

**Data Report for New Production Cruise 2004
R/V Oceanus Cruise 399-03**

Prepared: 10 February 2005
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Cruise Summary

In 2004 the New Production research group conducted a 30-day research cruise in the Sargasso Sea from February 15th to March 15th. The primary objective of this cruise was to study the biological response to the passage of winter storms.

From Julian Day 66.5 to 74, we 'caught' a significant storm event and were indeed able to follow the biological response.

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Graphics (2nd drift; JD66.5-74; originally called North Drift – renamed East Drift)
Physical parameters

Cruise Schedule – NEW PRODUCTION 2004

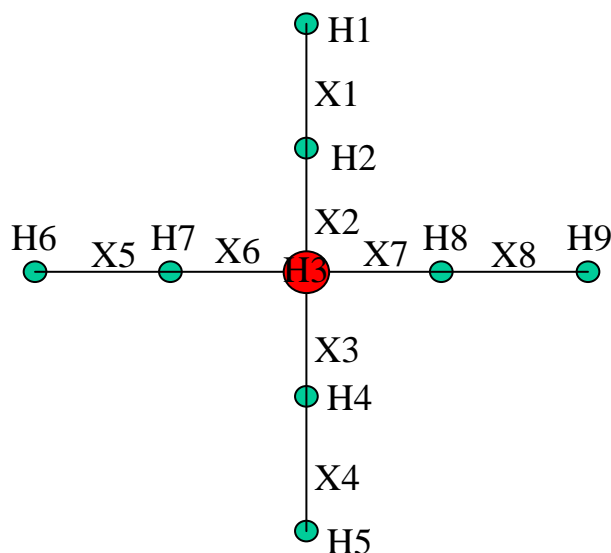
Day 1: Sunday 15th February

(all times are local)

Sunrise: 0659 Sunset: 1802

1000 Depart for Survey Grid Lat/Long (confirm eddy field with Dennis)

The survey grid will be done before and after the process work, including if we have to move away from the process site to avoid contact with eddies, etc. The sampling scheme is the same for each station.



2030 Arrive at Survey Grid 1st Station (31° 20'N 63° 00'W)

2030 HydroCast #1

(1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m

evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON

odds: HPLC, PSi, Meredith, Lora/Carrie

160-500m

D.O., DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

2330 Arrive **XBT #1** (31° 08'N 63° 00'W)

Day 2: Monday 16th February

Sunrise: 0658 Sunset: 1803

0100 Arrive at Survey Grid 2nd Station (30° 55'N 63° 00'W)
0100 **HydroCast #2**
(1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: HPLC, PSi, Meredith, Lora/Carrie
160-500m
D.O., DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

0400 Arrive **XBT #2** (30° 43'N 63° 00'W)
0530 Arrive at Survey Grid 3rd Station (30° 30'N 63° 00'W)

0530 **HydroCast #3**
(1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: HPLC, PSi, Meredith, Lora/Carrie
160-500m
D.O., DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

0830 Arrive **XBT #3** (30° 18'N 63° 00'W)
1000 Arrive at Survey Grid 4th Station (30° 05'N 63° 00'W)

1000 **HydroCast #4**
(1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: HPLC, PSi, Meredith, Lora/Carrie
160-500m
D.O., DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

1300 Arrive **XBT #4** (29° 93'N 63° 00'W)
1430 Arrive at Survey Grid 5th Station (29° 80'N 63° 00'W)

1430 **HydroCast #5**
(1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: HPLC, PSi, Meredith, Lora/Carrie
160-500m
D.O., DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

2130 Arrive at Survey Grid 6th Station (30° 30'N 67° 00'W)
2130 **HydroCast #6**
(1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: HPLC, PSi, Meredith, Lora/Carrie
160-500m
D.O., DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

Day 3: Tuesday 17th February

Sunrise: 0656 Sunset: 1804

0030 Arrive **XBT #5** (30° 30'N 66° 00'W)
0200 Arrive at Survey Grid 7th Station (30° 30'N 65° 00'W)

0200 **HydroCast #7**
(1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: HPLC, PSi, Meredith, Lora/Carrie
160-500m
D.O., DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

0500 Arrive **XBT #6** (30° 30'N 64° 00'W)

0730 Arrive **XBT #7** (30° 30'N 62° 00'W)
0900 Arrive at Survey Grid 8th Station (30° 30'N 61° 00'W)

0900 **HydroCast #8**
(1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: HPLC, PSi, Meredith, Lora/Carrie
160-500m
D.O., DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

1200 Arrive **XBT #8** (30° 30'N 60° 00'W)
1330 Arrive at Survey Grid 9th Station (30° 30'N 59° 00'W)

1330 **HydroCast #9**
(1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)

0-140m

evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON

odds: HPLC, PSi, Meredith, Lora/Carrie

160-500m

D.O., DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

1900

Arrive back at Process Site

(30° 30'N 63° 00'W)

BEGIN PROCESS PORTION OF CRUISE

Note from this point on, all sampling will be done while following the 10m drogue unless otherwise decided.

