# High resolution CTD and beam attenuation data from R/V Atlantis II cruise AII-119-5 in the North Atlantic in 1989 (U.S. JGOFS NABE project)

**Website**: https://www.bco-dmo.org/dataset/2578
**Version**: November 06, 2002
**Version Date**: 2002-11-06

**Project**
» U.S. JGOFS North Atlantic Bloom Experiment (NABE)

**Program**
» U.S. Joint Global Ocean Flux Study (U.S. JGOFS)

| Contributors | Affiliation | Role |
|---|---|---|
| Broenkow, William | Moss Landing Marine Laboratories (MLML) | Principal Investigator |
| Chandler, Cynthia L. | Woods Hole Oceanographic Institution (WHOI BCO-DMO) | BCO-DMO Data Manager |

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## Dataset Description

High resolution CTD and beam attenuation data

### Methods & Sampling

**PI:** William Broenkow
**of:** Moss Landing Marine Laboratory (MLML)
**dataset:** High resolution CTD and beam attenuation data
**dates:** May 18, 1989 to June 07, 1989
**location:** N: 59.8117 S: 46.24 W: -20.7483 E: -17.68
**project/cruise:** North Atlantic Bloom Experiment/Atlantis II 119, leg 4
**ship:** R/V Atlantis II

# Methodology:

# CTD PROFILES - (Broenkow, MLML)

The MLML CTD/Rosette (Yarbrough et al., 1989) was used to make profiles of conductivity, temperature, dissolved oxygen, beam attenuation and in situ fluorescence. Conductivity was measured with a Sea-Bird conductivity cell and MLML pump, temperature with a platinum thermometer (tau = 0.3 sec) and pressure with a Digiquartz transducer. Data were digitized at 0.8 m intervals. Corrections were applied to temperature,

salinity, and pressure using laboratory calibrations done before and after the cruise. Pressure corrections for the compressibility of the Sea-Bird cell were applied using the algorithm provided by Sea-Bird Electronics. Corrected data were compared with salinity and temperature field calibration data provided by the Scripps CTD group. Scripps corrected CTD data and ours show excellent agreement. Maximum salinity differences between the SIO and MLML profiles are about +/- 0.02 S.

## Oxygen

The oxygen electrode data were obtained with a Beckman polarograph electrode modified at MLML to obtain near-membrane temperatures. The data have been corrected to oxygen concentrations by comparison with titrated calibration samples obtained during ATLANTIS II 119.5. Most of these calibration samples were analyzed by MLML personnel, and the RMS difference with Scripps titrations was 3 umole/kg. Oxygen concentrations were computed from oxygen reduction current via the WHOI algorithm (Owens and Millard, 1984) using near-membrane temperatures and in situ pressure. Corrections for membrane porosity changes may be large, and cynicism is advised when using these data.

## Beam Attenuation

The MLML transmissometer is a modified Martek instrument based on the Scripps Visibility Laboratory design (Petzolf and Austin, 1968). Beam attenuation is measured through the folded 1 m path with a Wratten 45 (480 nm) filter and an IR blocking filter. Calibration is done in the laboratory by adjusting instrument gain to a transmission reading of 85.5% in dry air. Drift is estimated aboard ship before and after each cast by diligent cleaning of the windows using alcohol.

## Fluorescence

The MLML profiling fluorometer uses Variosens electronics (Frungel and Koch, 1980) and produces log-scaled signals. Excitation is via a Xenon flash lamp and a broad band filter (350-550 nm half power). Fluorescence emission was detected by silicon diode through a 670 nm (half power) long pass filter. These raw data are converted to "rescaled fluorescence" units by comparison with extracted pigment analyses. We provided our own chlorophyll calibrations during ATLANTIS II 119.5 by fluorometric analysis of acetone extracts of water filtered through Whatman GF/F (0.7 micron) filters. The "rescaled fluorescence" units are numerically equivalent to chlorophyll-a concentrations in ug/liter. The term "rescaled fluorescence" is used to acknowledge the fact that fluorescence and chlorophyll concentrations may not covary because of variation in quantum yield. The RMS difference between "rescaled fluorescence" and extracted chlorophyll was 0.27 ug/liter.

