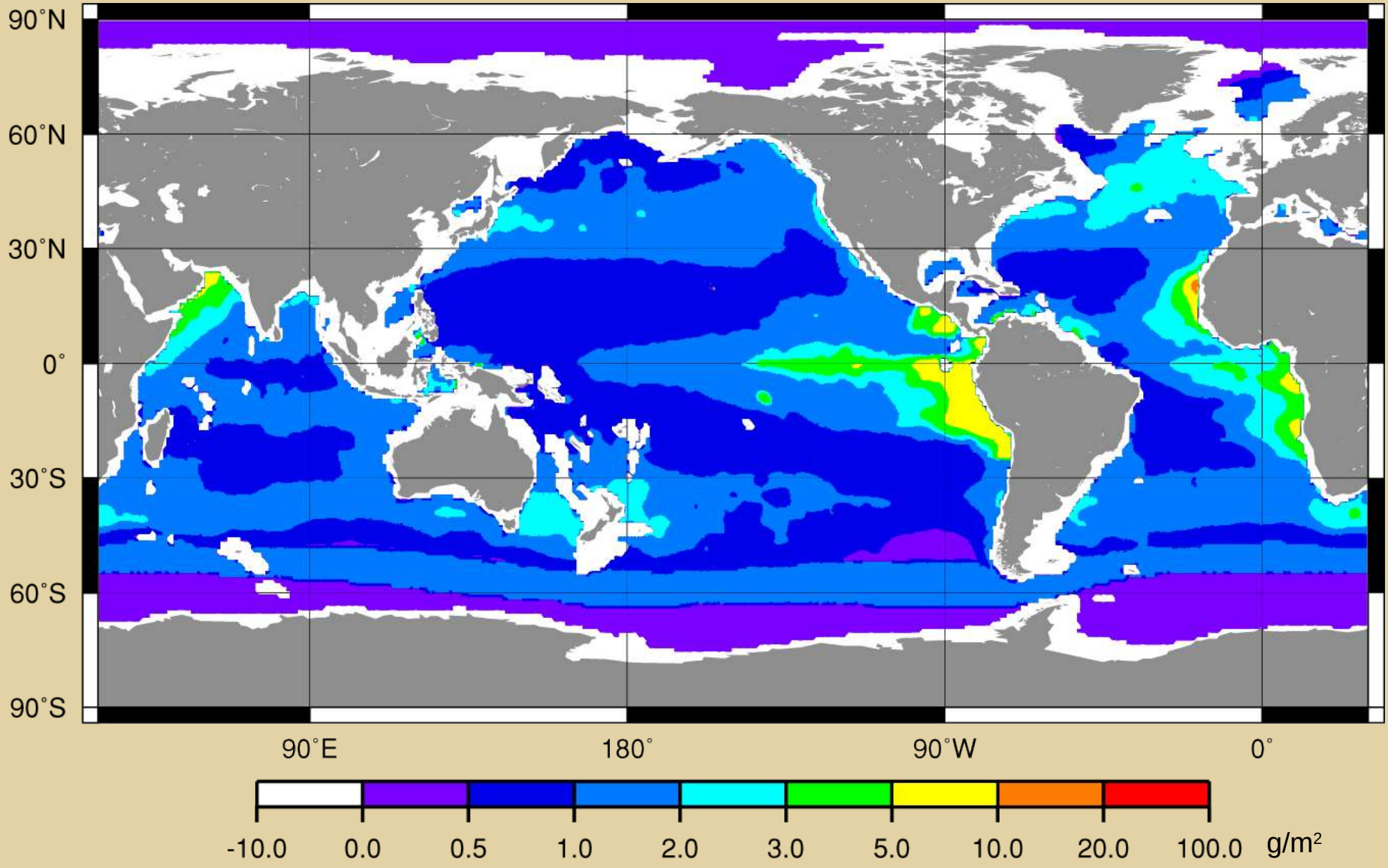
f-ratio (EP/PP)