0930 deploy 10m drogue. 30° 30'N 63° 00'W
(try and follow RDF get hits overnight)

1030 *Comm Structure (CAST #10)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
Samples: HPLC, PIC/POC/PON, PSi, microscopy, FCM, CBN ²³⁴Th

1200 *PM Profile (CAST #11)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: 3He/3H*, Nutrients, O2, Salts,

1930 *PM Production (CAST #12)*
Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),

2200 PM Production bottles in incubator

2300 *AM Profile (CAST #13)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: Nutrients, DIC, TOC/N, deep PIC/POC/PON,

Day 5: Thursday 19th February

Sunrise: 0655 Sunset: 1805

All overboard activities suspended due to weather

1730 XBT #12

2300 XBT #13

Day 6: Friday 20th February

Sunrise: 0654 Sunset: 1806

Steam to the following position to start the days activities: **30° 34'N 63° 05'N**

0830 deploy drogue

- 0900 *Comm Structure (CAST #14)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
 Samples: HPLC, PIC/POC/PON, microscopy, FCM, CBN ²³⁴Th
- 1200 *PM Profile (CAST #15)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: 3He/3H, O2, Nutrients,
- 1330 *in situ* pump – check out and prepare for use/attachment to CTD
- 1430 Deploy PITS array
- 1930 *PM Production (CAST #16)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),
- 2200 PM Production bottles in incubator
- 2300 *AM Profile (CAST #17)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, DIC, TOC/N, salts

Day 7: Saturday 21st February

Sunrise: 0653 Sunset: 1807

- 0330 *AM Production (CAST #18)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)
- Depths: 0, 40 80 100, 140, 200, 300, 500m (**N.B.** one bottle/depth)
 Samples: CAC Bact Prod; biomass; sugars,
- 0430 Breakdown evening production incubations
- 0630 AM Production spar deployed
- 0800 *Comm Structure (CAST #19)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
 Samples: HPLC, PIC/POC/PON, microscopy, FCM, CBN ²³⁴Th

- 1200 *PM Profile (CAST #20)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: 3He/3H, Nutrients, O₂,
- 1430 CTD cast to 3000m to collect deep Th calibration samples for Claudia (5 bottles total, or full profile).
- 1830 Retrieve AM Production spar
- 2300 *AM Profile (CAST #21)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: Nutrients, DIC, TOC/N, deep PIC/POC/PON,

Day 8: Sunday 22st February

Sunrise: 0652 Sunset: 1808

- 0245 *AM Production (CAST #22)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)
- Depths: 0, 40 80 100, 140, 200, 300, 500m (**N.B.** one bottle/depth)
 Samples: CAC Bact Prod; biomass; sugars,
- 0430 Breakdown evening production incubations
- 0630 AM Production spar deployed
- 0800 *Comm Structure (CAST #23)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
 Samples: HPLC, PIC/POC/PON, microscopy, FCM, CBN ²³⁴Th
- 1000 Deploy PITS array
- 1200 *PM Profile (CAST #24)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: 3He/3H, Nutrients, O₂,
- 1430 CTD cast to 3000m to collect deep Th calibration samples for Claudia (5 bottles total, or full profile).
- 1830 Retrieve AM Production spar
- 1930 *PM Production (CAST #25)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),
- 2200 PM Production bottles in incubator
- 2300 *AM Profile (CAST #26)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, DIC, TOC/N, deep PIC/POC/PON,

All activities to be conducted within several tenths of a mile of the 10m drogue, if possible.

Day 9: Monday 23rd February

Sunrise: 0653 Sunset: 1809

- 0245 *AM Production (CAST #27)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)
- Depths: 0, 40 80 100, 140, 200, 300, 500m (**N.B.** one bottle/depth)
 Samples: CAC Bact Prod; biomass; sugars,
- 0430 Breakdown evening production incubations
- 0630 AM Production spar deployed
- 0800 *Comm Structure (CAST #28)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
 Samples: HPLC, PIC/POC/PON, microscopy, FCM, CBN ²³⁴Th
- 0930 deploy the in situ pump at the end of the wire for the CTD
- 1200 *PM Profile (CAST #29)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, salts, NH₄
- Afternoon spent re-terminating the CTD.
- 1830 Retrieve AM Production spar
- 1930 *PM Production (CAST #30)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),
- 2200 PM Production bottles in incubator
- 2300 *AM Profile (CAST #31)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, DIC, DO's, TOC/N

All activities to be conducted within several tenths of a mile of the 10m drogue, if possible.

Day 10: Tuesday 24rd February

Sunrise: 0652 Sunset: 1810

- 0245 *AM Production (CAST #32)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)
- Depths: 0, 40 80 100, 140, 200, 300, 500m (**N.B.** one bottle/depth)
 Samples: CAC Bact Prod; biomass; sugars,
- 0430 Breakdown evening production incubations
- 0630 AM Production spar deployed
- 0800 *Comm Structure (CAST #33)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
 Samples: HPLC, PIC/POC/PON, microscopy, FCM,
- 1200 *PM Profile (CAST #34)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, salts, NH₄
- 1400 deep CTD cast 0-3000m for collecting deep ²³⁴Th inventory samples (should be done by
 ~1730h) (**CAST #35**)
- 1830 Retrieve AM Production spar
- 1930 *PM Production (CAST #36)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),
- 2200 PM Production bottles in incubator
- 2300 *AM Profile (CAST #37)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, DIC, DO's, TOC/N

All activities to be conducted within several tenths of a mile of the 10m drogue, if possible.