## Depth calculation for the CTD data files

The depth values in these CTD files have been calculated from pressure by the US JGOFS Data Management Office using the algorithm below. The latitude used in computation was the latitude recorded in the CTD data file. The CHECKVALUE was used to verify the accuracy of the computation. The stated accuracy of this algorithm is 0.1 meters. The calculated depths have been rounded to the nearest whole meter.

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function DEPTH=depth(P,LAT); DEPTH Computes depth given the pressure at some latitude D=DEPTH(P,LAT) gives the depth D (m) for a pressure P (dbars) at some latitude LAT (degrees). Fofonoff and Millard (1982). UNESCO Tech Paper #44. Notes: (ETP3, MBARI) This algorithm was originally compiled by RP @ WHOI. It was copied from the UNESCO technical report. The algorithm was endorsed by SCOR Working Group 51. The equations were originally developed by Saunders and Fofonoff (1976). DSR 23: 109-111. The parameters were re-fit for the 1980 equation of state for seawater (EOS80). CHECKVALUE: D=9712.653 M FOR P=10000 DECIBARS, LAT=30 DEG CALCULATON ASSUMES STD OCEAN: T = 0 DEG C; S = 35 (IPSS-78) X = sin(LAT/57.29578); X' = X*X; GR = GRAVITY VARIATION WITH LAT: ANON (1970) BULLETIN GEODESIQUE GR = 9.780318*(1.0+(5.2788E-3+2.36E-5*X')*X') + 1.092E-6*P D = DEPTH BEFORE GRAVITY CORRECTION D = (((-1.82E-15*P+2.279E-10)*P-2.2512E-5)*P+9.72659)*P DEPTH = D/GR

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## Data Files

| File |
| --- |
| **ctdml.csv** (Comma Separated Values (.csv), 1.14 MB)<br>MD5:ea2efb1f58c2a8f284880871546fc67e<br>Primary data file for dataset ID 2578 |

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## Parameters

| Parameter | Description | Units |
|---|---|---|
| year | year (as YYYY) | dimensionless |
| sta | station number from event log | dimensionless |
| cast | cast number, numbered consecutively within station, event log | dimensionless |
| event | event number, from event log, a unique number assigned to each sampling operation | dimensionless |
| lat | latitude, negative = south | decimal degrees |
| lon | longitude, negative = west | decimal degrees |
| depth | depth calculated from pressure | meters |
| press | depth of sample reported as pressure | decibars |
| temp | temperature IPTS-68 | degrees C |
| sal | salinity as calculated from conductivity PSS-78 scale | dimensionless |
| O2 | oxygen, from CTD unit | milliliters/liter |
| potemp | potental temperature, calculated by U.S. JGOFS DMO | degrees C |
| sigma_0 | sigma theta, calculated by U.S. JGOFS DMO | dimensionless |
| beam_cp | beam attenuation coefficient due to particles | 1/meter |

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## Instruments

| | |
|---|---|
| **Dataset-specific Instrument Name** | SeabirdCTD |
| **Generic Instrument Name** | CTD Sea-Bird |
| **Dataset-specific Description** | A Sea-Bird conductivity cell used to collect conductivity. |
| **Generic Instrument Description** | A Conductivity, Temperature, Depth (CTD) sensor package from SeaBird Electronics. This instrument designation is used when specific make and model are not known or when a more specific term is not available in the BCO-DMO vocabulary. Refer to the dataset-specific metadata for more information about the specific CTD used. More information from: http://www.seabird.com/ |

| | |
|---|---|
| **Dataset-specific Instrument Name** | Fluorometer |
| **Generic Instrument Name** | Fluorometer |
| **Generic Instrument Description** | A fluorometer or fluorimeter is a device used to measure parameters of fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light. The instrument is designed to measure the amount of stimulated electromagnetic radiation produced by pulses of electromagnetic radiation emitted into a water sample or in situ. |

| | |
|---|---|
| **Dataset-specific Instrument Name** | Transmissometer |
| **Generic Instrument Name** | Transmissometer |
| **Dataset-specific Description** | The MLML transmissometer is a modified Martek instrument based on the Scripps Visibility Laboratory design (Petzolf and Austin, 1968). |
| **Generic Instrument Description** | A transmissometer measures the beam attenuation coefficient of the lightsource over the instrument's path-length. This instrument designation is used when specific manufacturer, make and model are not known. |