90˚N
60˚N
30˚N
0˚
30˚S
60˚S
90˚S
90˚E
180˚
90˚W
0˚
-10.00
0.00
0.10
0.15
0.20
0.25
0.30
0.40
0.50
0.70

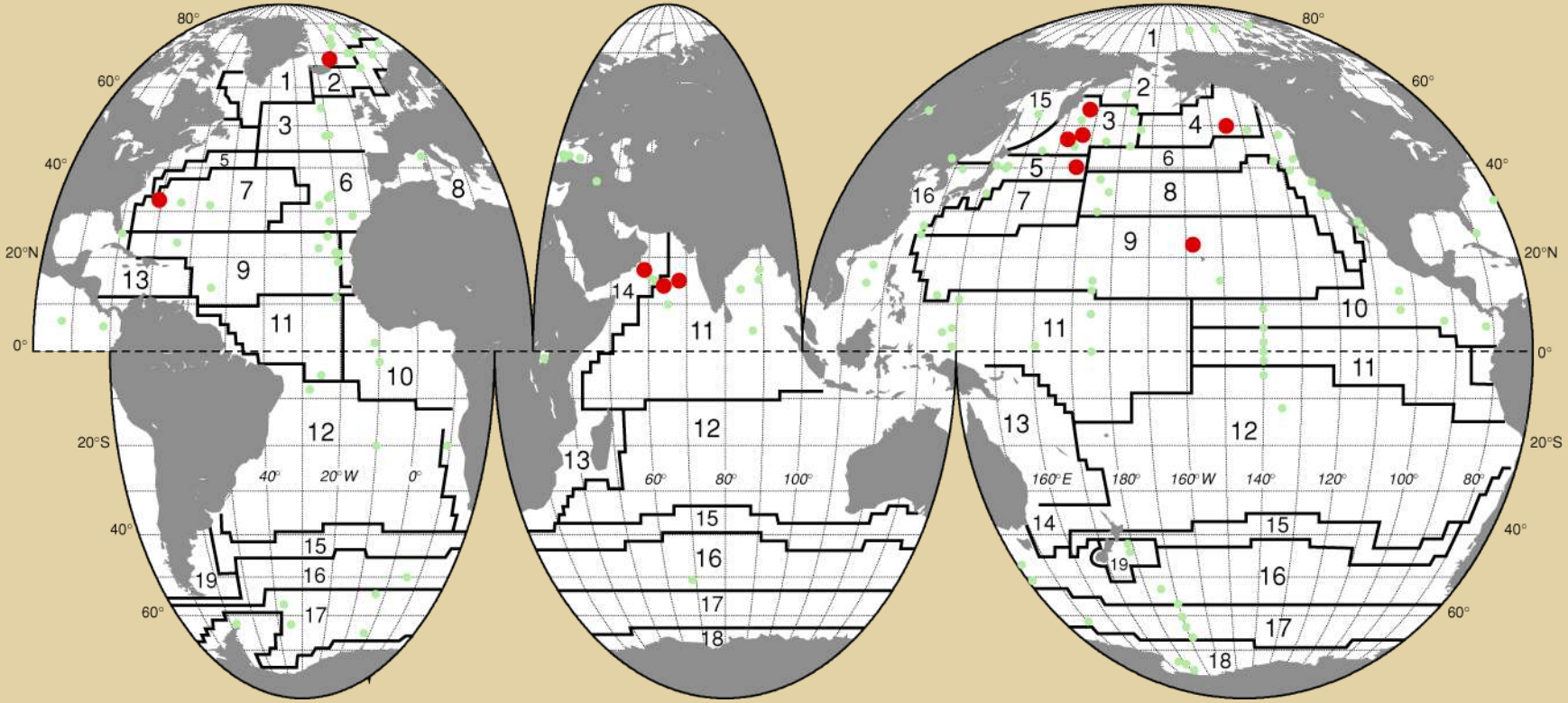
Mean Annual Organic Carbon Delivery

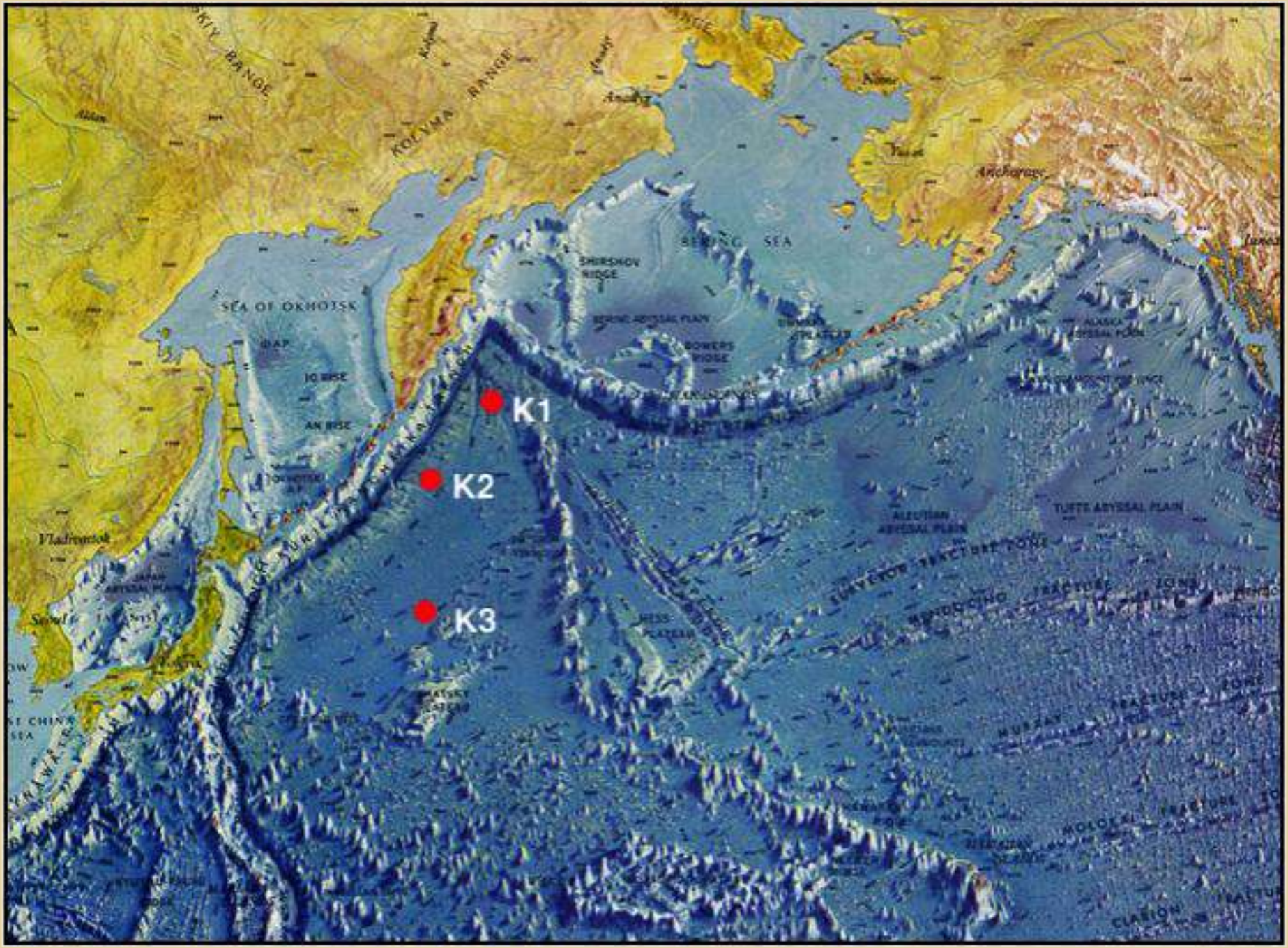


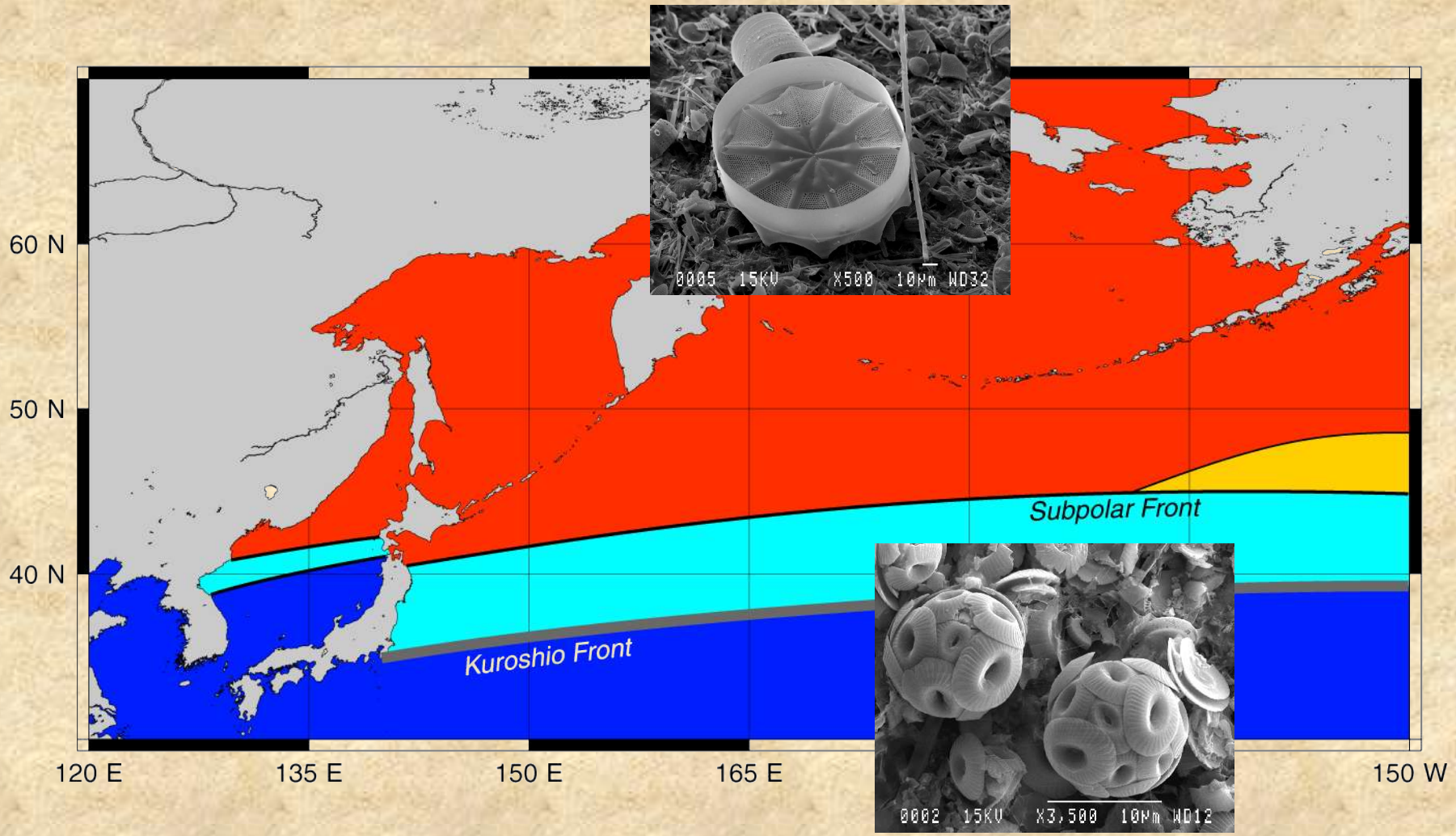
Mean Annual Inorganic Carbon Export Flux



Sediment Trap Stations 1986-2002
Projected on the Oceanic Provinces; Longhurst, et al., 1994




K1
K2
K3
SEA OF OKHOTSK
BERING SEA
KOLYMA RANGE
Vladivostok
Anchorage


60 N
50 N
40 N
120 E
135 E
150 E
165 E
150 W
Subpolar Front
Kuroshio Front
0005 15KV X500 10µm WD32
0002 15KV X3,500 10µm WD12

NATIONAL SCIENCE FOUNDATION

BIOCOMPLEXITY: SPECIAL COMPETITION; *NSF 02-22*

Integrated Research to Understand and Model Complexity Among Biological, Physical, and Social Systems

DEADLINE DATES:

MESSAGE OF INTENT - JANUARY 31, 2002
RESEARCH PROPOSALS - MARCH 1, 2002
INCUBATION ACTIVITIES - MARCH 1, 2002

SUMMARY OF PROGRAM REQUIREMENTS

Short Description/Synopsis of Program:

This special competition is the second year of a multi-year effort to enhance our understanding of the nature and dynamics of biocomplexity in the environment. Specifically, this special competition will support integrated research to better understand and model complexity that arises from the interaction of biological, physical, and social systems. Biocomplexity arises from dynamics spanning several levels within a system, between systems, and/or across multiple spatial (microns to thousands of kilometers) and temporal (nanoseconds to eons) scales. **This special competition will specifically support Research Projects** which directly explore nonlinearities, chaotic behavior, emergent phenomena or feedbacks within and between systems and/or integrate across multiple components or scales of time and space in order to better understand and predict the dynamic behavior of systems. **The competition will also support Incubation Activities** that enable groups of researchers who have not historically collaborated on biocomplexity research to develop projects via focused workshops, virtual meetings, and other types of development and planning activities.