Day 11: Wednesday 25th February

Sunrise: 0652 Sunset: 1810

- 0245 *AM Production (CAST #38)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)
- Depths: 0, 40 80 100, 140, 200, 300, 500m (**N.B.** one bottle/depth)
 Samples: CAC Bact Prod; biomass; sugars,
- 0430 Breakdown evening production incubations
- 0630 AM Production spar deployed
- 0800 *Comm Structure (CAST #39)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
 Samples: HPLC, PIC/POC/PON, microscopy, FCM,
- 1200 *PM Profile (CAST #40)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, salts,

The afternoon will be spent tracking down the PITS array and making sure that a good visual mark is made.

- 1830 Retrieve AM Production spar
- 2300 *AM Profile (CAST #41)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, DIC, DO's, TOC/N

All activities to be conducted within several tenths of a mile of the 10m drogue, if possible.

Day 12: Thursday 26th February

Sunrise: 0650 Sunset: 1812

- 0245 *AM Production (CAST #42)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)
 Depths: 0, 40 80 100, 140, 200, 300, 500m (**N.B.** one bottle/depth)
 Samples: CAC Bact Prod; biomass; sugars,
- 0430 Breakdown evening production incubations

- 0630 AM Production spar deployed
- 0800 *Comm Structure (CAST #43)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
Samples: HPLC, PIC/POC/PON, microscopy, FCM,
- 0930 in situ pump profile. Note, this cast will immediately follow **CAST #43** and therefore can be earlier than 0930 if that is when **CAST #43** is done.
- 1130 *PM Profile (CAST #44)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: Nutrients, salts,
- As soon as cast #44 is on deck, we should make way for the position of the PITS array. The remainder of the afternoon will be spent tracking down the PITS array. When it is found, a decision will be made based upon weather and sea state as to whether or not it is safe to retrieve it. If safe, we will retrieve it, and then **redeploying** to the south at the then current position of the drogue and primary production arrays.
- 1830 Retrieve AM Production spar
- 2300 *AM Profile (CAST #45)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: Nutrients, DIC, DO's, TOC/N

Day 13: Friday 26th February

Sunrise: 0649 Sunset: 1813

- 0245 *AM Production (CAST #46)*
Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)

Depths: 0, 40 80 100, 140, 200, 300, 500m (**N.B.** one bottle/depth)
Samples: CAC Bact Prod; biomass; sugars,

0545 AM Production spar deployed

0800 *Comm Structure (CAST #47)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
Samples: HPLC, PIC/POC/PON, microscopy, FCM,

1200 *PM Profile (CAST #48)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: Nutrients, salts,

The afternoon will be spent tracking down the PITS array, production and drogue to make sure that a good visual mark is made.

1830 Retrieve AM Production spar

1930 *PM Production (CAST #49)*
Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),

2200 PM Production bottles in incubator

2300 *AM Profile (CAST #50)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: Nutrients, DIC, DO's, TOC/N

All activities to be conducted within several tenths of a mile of the 10m drogue, if possible.

Day 14: Saturday 28th February

Sunrise: 0648 Sunset:1814

0245 *AM Production (CAST #51)*
Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)
Depths: 0, 40 80 100, 140, 200, 300, 500m (**N.B.** one bottle/depth)
Samples: CAC Bact Prod; biomass; sugars,

0430 Breakdown evening production incubations

- 0630 AM Production spar deployed
- 0800 *Comm Structure (CAST #52)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
 Samples: HPLC, PIC/POC/PON, microscopy, FCM,
- 0930 in situ pump profile. Note, this cast will immediately follow **CAST #52** and therefore can be earlier than 0930 if that is when **CAST #52** is done.
- 1200 *PM Profile (CAST #53)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, salts,
- The afternoon will be spent tracking down the PITS array, production and drogue to make sure that a good visual mark is made.
- 1830 Retrieve AM Production spar
- 1930 *PM Production (CAST #54)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),
- 2200 PM Production bottles in incubator
- 2300 *AM Profile (CAST #55)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, DIC, DO's, TOC/N

All activities to be conducted within several tenths of a mile of the 10m drogue, if possible.

Day 15: Sunday 29th February

Sunrise: 0649 Sunset:1815

Day shortened due to extreme weather. Winds at 0000, steady 40 knots, gusts to 50knots.

- 1200 *PM Profile (CAST #56)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, salts,

The afternoon will be spent tracking down the PITS array, production and drogue to make sure that a good visual mark is made.

- 1930 *PM Production (CAST #57)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),
- 2200 PM Production bottles in incubator
- 2300 *AM Profile (CAST #58)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, DIC, DO's, TOC/N

All activities to be conducted within several tenths of a mile of the 10m drogue, if possible.