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## Deployments

**AII-119-5**

| | |
|---|---|
| **Website** | https://www.bco-dmo.org/deployment/57738 |
| **Platform** | R/V Atlantis II |
| **Start Date** | 1989-05-15 |
| **End Date** | 1989-06-06 |

| | |
|---|---|
| **Description** | late bloom cruise; 31 locations; 61N 22W to 41N 17W<br><br>**Methods & Sampling**<br>PI: William Broenkow of: Moss Landing Marine Laboratory (MLML) dataset: High resolution CTD and beam attenuation data dates: May 18, 1989 to June 07, 1989 location: N: 59.8117 S: 46.24 W: -20.7483 E: -17.68 project/cruise: North Atlantic Bloom Experiment/Atlantis II 119, leg 4 ship: R/V Atlantis II Methodology: CTD PROFILES - (Broenkow, MLML) The MLML CTD/Rosette (Yarbrough et al., 1989) was used to make profiles of conductivity, temperature, dissolved oxygen, beam attenuation and in situ fluorescence. Conductivity was measured with a Sea-Bird conductivity cell and MLML pump, temperature with a platinum thermometer (tau = 0.3 sec) and pressure with a Digiquartz transducer. Data were digitized at 0.8 m intervals. Corrections were applied to temperature, salinity, and pressure using laboratory calibrations done before and after the cruise. Pressure corrections for the compressibility of the Sea-Bird cell were applied using the algorithm provided by Sea-Bird Electronics. Corrected data were compared with salinity and temperature field calibration data provided by the Scripps CTD group. Scripps corrected CTD data and ours show excellent agreement. Maximum salinity differences between the SIO and MLML profiles are about +/- 0.02 S. Oxygen The oxygen electrode data were obtained with a Beckman polarograph electrode modified at MLML to obtain near-membrane temperatures. The data have been corrected to oxygen concentrations by comparison with titrated calibration samples obtained during ATLANTIS II 119.5. Most of these calibration samples were analyzed by MLML personnel, and the RMS difference with Scripps titrations was 3 umole/kg. Oxygen concentrations were computed from oxygen reduction current via the WHOI algorithm (Owens and Millard, 1984) using near-membrane temperatures and in situ pressure. Corrections for membrane porosity changes may be large, and cynicism is advised when using these data. Beam Attenuation The MLML transmissometer is a modified Martek instrument based on the Scripps Visibility Laboratory design (Petzolf and Austin, 1968). Beam attenuation is measured through the folded 1 m path with a Wratten 45 (480 nm) filter and an IR blocking filter. Calibration is done in the laboratory by adjusting instrument gain to a transmission reading of 85.5% in dry air. Drift is estimated aboard ship before and after each cast by diligent cleaning of the windows using alcohol. Fluorescence The MLML profiling fluorometer uses Variosens electronics (Frungel and Koch, 1980) and produces log-scaled signals. Excitation is via a Xenon flash lamp and a broad band filter (350-550 nm half power). Fluorescence emission was detected by silicon diode through a 670 nm (half power) long pass filter. These raw data are converted to "rescaled fluorescence" units by comparison with extracted pigment analyses. We provided our own chlorophyll calibrations during ATLANTIS II 119.5 by fluorometric analysis of acetone extracts of water filtered through Whatman GF/F (0.7 micron) filters. The "rescaled fluorescence" units are numerically equivalent to chlorophyll-a concentrations in ug/liter. The term "rescaled fluorescence" is used to acknowledge the fact that fluorescence and chlorophyll concentrations may not covary because of variation in quantum yield. The RMS difference between "rescaled fluorescence" and extracted chlorophyll was 0.27 ug/liter. Depth calculation for the CTD data files The depth values in these CTD files have been calculated from pressure by the US JGOFS Data Management Office using the algorithm below. The latitude used in computation was the latitude recorded in the CTD data file. The CHECKVALUE was used to verify the accuracy of the computation. The stated accuracy of this algorithm is 0.1 meters. The calculated depths have been rounded to the nearest whole meter. function DEPTH=depth(P,LAT); DEPTH Computes depth given the pressure at some latitude D=DEPTH(P,LAT) gives the depth D (m) for a pressure P (dbars) at some latitude LAT (degrees). Fofonoff and Millard (1982). UNESCO Tech Paper #44. Notes: (ETP3, MBARI) This algorithm was originally compiled by RP @ WHOI. It was copied from the UNESCO technical report. The algorithm was endorsed by SCOR Working Group 51. The equations were originally developed by Saunders and Fofonoff (1976). DSR 23: 109-111. The parameters were re-fit for the 1980 equation of state for seawater (EOS80). CHECKVALUE: D=9712.653 M FOR P=10000 DECIBARS, LAT=30 DEG CALCULATON ASSUMES STD OCEAN: T = 0 DEG C; S = 35 (IPSS-78) X = sin(LAT/57.29578); X' = X*X; GR = GRAVITY VARIATION WITH LAT: ANON (1970) BULLETIN GEODESIQUE GR = 9.780318*(1.0+(5.2788E-3+2.36E-5*X')*X') + 1.092E-6*P D = DEPTH BEFORE GRAVITY CORRECTION D = (((-1.82E-15*P+2.279E-10)*P-2.2512E-5)*P+9.72659)*P DEPTH = D/GR |