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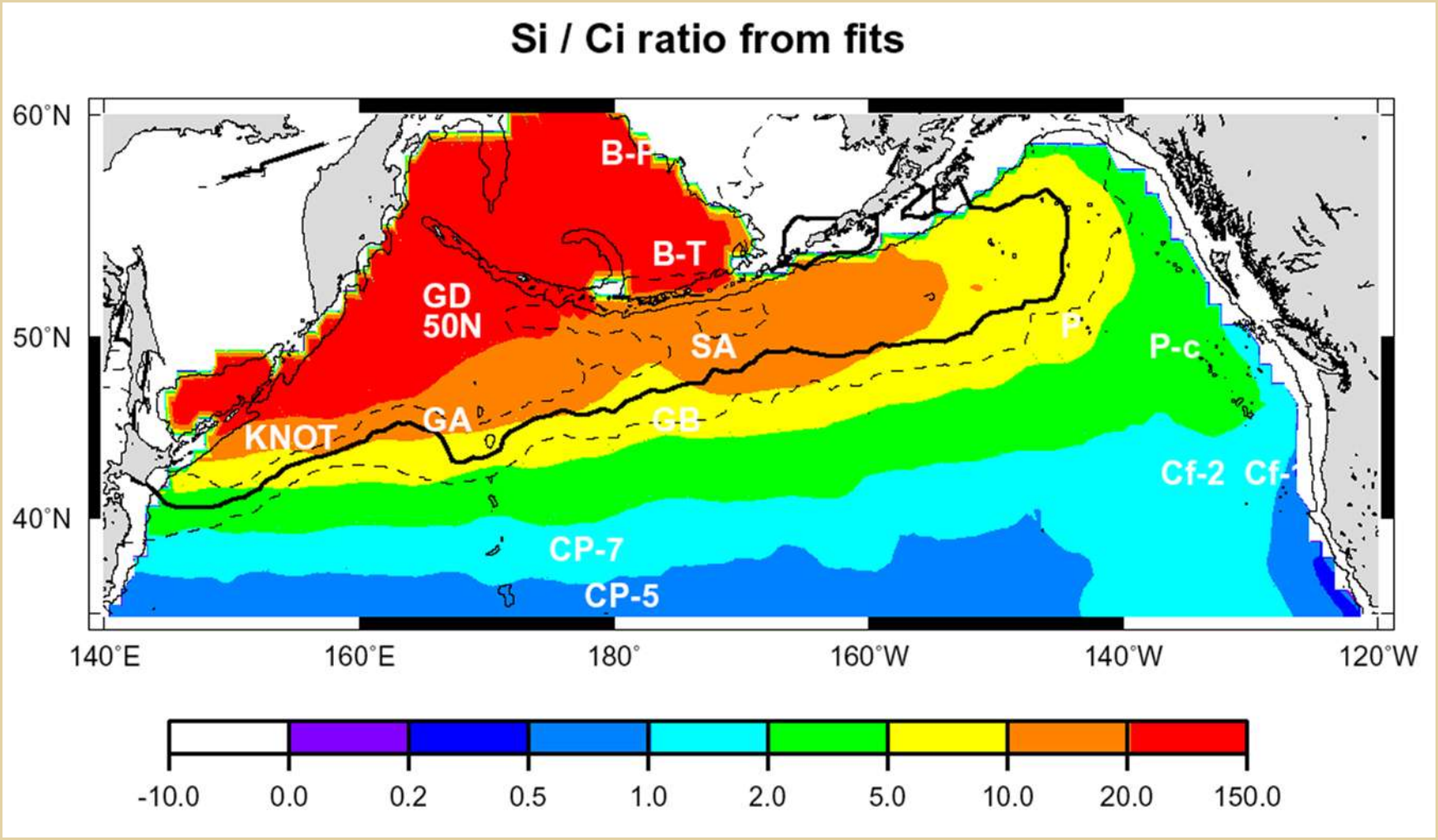
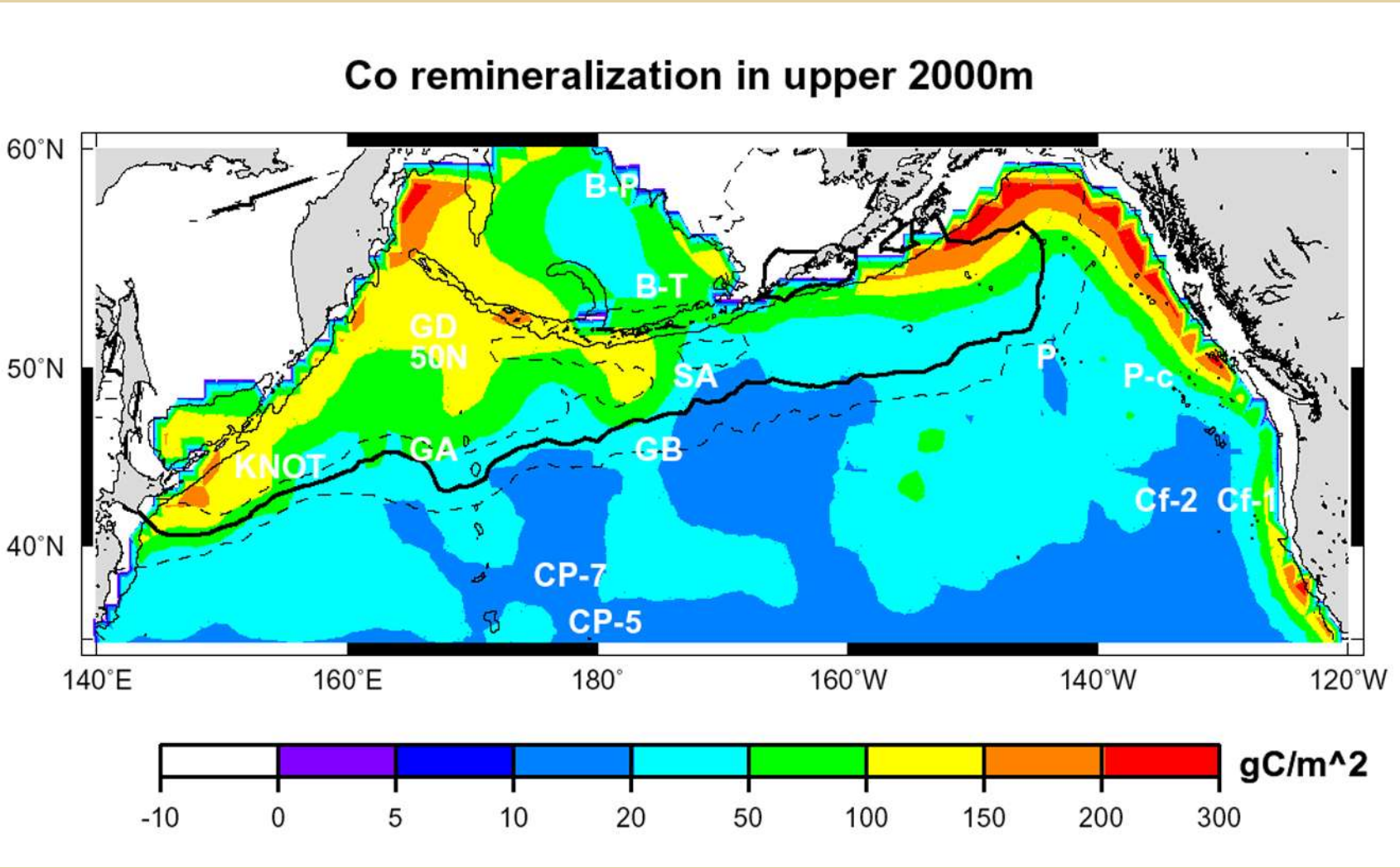
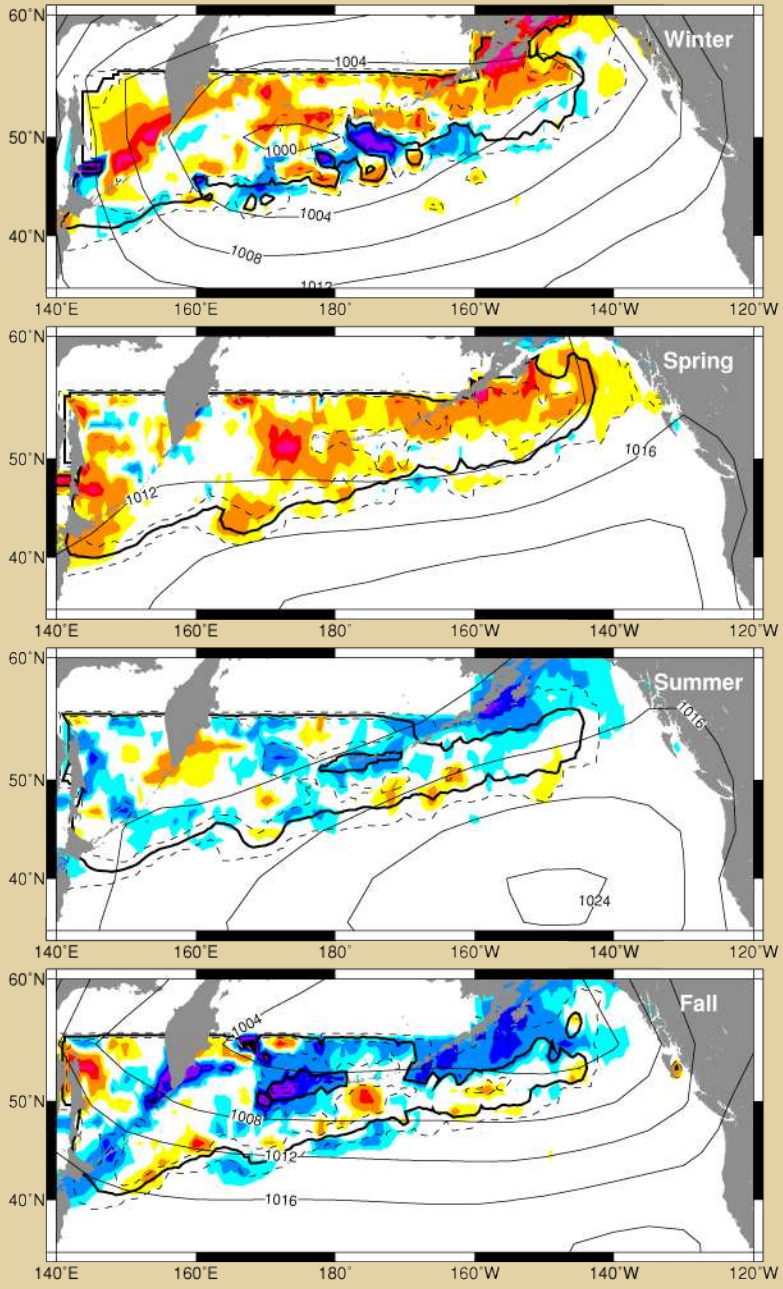
Mission and Objective

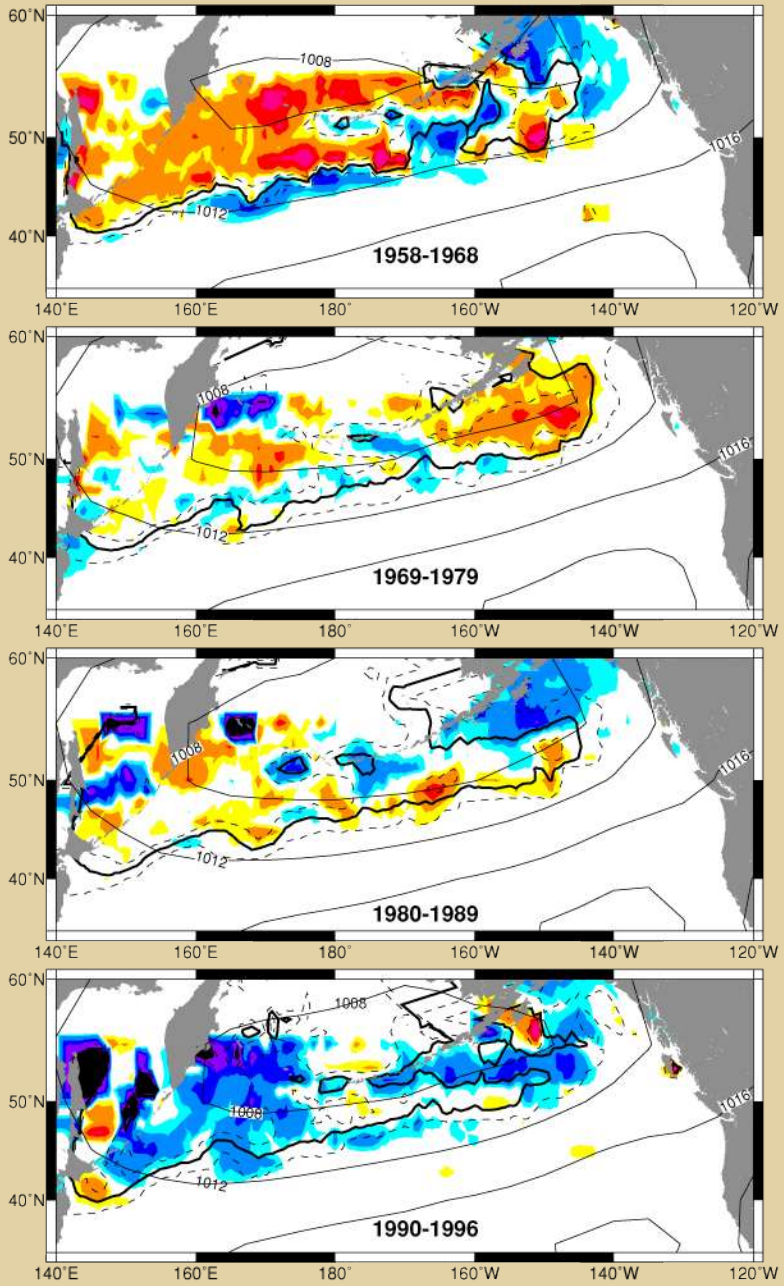

Si / Ci ratio from fits
60°N
50°N
40°N
140°E
160°E
180°
160°W
140°W
120°W
B-P
B-T
GD
50N
SA
P
P-c
KNOT
GA
GB
Cf-2
CP-7
CP-5
-10.0
0.0
0.2
0.5
1.0
2.0
5.0
10.0
20.0
150.0

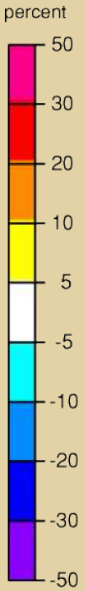

Co remineralization in upper 2000m
60˚N
50˚N
40˚N
140˚E
160˚E
180˚
160˚W
140˚W
120˚W
B-P
B-T
GD
50N
SA
P
P-c
KNOT
GA
GB
Cf-2
Cf-1
CP-7
CP-5
-10
0
5
10
20
50
100
150
200
300
gC/m^2