Day 16 Monday 1st March

Sunrise: 0646 Sunset:1816

- 0245 *AM Production (CAST #59)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)
 Depths: 0, 40 80 100, 140, 200, 300, 500m (**N.B.** one bottle/depth)
 Samples: CAC Bact Prod; biomass; sugars,
- 0400 Breakdown evening production incubations
- 0600 AM Production spar deployed
- 0800 *Comm Structure (CAST #60)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
 Samples: HPLC, PIC/POC/PON, microscopy, FCM,
- 0930 in situ pump profile. Note, this cast will immediately follow **CAST #60** and therefore can be earlier than 0930 if that is when **CAST #60** is done.
- 1200 *PM Profile (CAST #61)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, salts,
- The afternoon will be spent tracking down the PITS array, and recovering it.
- 1830 Retrieve AM Production spar

The rest of the schedule depends upon the eddy map that will be sent by Dennis McGillicuddy today. We may forego some of these casts in order to steam to a northerly station and start our sampling regime where we are more likely to get deep convective mixing.

Day 16 Monday 1st March

Sunrise: 0646 Sunset: 1816

2230 Depart for beginning of new XBT (Station #9) survey grid **30° 40'N 63° 45'W**

Day 17 Tuesday 2nd March

Sunrise: 0645 Sunset: 1817

0900 Arrive at XBT Station #15 - **30° 40'N 63° 45'W**
(based upon 10kt speed and ~120mile transit)

1130 Arrive at XBT Station #16 - **31° 05'N 63° 45'W**

1400 Arrive at **Hydrocast #63** - **31° 30'N 63° 45'W**
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: DIC, DO's, Nutrients, salts, HPLC, PIC/POC/PON, microscopy, FCM,

NOTE: This will be the New Process Site for the remainder of the cruise

1830 Arrive at XBT Station #17 - **31° 55'N 63° 45'W**

2100 Arrive at XBT Station #18 - **32° 20'N 63° 45'W**

Day 18 Wednesday 3rd March

Sunrise: 0644 Sunset: 1818

- 0300 Arrive at XBT Station #19 - **31° 30'N 64° 35'W**
- 0530 Arrive at XBT Station #20 - **31° 30'N 64° 10'W**
- 0800 Arrive at XBT Station #21 - **31° 30'N 63° 45'W**
- 1030 Arrive at XBT Station #22 - **31° 30'N 63° 20'W**
- 1300 Arrive at XBT Station #23 - **31° 30'N 62° 55'W**
- 1800 Return to New Process Site - **31° 30'N 63° 45'W**
Deploy drogue unit, confirm flotation and RDF, Flasher test

All activities to be conducted within several tenths of a mile of the 10m drogue, if possible.

- 1930 *PM Production (CAST #64)*
Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),
- 2200 PM Production bottles in incubator
- 2300 *AM Profile (CAST #65)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: Nutrients, DIC, DO's, TOC/N

All activities to be conducted within several tenths of a mile of the 10m drogue, if possible.

Day 19: Thursday 4th March

Sunrise: 0643 Sunset:1819

- 0245 *AM Production (CAST #66)*
Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)
Depths: 0, 40 80 100, 140, 200, 300, 500m (**N.B.** one bottle/depth)
Samples: CAC Bact Prod; biomass; sugars,
- 0400 Breakdown evening production incubations

- 0545 AM Production spar deployed
- 0800 *Comm Structure (CAST #67)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
Samples: HPLC, PIC/POC/PON, microscopy, FCM,
- 0930 in situ pump profile. Note, this cast will immediately follow **CAST #67** and therefore can be earlier than 0930 if that is when **CAST #67** is done.
- 1200 *PM Profile (CAST #68)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: Nutrients, salts,
- 1400 PITs will be deployed within several tenths of a mile of the drogue
- 1830 Retrieve AM Production spar
- 1930 *PM Production (CAST #69)*
Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),
- 2200 PM Production bottles in incubator
- 2300 *AM Profile (CAST #70)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: Nutrients, DIC, DO's, TOC/N

Day 20: Friday 5th March

Sunrise: 0642 Sunset: 1820

- 0245 *AM Production (CAST #71)*
Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)
Depths: 0, 40 80 100, 140, 200, 300, 500m (**N.B.** one bottle/depth)
Samples: CAC Bact Prod; biomass; sugars,
- 0400 Breakdown evening production incubations
- 0600 AM Production spar deployed

0800 *Comm Structure (CAST #72)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
Samples: HPLC, PIC/POC/PON, microscopy, FCM,

1200 *PM Profile (CAST #73)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: Nutrients, salts,

The afternoon will be spent getting visual locations on PITs (Mr. Blue), production spar (Mr. Green), and the drogue (Mr. Orange).

1830 Retrieve AM Production spar

1930 *PM Production (CAST #74)*
Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),

2200 PM Production bottles in incubator

2300 *AM Profile (CAST #75)*
Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: Nutrients, DIC, DO's, TOC/N

Day 20 Friday March 5th --- UPDATE ---

Starting upon location of PITS (Mr. Blue), the array will be retrieved. Immediately upon securing array, steam for Production (Mr. Green). Upon location, this will be retrieved. Upon securing production array, immediately steam to the drogue (Mr. Orange) and retrieve.