Seasonal Percent Tmin anomaly and PF

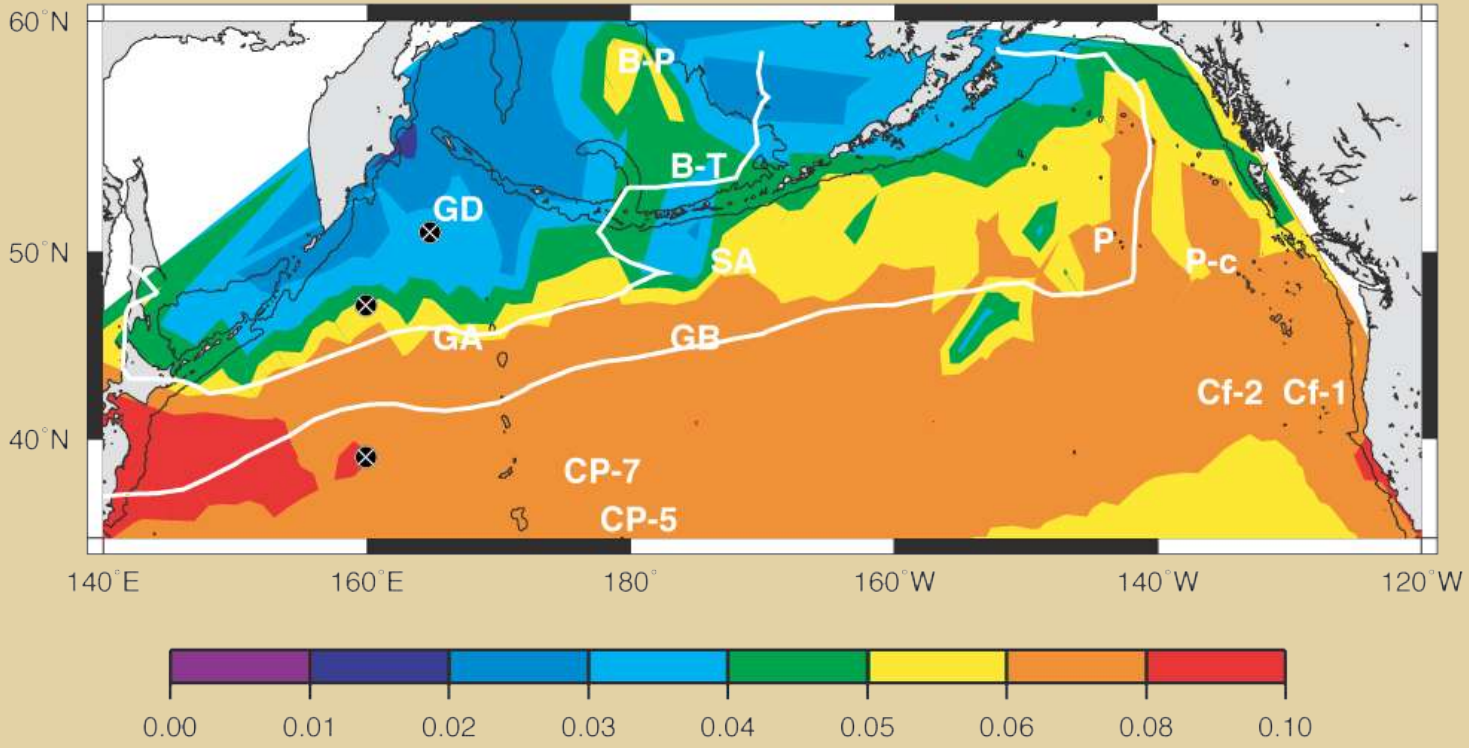


Mean decadal percent Tmin anomaly and SLP contours





Transfer efficiency at 2000 m



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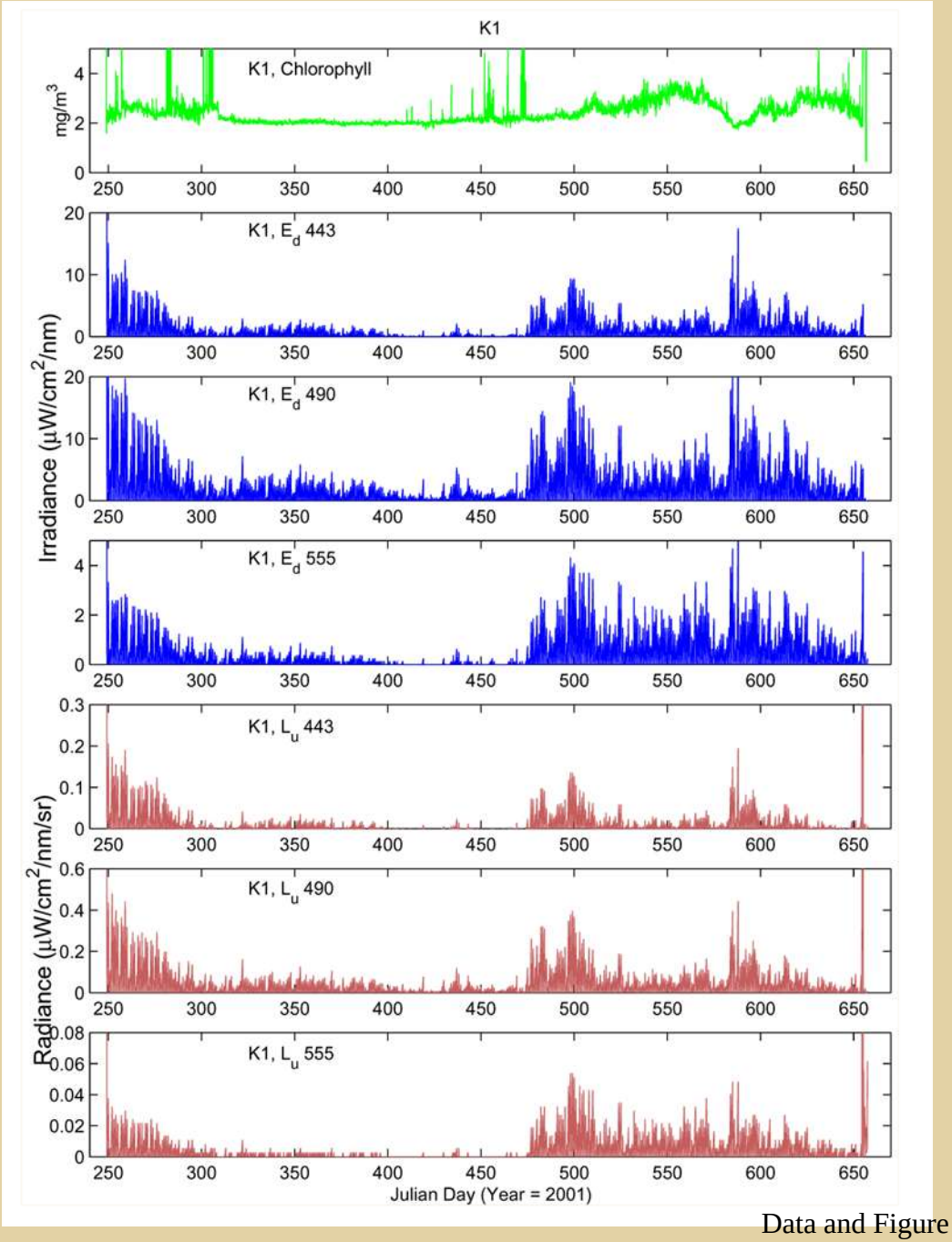
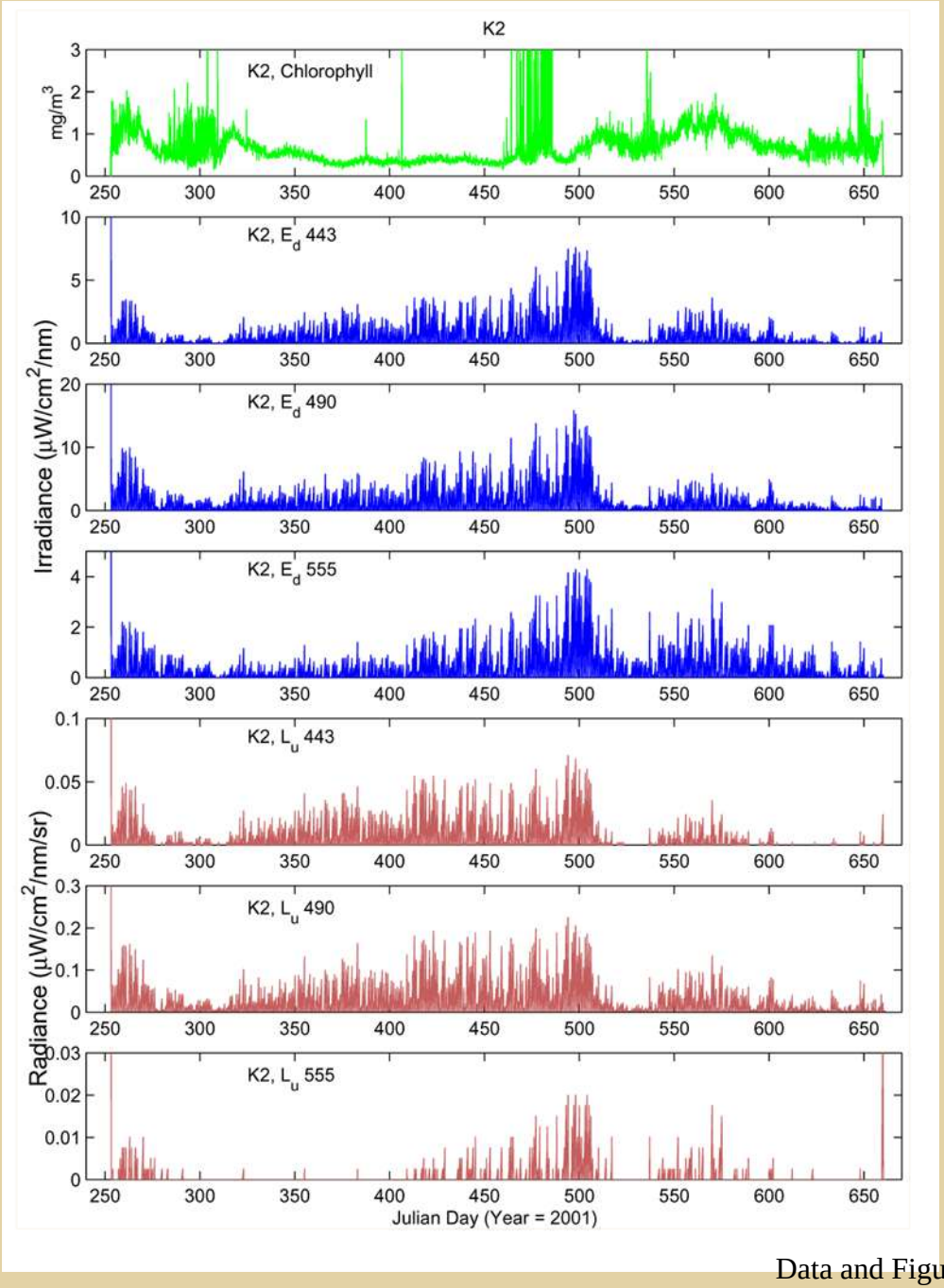
The Team



Data and Figure from T. Dickey, UCSB



Data and Figure from T. Dickey, UCSB

The Challenge

- The Challenge: Why Now?
- Time Series Research
- The Biological Pump
- Investigation
- Why the Pacific Subarctic Zone?
- Immediate Questions

MIO Home
JAMSTEC Home
JPAC Home
Links
Contact Information

Home: The Challenge: Why Now?

The Challenge: Why Now?

The rough and severe seas of the Northwestern Pacific exhibit a unique and vigorous biogeochemical cycle which demands rigorous oceanographic exploration now. The Mutsu Institute for Oceanography (MIO) proposes to investigate this significant ocean region with long term, full-water column time-series researh the expectation of ch by deploying the 128 m R/V *Mirai* and an array of advanced instrumental moorings witsignificantly deepening our understanding of the role of the high latitude ocean in global climatic change.

We strongly urge international scientists who are interested in furthering the understanding of the biogeochemical cycles in the Northwest Pacific to share their research power with MIO. MIO scientists are always willing to collaborate by sharing their hypotheses and exploring the ideas of others. We invite international scientists to attack this strategically difficult area by pursuing a long-term time-series investigation of ocean environmental research.

The resulting models of the high-latitude Pacific will offer a fundamental aid for devising critical policy and economic decisions designed to cope with the CO2 problems that signify an increasing threat to the Earth's environment.

WHAT'S NEW?

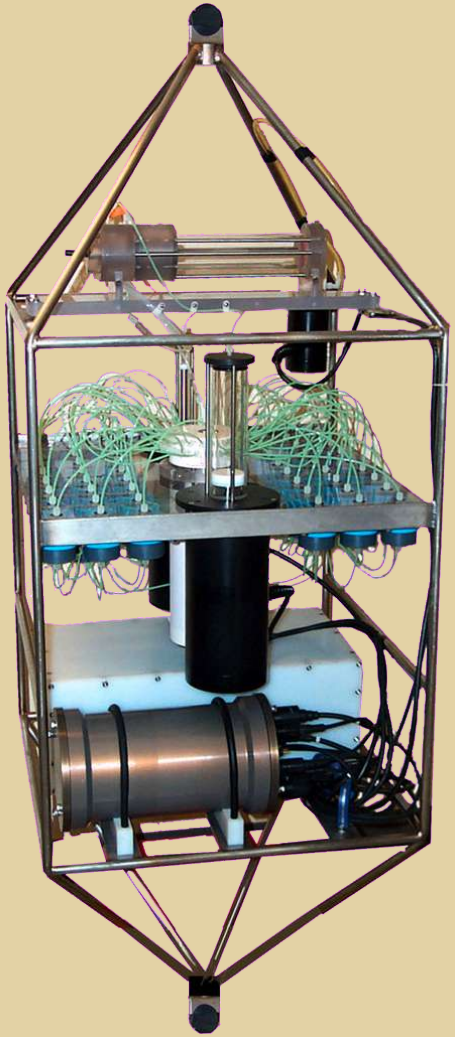
2002 R/V Mirai North West Pacific Cruise Summary

The Mutsu Institute of Oceanography joins the leaders of the world's premiere oceanographic institutions in their commitment to furthering the knowledge, understanding and collaboration that is needed to predict environmental changes. (See the Yokosuka Agreement signed at the 30th anniversary Round Table Discussion of the Japan Marine Technology Center.) MIO expects to expand our current collaborations with scientists and technicians from the Woods Hole Oceanographic Institution through the Joint North Pacific Research Center (J-Pac) to other international scientists interested in our mission.

Biogeochemical Time-Series Sampling Instruments

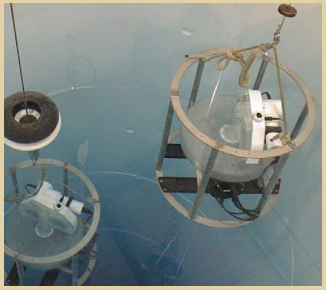
Nutrients –
Water Sampler
(Euphotic Layer)

Sediment Trap
(Ocean Interior)



Autonomous C^{14}
Productivity Incubation

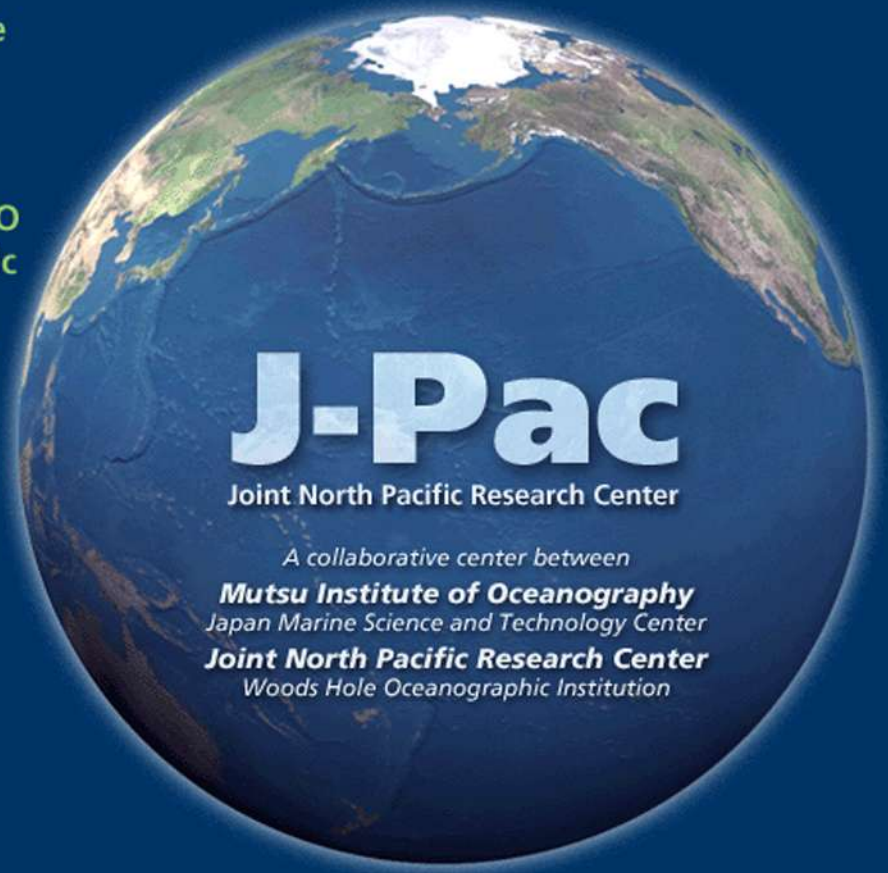
Phytoplankton Sampler
(Euphotic Layer)



Micro-zooplankton
Collector
(Euphotic Layer)