All other activities scheduled for this evening, Casts #74 & 75, are cancelled.

Upon successful retrieval of all gear currently in the water, we will steam southeast to the following coordinates:

30° 40'N 062° 30'W

for arrival in time to start the daily operations as listed below.

Day 21 Saturday March 6th

Sunrise: 0641 Sunset: 1821

- 0630 Deploy drogue in the same area as the production spar
- 0800 *Comm Structure (CAST #74)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
 Samples: HPLC, PIC/POC/PON, microscopy, FCM,
- 1200 *PM Profile (CAST #75)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, salts,
- 1400 Deploy PITS (Mr. Blue) in the new location.
- 1830 Retrieve AM Production spar
- 1930 *PM Production (CAST #76)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 15N, LK-rna; 15N; 13C (4depths),
- 2200 PM Production bottles in incubator
- 2300 *AM Profile (CAST #77)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, DIC, DO's, TOC/N

Day 22 Sunday March 7th

Sunrise: 0641 Sunset: 1821

- 0245 *AM Production (CAST #78)*
 Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)
 Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)
 Depths: 0, 40 80 100, 140, 200, 300, 500m (**N.B.** one bottle/depth)
 Samples: CAC Bact Prod; biomass; sugars,
- 0400 Breakdown evening production incubations
- 0600 AM Production spar deployed
- 0800 *Comm Structure (CAST #79)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)
 Samples: HPLC, PIC/POC/PON, microscopy, FCM,

- 1200 *PM Profile (CAST #80)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, salts,
- 1400 3000m cast for ²³⁴Th (CAST #81)
- 1830 Retrieve AM Production spar
- 1930 *PM Production (CAST #82)*
 Depths: 1,20,40,60,80,100,120,140m (N.B. 2 bottles/depth)
 Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),
- 2200 PM Production bottles in incubator
- 2300 *AM Profile (CAST #83)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, DIC, DO's, TOC/N

Day 23 Monday March 8th

Sunrise: 0640 Sunset: 1822

- 0245 *AM Production (CAST #84)*
 Depths: 1,20,40,60,80,100,120,140m (N.B. 2 bottles/depth)
 Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)
 Depths: 0, 40 80 100, 140, 200, 300, 500m (N.B. one bottle/depth)
 Samples: CAC Bact Prod; biomass; sugars,
- 0400 Breakdown evening production incubations
- 0600 AM Production spar deployed
- 0800 *Comm Structure (CAST #85)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (N.B. 2 bottles/depth)
 Samples: HPLC, PIC/POC/PON, microscopy, FCM,
- 1200 *PM Profile (CAST #86)*
 Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
 Samples: Nutrients, salts,

As soon as Cast #86 is on board, and weather permitting, steam to the location of Mr. Blue (PITs). Any ARGOS hits will be provided, however, the last registered hit was Sunday at 0342 local time.

1830 Retrieve AM Production spar

1930 *PM Production (CAST #87)*

Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)

Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),

2200 PM Production bottles in incubator

2300 *AM Profile (CAST #88)*

Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m

Samples: Nutrients, DIC, DO's, TOC/N

Day 24 Tuesday March 9th

Sunrise: 0639 Sunset:1823

0600 Breakdown evening production incubations

0800 *Comm Structure (CAST #89)*

Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)

Samples: HPLC, PIC/POC/PON, microscopy, FCM,

1200 *PM Profile (CAST #90)*

Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m

Samples: Nutrients, salts,

As soon as Cast #86 is on board, and weather permitting, steam to the location of Mr. Blue (PITs). Any ARGOS hits will be provided, however, the last registered hit was Sunday at 0342 local time.

1930 *PM Production (CAST #91)*

Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)

Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),

2200 PM Production bottles in incubator

2300 *AM Profile (CAST #92)*

Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m
Samples: Nutrients, DIC, DO's, TOC/N

Day 23 Wednesday March 10th

Sunrise: 0638 Sunset: 1824

0245 *AM Production (CAST #93)*

Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)

Samples: 32Si, 14C, 15N, LK-rna; 15N; 13C (4depths)

Depths: 0, 40 80 100, 140, 200, 300, 500m (**N.B.** one bottle/depth)

Samples: CAC Bact Prod; biomass; sugars,

0400 Breakdown evening production incubations

0600 AM Production spar deployed

0800 *Comm Structure (CAST #94)*

Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)

Samples: HPLC, PIC/POC/PON, microscopy, FCM,

1200 *PM Profile (CAST #95)*

Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m

Samples: Nutrients, salts,

As soon as Cast #95 is on board, and weather permitting, steam to the location of Mr. Blue (PITs). Any ARGOS hits will be provided, however, the last registered hit was Sunday at 0342 local time.