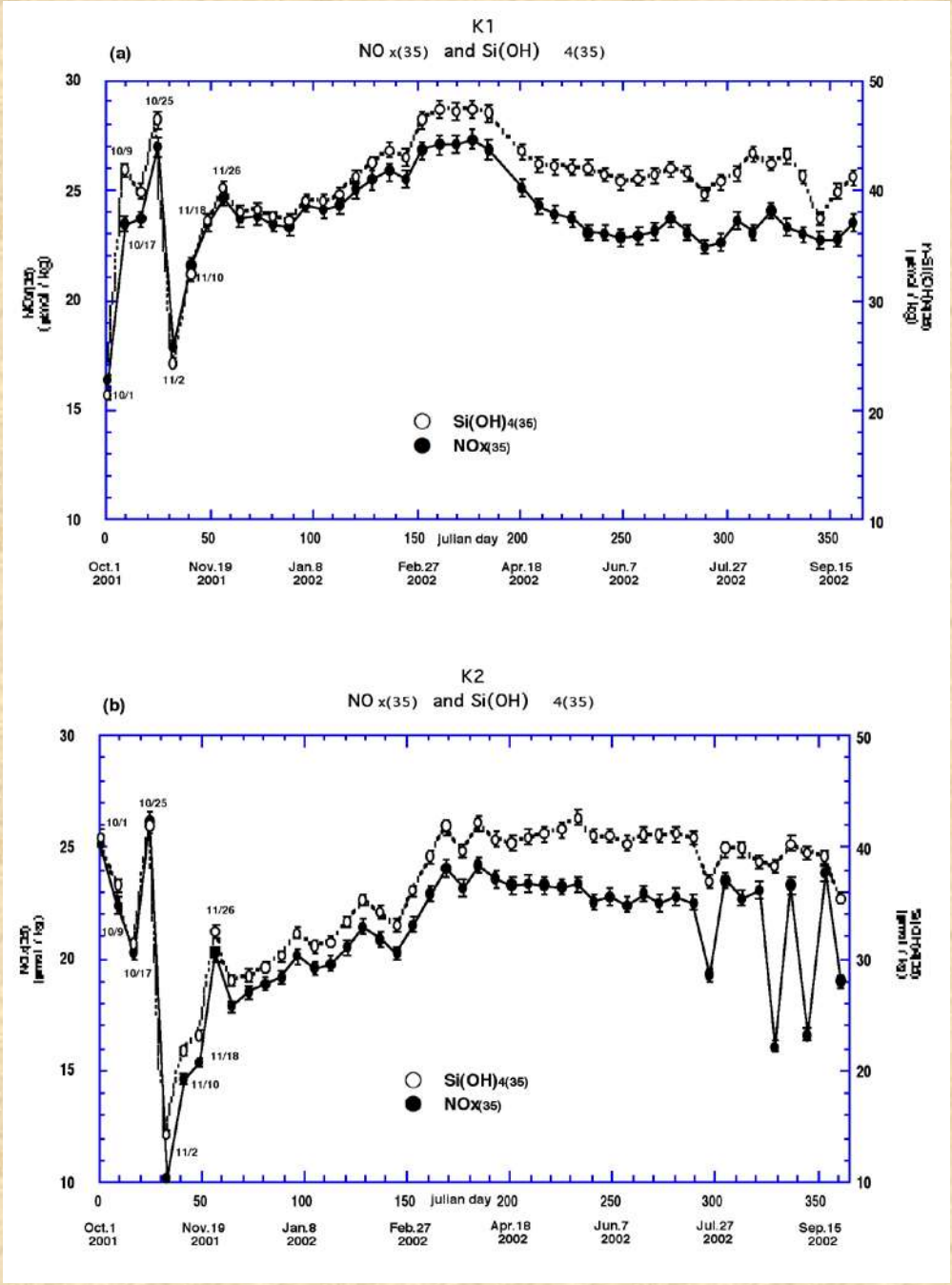
http://jpac.whoi.edu/

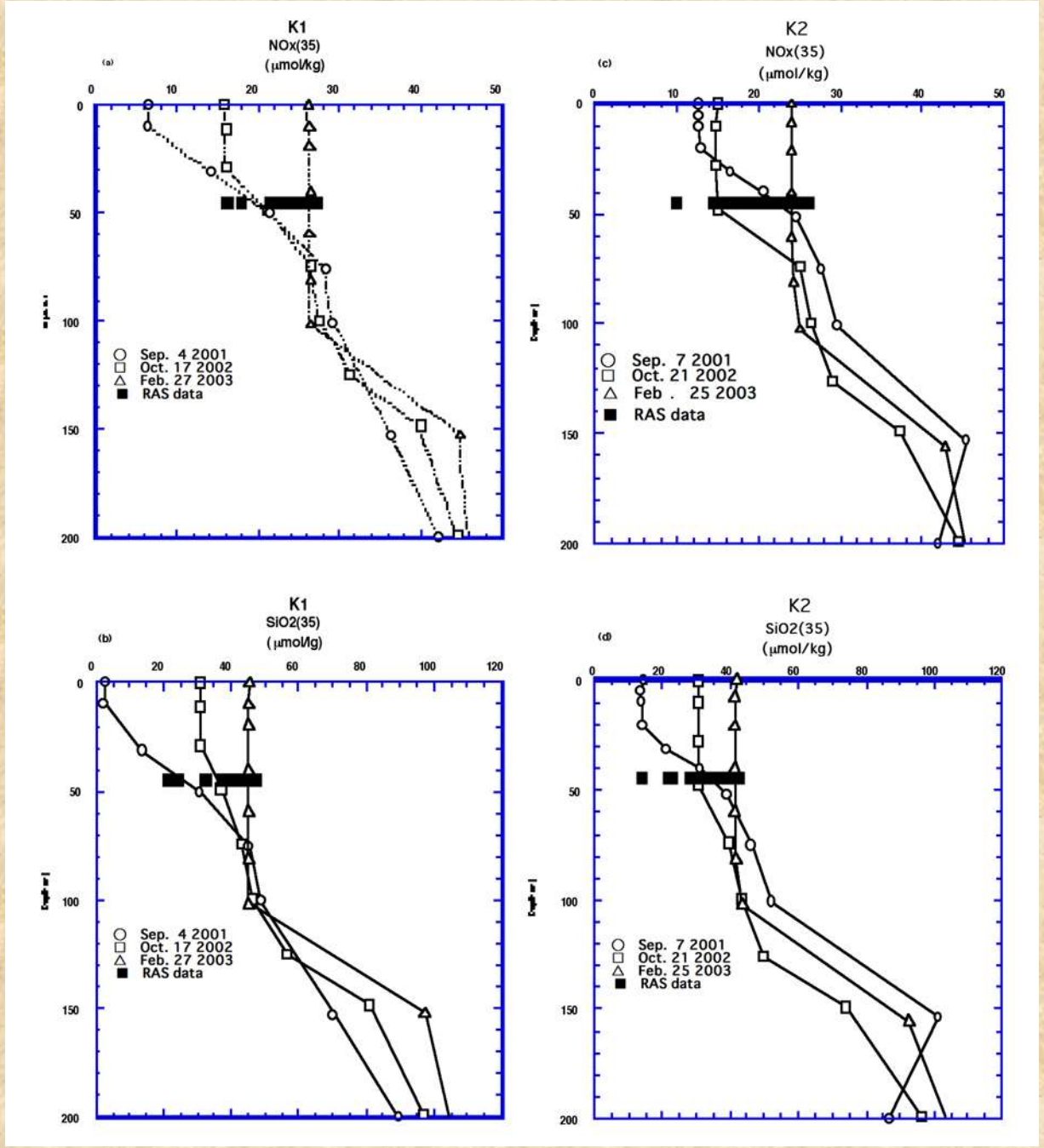
- Japanese
  日本語
- English
  英語
- JPAC/MIO Electronic Library
  電子図書館



JAMSTEC

WOODS HOLE OCEANOGRAPHIC INSTITUTION
1930


K1
(a)
NO x(35) and Si(OH) 4(35)
10/25
10/9
11/26
11/18
10/17
11/10
10/1
11/2
Si(OH)4(35)
NOx(35)
julian day
Oct.1 2001
Nov.19 2001
Jan.8 2002
Feb.27 2002
Apr.18 2002
Jun.7 2002
Jul.27 2002
Sep.15 2002
K2
(b)
NO x(35) and Si(OH) 4(35)
10/25
10/1
10/9
11/26
10/17
11/18
11/10
11/2
Si(OH)4(35)
NOx(35)
julian day
Oct.1 2001
Nov.19 2001
Jan.8 2002
Feb.27 2002
Apr.18 2002
Jun.7 2002
Jul.27 2002
Sep.15 2002


K1
NOx(35)
(μmol/kg)
(a)
Sep. 4 2001
Oct. 17 2002
Feb. 27 2003
RAS data
K2
NOx(35)
(μmol/kg)
(c)
Sep. 7 2001
Oct. 21 2002
Feb . 25 2003
RAS data
K1
SiO2(35)
(μmol/g)
(b)
Sep. 4 2001
Oct. 17 2002
Feb. 27 2003
RAS data
K2
SiO2(35)
(μmol/kg)
(d)
Sep. 7 2001
Oct. 21 2002
Feb. 25 2003
RAS data

Calcareous Nannoplankton

Coccolithophorid

1. *Emiliania huxleyi*

2. *Emiliania huxleyi*

3. *Emiliania huxleyi*

4. *Gephyrocapsa oceanica*

5. *Calcidiscus leptoporus*

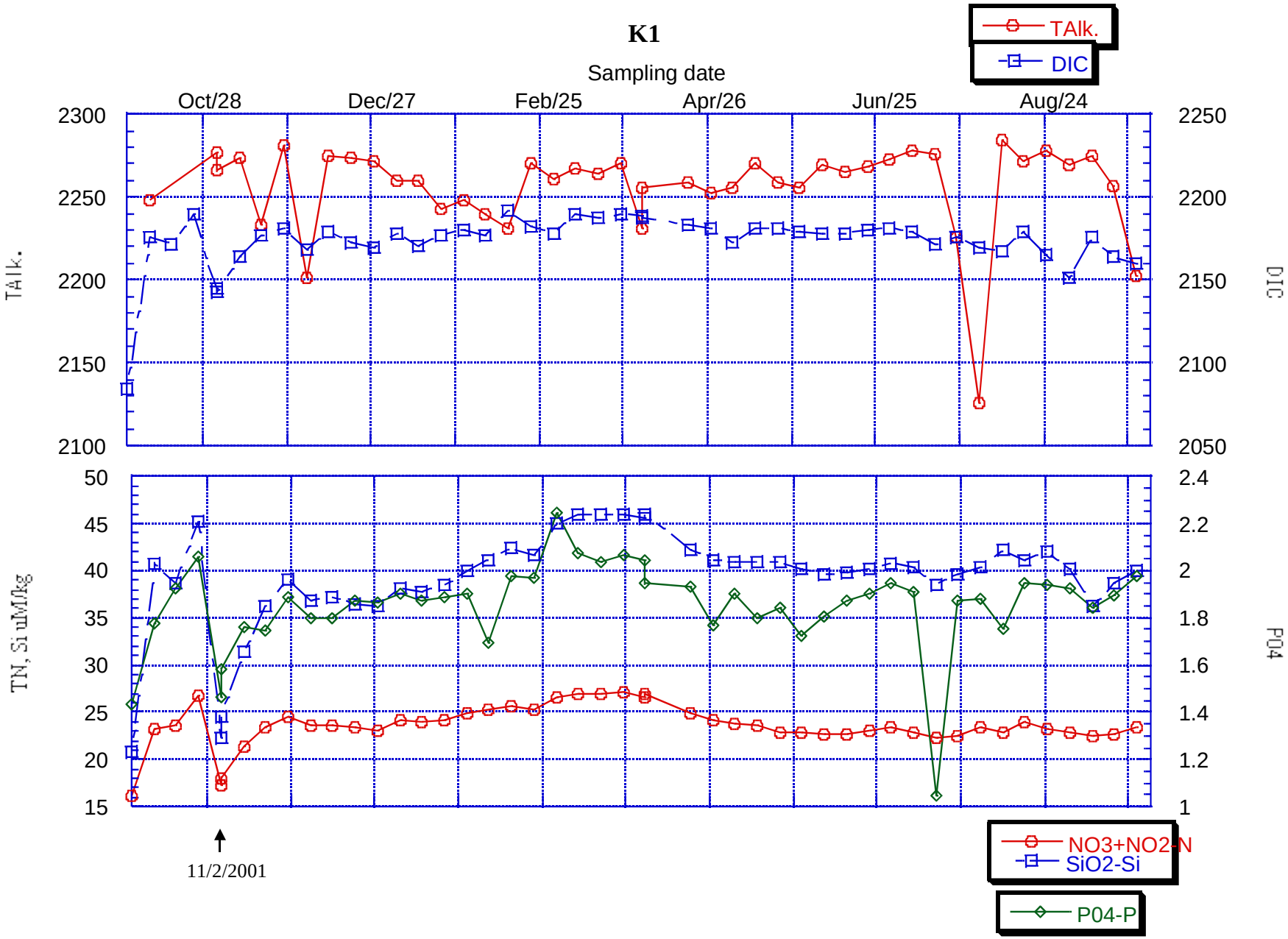
6. *Calcidiscus leptoporus*

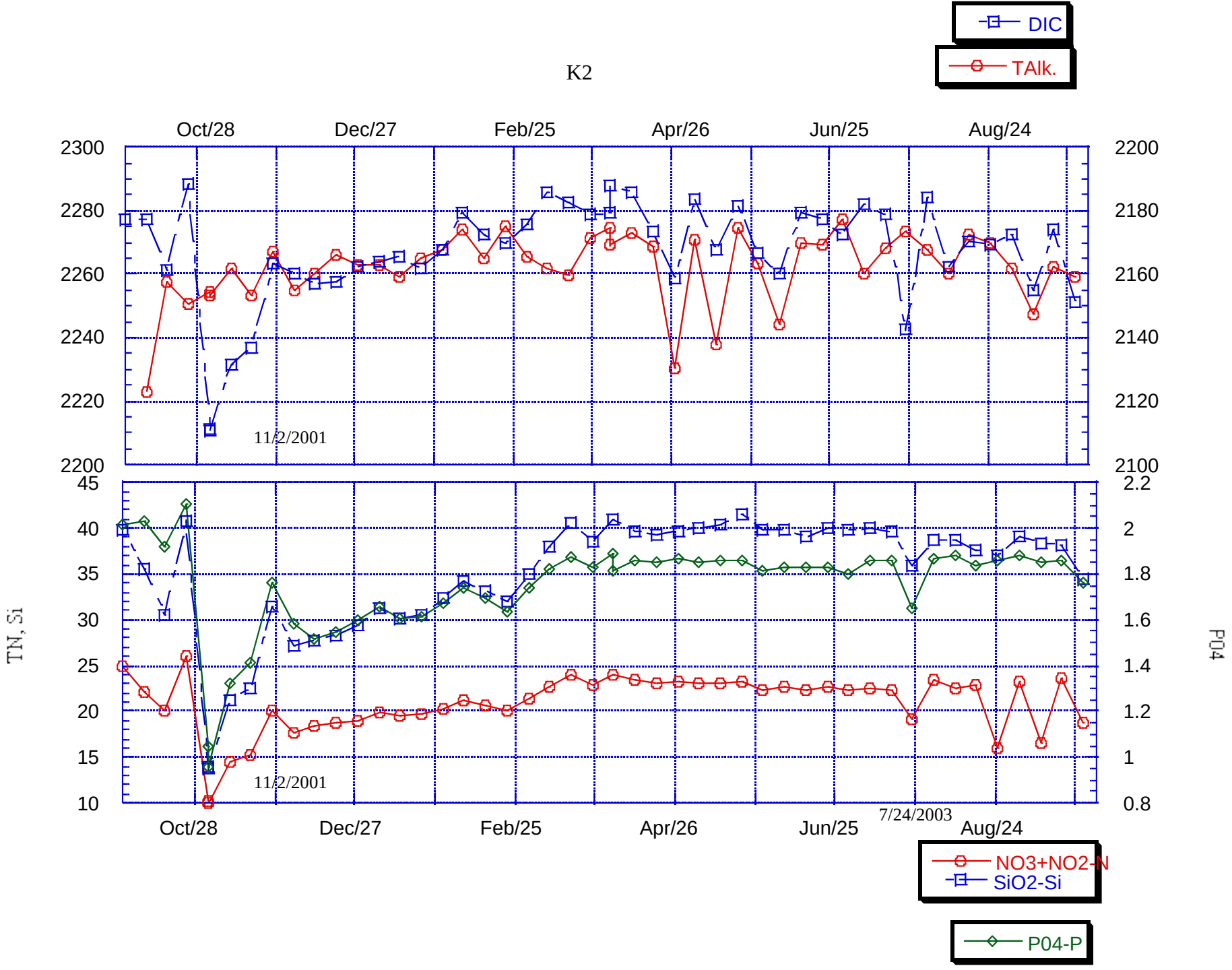
7. *Coccolithus pelagicus*

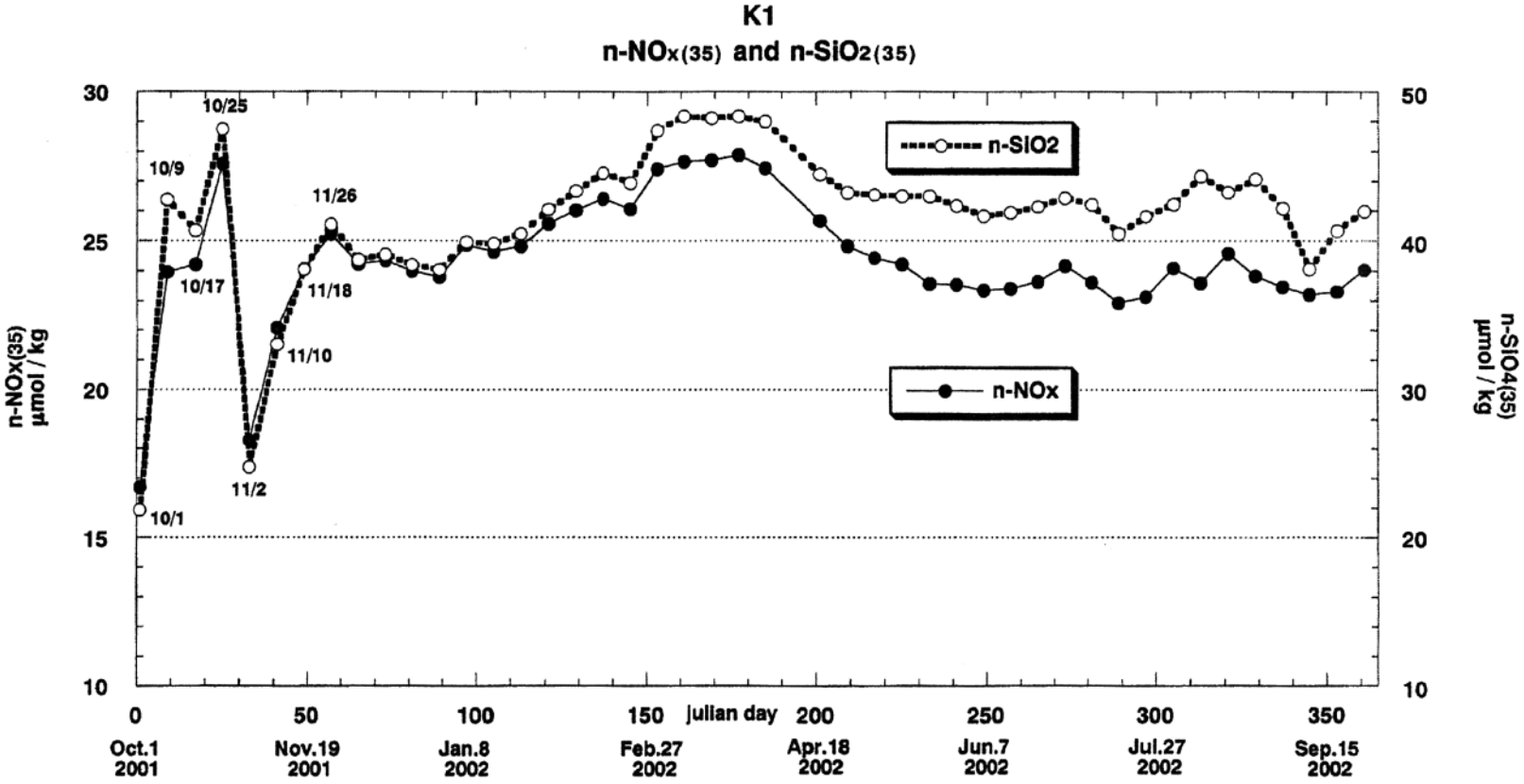
8. *Coccolithus pelagicus*

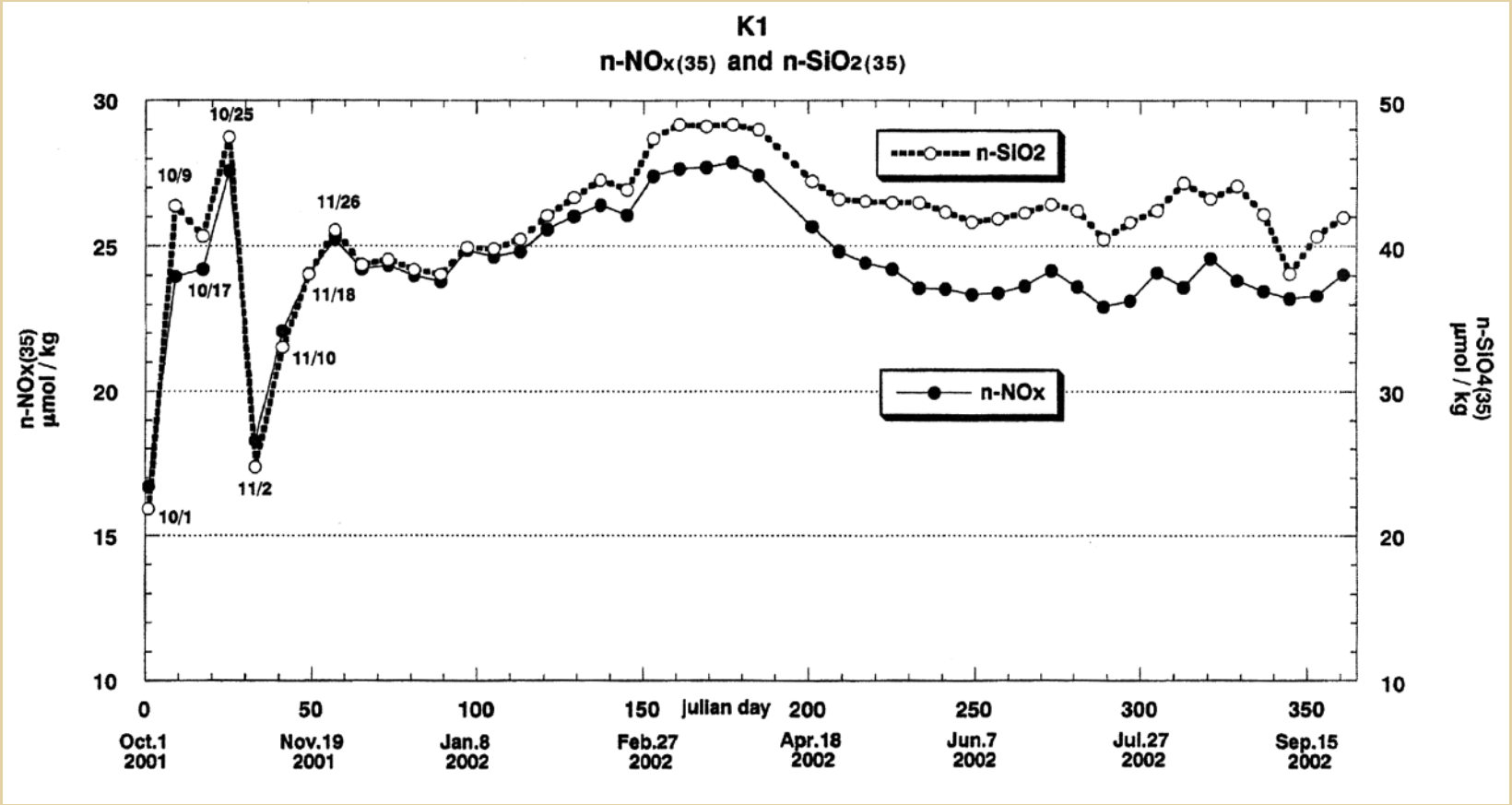
9. *Syracosphaera anthos*

from the northwestern North Pacific


K1
Sampling date
Oct/28
Dec/27
Feb/25
Apr/26
Jun/25
Aug/24
TAlk.
DIC
2300
2250
2200
2150
2100
2250
2200
2150
2100
2050
50
45
40
35
30
25
20
15
2.4
2.2
2
1.8
1.6
1.4
1.2
1
TN, SiuM/kg
P04
11/2/2001
NO3+NO2-N
SiO2-Si
P04-P


K2
DIC
TAlk.
Oct/28
Dec/27
Feb/25
Apr/26
Jun/25
Aug/24
2300
2280
2260
2240
2220
2200
2200
2180
2160
2140
2120
2100
11/2/2001
45
40
35
30
25
20
15
10
2.2
2
1.8
1.6
1.4
1.2
1
0.8
TN, Si
PO4
11/2/2001
7/24/2003
NO3+NO2-N
SiO2-Si
P04-P


K1
n-NOx(35) and n-SiO2(35)
n-NOx(35) µmol / kg
n-SiO4(35) µmol / kg
n-SiO2
n-NOx
10/1
10/9
10/17
10/25
11/2
11/10
11/18
11/26
30
25
20
15
10
50
40
30
20
10
0
50
100
150
200
250
300
350
julian day
Oct.1 2001
Nov.19 2001
Jan.8 2002
Feb.27 2002
Apr.18 2002
Jun.7 2002
Jul.27 2002
Sep.15 2002