1400 Retrieve Mr. Blue and steam to current location of drogue for redeployment of Mr. Blue.

1830 Retrieve AM Production spar

1930 *PM Production (CAST #96)*

Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)

Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),

2200 PM Production bottles in incubator

2300 *AM Profile (CAST #97)*

Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m

Samples: Nutrients, DIC, DO's, TOC/N

Day 24 Thursday March 11th

Sunrise: 0637 Sunset: 1825

*** TENTATIVE ***

0600 Breakdown evening production incubations

0800 *Comm Structure (CAST #98)*

Depths: 1,20,40,60,80,100,120,140,160,180,200,250m (**N.B.** 2 bottles/depth)

Samples: HPLC, PIC/POC/PON, microscopy, FCM, 234Th

0930 in situ pump cast to 200m.

1200 *PM Profile (CAST #99)*

Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m

Samples: Nutrients, salts,

As soon as Cast #100 is on board, and weather permitting, steam to the location of Mr. Blue (PITs) for a visual mark. Any ARGOS hits will be provided.

1930 *PM Production (CAST #100)*

Depths: 1,20,40,60,80,100,120,140m (**N.B.** 2 bottles/depth)

Samples: 32Si, 15N, LK-rna;15N; 13C (4depths),

2200 PM Production bottles in incubator

2300 *AM Profile (CAST #101)*

Depths: 1,20,40,60,80,100,120,140,160,180,200,250,300,400,500m

Samples: Nutrients, DIC, DO's, TOC/N

The following stations will be completed in succession. Following the AM Profile cast on Thursday, we will immediately steam for the Southern most portion of the survey leg and begin sampling.

NOTES:

-Following CTD cast stations please steam to the next station at a speed that is comfortable for sampling the CTD. As soon as sampling is done, the bridge will be notified and speed may be increased to best possible speed.

-At XBT stations, please notify ~5minutes prior to station arrival so that launcher can be readied, and slow to 5kts over the station site. As soon as the XBT recording is completed the bridge will be notified and speed may be increased to best possible speed.

-During all other periods within the survey grid sampling, please make best possible speed.

-The overall goal of here is to provide the most amount of time to hunt for and retrieve Mr. Blue, and secondly to ensure that we arrive in St. George's no later than 1000, Monday the 15th.

Day 27 Friday March 12th

0600	Arrive at station Cast#102	29° 07'N 062° 34'W
0845	Arrive at XBT#26	29° 19.5'N 062° 34'W
1025	Arrive at station Cast#103	29° 32'N 062° 34'W
1310	Arrive at XBT#27	29° 44.5'N 062° 34'W
1450	Arrive at station Cast#104	29° 57'N 062° 34'W
1735	Arrive at XBT#28	30° 09.5'N 062° 34'W
1915	Arrive at station Cast#105	30° 22'N 062° 34'W
2200	Arrive at XBT#29	30° 34.5'N 062° 34'W
2340	Arrive at station Cast#106	30° 47'N 062° 34'W

Day 28 Saturday March 13th

0955	Arrive at station Cast#107	29° 57'N 061° 34'W
1240	Arrive at XBT#30	29° 57'N 061° 49'W
1420	Arrive at station Cast#108	29° 57'N 062° 04'W
1705	Arrive at XBT#31	29° 57'N 062° 19'W
1845	Arrive at station Cast#109	29° 57'N 062° 34'W

2130	Arrive at XBT#32	29° 57'N 062° 49'W
2310	Arrive at station Cast#110	29° 57'N 063° 04'W

Day 29 Sunday March 14th

0155	Arrive at XBT#33	29° 57'N 063° 19'W
0335	Arrive at station Cast#111	29° 57'N 063° 34'W
0615	3000m cast at station Cast#111 (cast should be completed by ~0900)	29° 57'N 063° 34'W

Steam to PITs and retrieve.

1600 Absolute latest we should depart for St. George's (from est. 29° 57'N 063° 34'W @ 8kts) arrive in port 0900 Monday March 15th. This of course depends upon where Mr. Blue really is located. Science suggests that as soon as Mr. Blue is secured on deck, regardless of the time, we should steam for St. George's, Bermuda.

Sample table for final survey sampling

H102 (1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: 3He/Tr, HPLC, PSi, Meredith, Lora/Carrie
160-500m
3He/Tr, DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

H103 (1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: HPLC, PSi, Meredith, Lora/Carrie
160-500m
DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

H104 (1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON

odds: HPLC, PSi, Meredith, Lora/Carrie
160-500m
DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

H105 (1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: HPLC, PSi, Meredith, Lora/Carrie
160-500m
DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

H106 (1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: 3He/Tr, HPLC, PSi, Meredith, Lora/Carrie
160-500m
3He/Tr, DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

H107 (1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: 3He/Tr, HPLC, PSi, Meredith, Lora/Carrie
160-500m
3He/Tr, DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

H108 (1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: HPLC, PSi, Meredith, Lora/Carrie
160-500m
DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

H109 (1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: HPLC, PSi, Meredith, Lora/Carrie
160-500m
DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

H110 (1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m

evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: 3He/Tr, HPLC, P*S*i, Meredith, Lora/Carrie
160-500m
DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