K1
n-NOx(35) and n-SiO2(35)
n-NOx(35) µmol / kg
n-SiO4(35) µmol / kg
n-SiO2
n-NOx
10/1
10/9
10/17
10/25
11/2
11/10
11/18
11/26
30
25
20
15
10
50
40
30
20
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0
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julian day
Oct.1 2001
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Feb.27 2002
Apr.18 2002
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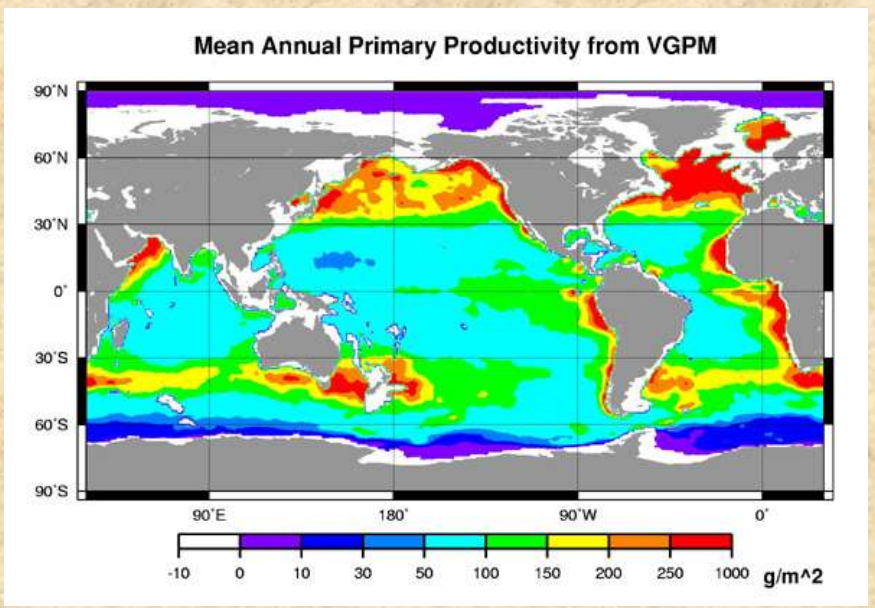
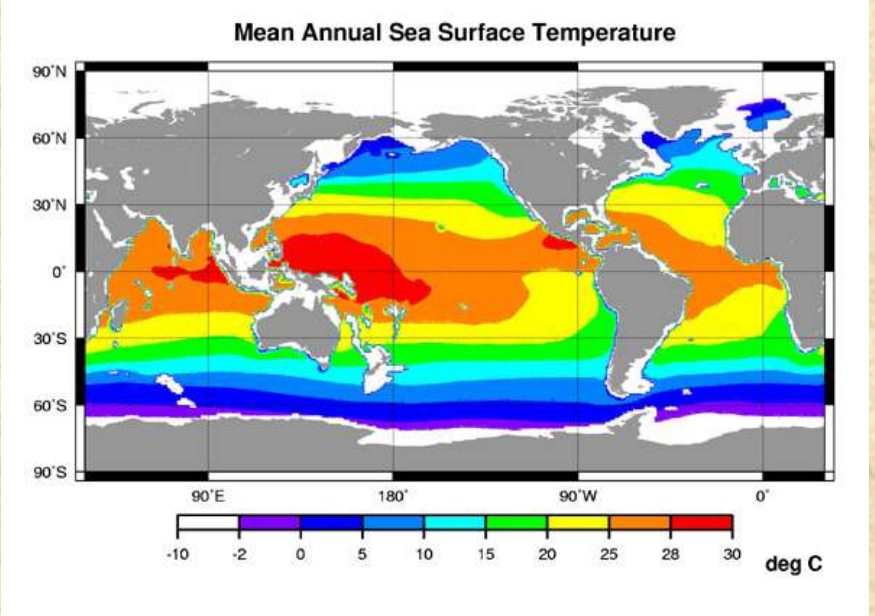
Jul.27 2002
Sep.15 2002


Mean Annual Primary Productivity from VGPM
90°N
60°N
30°N
0°
30°S
60°S
90°S
90°E
180°
90°W
0°
-10
0
10
30
50
100
150
200
250
1000
g/m^2


Mean Annual Sea Surface Temperature
90°N
60°N
30°N
0°
30°S
60°S
90°S
90°E
180°
90°W
0°
-10
-2
0
5
10
15
20
25
28
30
deg C

The Challenge

- The Challenge: Why Now?
- Time Series Research
- The Biological Pump
- Investigation
- Why the Pacific Subarctic Zone?
- Immediate Questions

MIO Home
JAMSTEC Home
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Links
Contact Information

Home: The Challenge: Why Now?

The Challenge: Why Now?

The rough and severe seas of the Northwestern Pacific exhibit a unique and vigorous biogeochemical cycle which demands rigorous oceanographic exploration now. The Mutsu Institute for Oceanography (MIO) proposes to investigate this significant ocean region with long term, full-water column time-series researh the expectation of ch by deploying the 128 m R/V *Mirai* and an array of advanced instrumental moorings witsignificantly deepening our understanding of the role of the high latitude ocean in global climatic change.

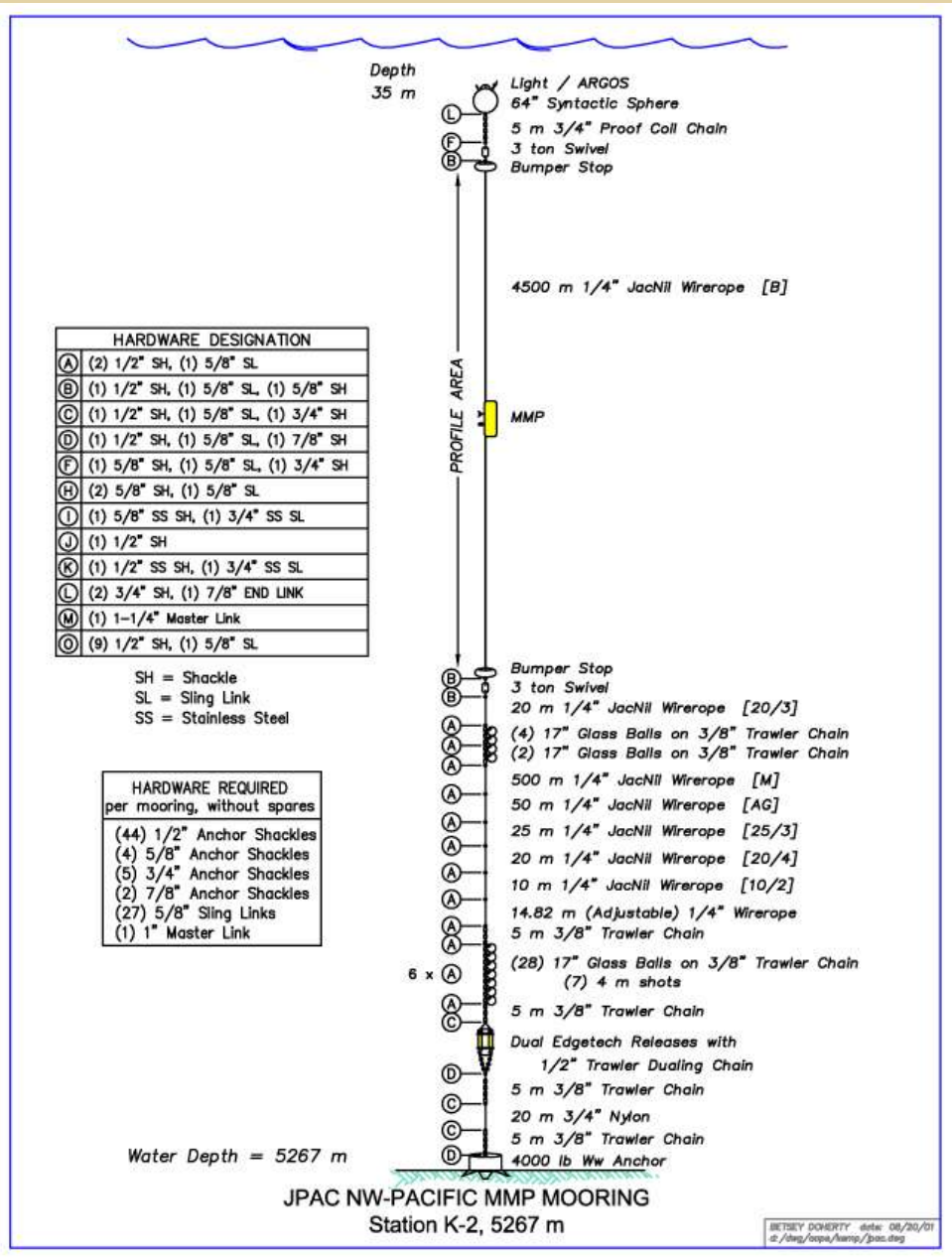
We strongly urge international scientists who are interested in furthering the understanding of the biogeochemical cycles in the Northwest Pacific to share their research power with MIO. MIO scientists are always willing to collaborate by sharing their hypotheses and exploring the ideas of others. We invite international scientists to attack this strategically difficult area by pursuing a long-term time-series investigation of ocean environmental research.

The resulting models of the high-latitude Pacific will offer a fundamental aid for devising critical policy and economic decisions designed to cope with the CO2 problems that signify an increasing threat to the Earth's environment.

WHAT'S NEW?

2002 R/V Mirai North West Pacific Cruise Summary

The Mutsu Institute of Oceanography joins the leaders of the world's premiere oceanographic institutions in their commitment to furthering the knowledge, understanding and collaboration that is needed to predict environmental changes. (See the Yokosuka Agreement signed at the 30th anniversary Round Table Discussion of the Japan Marine Technology Center.) MIO expects to expand our current collaborations with scientists and technicians from the Woods Hole Oceanographic Institution through the Joint North Pacific Research Center (J-Pac) to other international scientists interested in our mission.



HARDWARE DESIGNATION	
A	(2) 1/2" SH, (1) 5/8" SL
B	(1) 1/2" SH, (1) 5/8" SL, (1) 5/8" SH
C	(1) 1/2" SH, (1) 5/8" SL, (1) 3/4" SH
D	(1) 1/2" SH, (1) 5/8" SL, (1) 7/8" SH
F	(1) 5/8" SH, (1) 5/8" SL, (1) 3/4" SH
H	(2) 5/8" SH, (1) 5/8" SL
I	(1) 5/8" SS SH, (1) 3/4" SS SL
J	(1) 1/2" SH
K	(1) 1/2" SS SH, (1) 3/4" SS SL
L	(2) 3/4" SH, (1) 7/8" END LINK
M	(1) 1-1/4" Master Link
O	(9) 1/2" SH, (1) 5/8" SL

SH = Shackle
SL = Sling Link
SS = Stainless Steel

HARDWARE REQUIRED per mooring, without spares
(44) 1/2" Anchor Shackles
(4) 5/8" Anchor Shackles
(5) 3/4" Anchor Shackles
(2) 7/8" Anchor Shackles
(27) 5/8" Sling Links
(1) 1" Master Link

JPAC NW-PACIFIC MMP MOORING
Station K-2, 5267 m

BETSEY DOHERTY date: 08/20/01
d:/dwg/oopa/kamp/jpac.dwg