H111 (1x2,20x2,40x2,60x2,80x2,100x2,120x2,140x2,160,180,200,250,300,400,500m)
0-140m
evens: D.O., DIC, TOC/N, Nuts, PIC/POC/PON
odds: 3He/Tr, HPLC, P*S*i, Meredith, Lora/Carrie
160-500m
3He/Tr, DIC, TOC/N, Nuts, PIC/POC/PON (250m), HPLC (250m),

Science Notes:

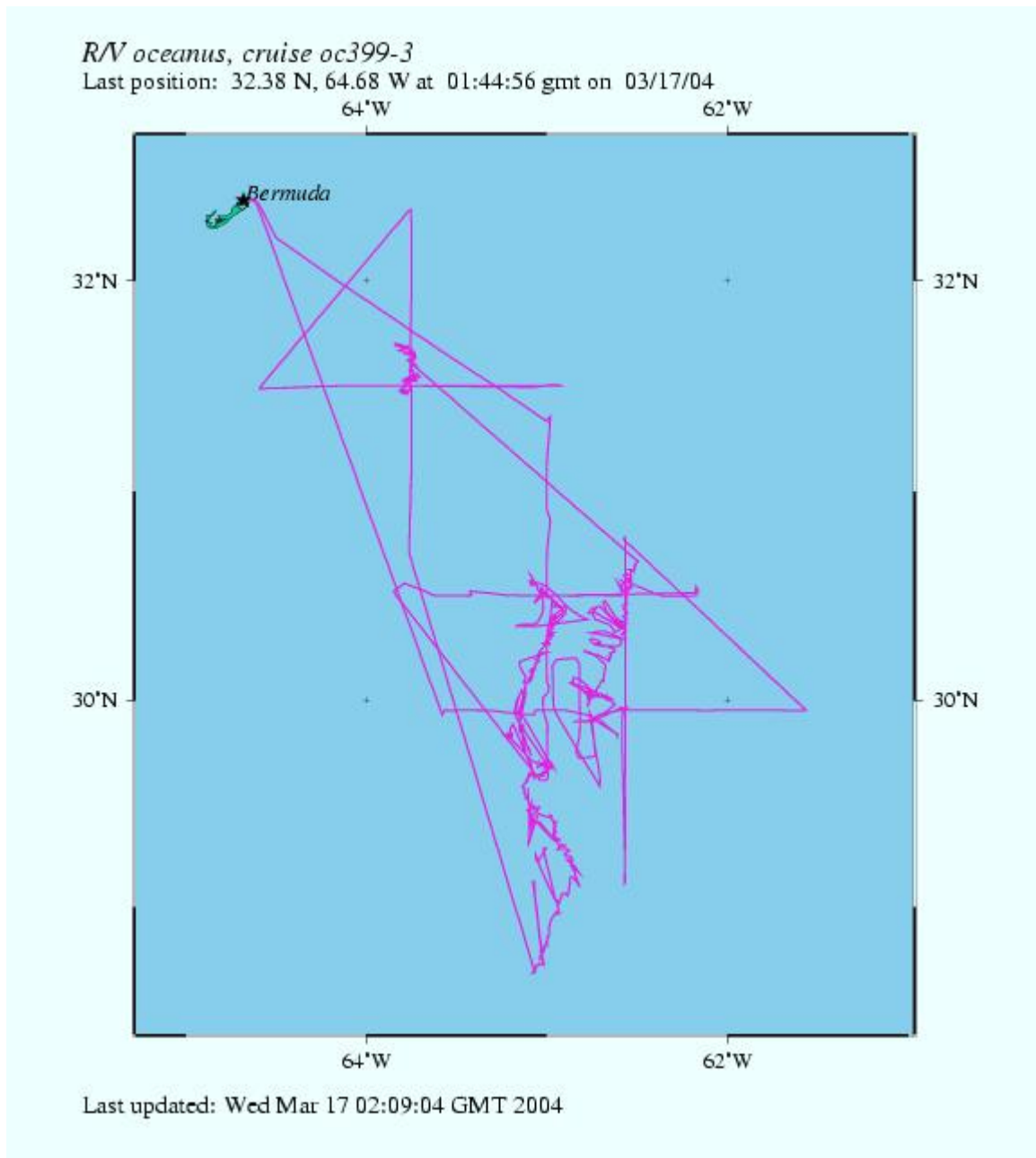
PITs samples will need to be processed late in the day on Sunday, during transit.

Samples in Freezer's

The 12 cuft freezer will be coming off the ship, and can be used to shuttle samples to the lab. There is -20°C freezer space at BBSR, if you need -80°C , please let me know so that I can make arrangements for the short term storage of samples.

If you stowed packing crates at BBSR, they will be brought to the ship on the first trip so that they can be packed.

Figure 1. Cruise 399-02 transect.



PRELIMINARY CRUISE REPORT FORM

STATE DEPT. CRUISE NO: File No. 2003-112, R/V Oceanus Cruise 399 Leg 3

SHIP NAME: R/V Oceanus

OPERATING INSTITUTE OR AGENCY: R/V Oceanus operated by Woods Hole Oceanographic Institution

PROJECT TITLE: Enhance New Production During Winter Mixing: A Missing Component of Current Estimates

CRUISE DATES (INCLUSIVE): 15 February 2004 to 15 March 2004

CHIEF SCIENTIST (name, affiliation, address, phone, fax, e-mail):

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CLEARANCE COUNTRIES: Bermuda

FOREIGN PARTICIPANTS: All cruise participants and affiliations are listed below

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Dr. David M. Nelson	Oregon State University
Ms. Carolyn Walker	Bermuda Biological Station
Ms. Jessica Lucchini	Southampton College -LIU
Mr. Jeff Krause	Oregon State University
Mr. Mathieu Mongin	Oregon State University
Ms. Carrie Fraser	Rutgers University
Ms. Lora McGuinness	Rutgers University
Ms. Charlotte Beucher	University of California – Santa Barbara
Mr. Kanchan Maiti	University of South Carolina
Ms. Meredith Meyers	University of California – Santa Barbara

DESCRIPTION OF SCIENTIFIC PROGRAM:

Photosynthetic uptake of CO₂ by oceanic phytoplankton and the export of the resulting organic carbon to the deep sea comprise a ‘biological pump’ (Volk and Hoffert, 1985), capable of extracting globally significant amounts of CO₂ from the atmosphere. As a consequence, it is important from the perspective of the global carbon cycle to understand both the present efficiency and the main controlling mechanisms of this important carbon pathway. In the open ocean the biological pump is driven by new production of organic matter (production supported by externally supplied nutrients) and export of that organic matter to depth. Many methods have been employed to estimate new production, with varying degrees of agreement. In the Sargasso Sea, for example, geochemical estimates of new production largely exclude the winter mixing period (because their fundamental assumption are valid only during stratified periods). Biological methods suggest that the pre-stratification period can be as important, in terms of new production, as the remainder of the year. Those biological estimates are poorly constrained and based on sparse data. Because of the enormous spatial extent of subtropical gyres similar to the Sargasso Sea, uncertainty in the rate of new production and organic matter export in those systems leads to large uncertainty in biologically-driven carbon fluxes at the global-scale.

Short-term stochastic events are increasingly recognized as being disproportionately important for biogeochemical cycling and carbon storage in the ocean. Recent data suggest that in the Sargasso Sea, the passage of weather fronts leads to increased new production during the winter mixing period. We hypothesize that these events lead to enhanced NO₃⁻ input, followed by a rapid biological response and accumulation of biomass, and an equally rapid export of that biomass. This rapid export may be systematically missed by the 3-4 day particle trap deployments of the Bermuda Atlantic Time-series Study (BATS) because they are hypothesized to happen during or immediately after the passage of frontal systems, when the vessel used for the BATS sampling program does not leave port. Such events have, however, been captured as increases in the fluorometer traces at the Bermuda Testbed Mooring (BTM) and increases in organic carbon flux in the continuous Ocean Flux Program (OFP) sediment traps, both of which are deployed in the Sargasso Sea near Bermuda.

We propose a process-oriented study of new production and its control during the period before formation of the seasonal thermocline in the BATS/BTM/OFP region near Bermuda. This study will be conducted during two 30-day cruises (one in 2004 and one in 2005) during the winter mixing period when the passage of these fronts is most common and when few data are available to constrain new production estimates. It will be crucial for this study to sample from a fully weather-capable research vessel, which can stay out and continue operations through most winter storms. We will use direct measurements of NO₃⁻ entrainment, NO₃⁻ uptake, phytoplankton community structure change, and dissolved and particulate organic matter export to elucidate the linkages between new production and export production as well as determine the main biological responses to short-term physical forcing. Particular emphasis will be placed on biogeochemically critical phytoplankton groups such as diatoms and coccolithophorids, which can exploit transiently favorable conditions of the kind we hypothesize to occur in late winter/early spring and which play a disproportionately large role in organic-matter export in many systems.

An understanding of ocean function is no longer important just to practicing ocean scientists. This project will provide information critical for biogeochemical modelers seeking to constrain future predictions of changes in the oceanic biological pump, and will also provide information of interest to students, teachers and the general public. If in fact a significant, and previously unmeasured, amount of new production occurs in subtropical gyres during the winter mixing period, then biological processes in the central oceans play a greater role in the global carbon cycle – including regulation of atmospheric CO₂ – than we recognize at present. Regardless of whether or not our study shows that this is the case, we will explain the results and their implications to graduate and undergraduate courses through the teaching programs at BBSR and OSU, to high-school and elementary-school teachers through a targeted teacher-training program at BBSR and to the broader public in seminars and other public presentations.

SCHEDULE OF DATA DELIVERY:

DATA DESCRIPTION Date of Expected Delivery to Dept. of State

7/16/2009

All environmental data relevant to this project will be submitted to designated U.S. National Data Center as soon as possible, but no later than two (2) years after the data are collected. This is in accordance with the U.S. National Science Foundation's Division of Ocean Sciences Data and Sample Policy guidelines (document NSF 04-004).