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## Project Information

### U.S. JGOFS North Atlantic Bloom Experiment (NABE)

**Website**: http://usjgofs.whoi.edu/research/nabe.html

**Coverage**: North Atlantic

One of the first major activities of JGOFS was a multinational pilot project, North Atlantic Bloom Experiment (NABE), carried out along longitude 20° West in 1989 through 1991. The United States participated in 1989 only, with the April deployment of two sediment trap arrays at 48° and 34° North. Three process-oriented cruises where conducted, April through July 1989, from R/V *Atlantis II* and R/V *Endeavor* focusing on sites at 46° and 59° North. Coordination of the NABE process-study cruises was supported by NSF-OCE award # 8814229. Ancillary sea surface mapping and AXBT profiling data were collected from NASA's P3 aircraft for a series of one day flights, April through June 1989.

A detailed description of NABE and the initial synthesis of the complete program data collection efforts appear in: Topical Studies in Oceanography, JGOFS: The North Atlantic Bloom Experiment (1993), Deep-Sea Research II, Volume 40 No. 1/2.

The U.S. JGOFS Data management office compiled a preliminary NABE data report of U.S. activities: Slagle, R. and G. Heimerdinger, 1991. U.S. Joint Global Ocean Flux Study, North Atlantic Bloom Experiment, Process Study Data Report P-1, April-July 1989. NODC/U.S. JGOFS Data Management Office, Woods Hole Oceanographic Institution, 315 pp. (out of print).

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## Program Information

### U.S. Joint Global Ocean Flux Study (U.S. JGOFS)

**Website**: http://usjgofs.whoi.edu/

**Coverage**: Global

The United States Joint Global Ocean Flux Study was a national component of international JGOFS and an integral part of global climate change research.

The U.S. launched the Joint Global Ocean Flux Study (JGOFS) in the late 1980s to study the ocean carbon cycle. An ambitious goal was set to understand the controls on the concentrations and fluxes of carbon and associated nutrients in the ocean. A new field of ocean biogeochemistry emerged with an emphasis on quality measurements of carbon system parameters and interdisciplinary field studies of the biological, chemical and physical process which control the ocean carbon cycle. As we studied ocean biogeochemistry, we learned that our simple views of carbon uptake and transport were severely limited, and a new "wave" of ocean science was born. U.S. JGOFS has been supported primarily by the U.S. National Science Foundation in collaboration with the National Oceanic and Atmospheric Administration, the National Aeronautics and Space Administration, the Department of Energy and the Office of Naval Research. U.S. JGOFS, ended in 2005 with the conclusion of the Synthesis and Modeling Project (SMP).

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## Funding

| Funding Source | Award |
| --- | --- |
| National Science Foundation (NSF) | unknown NABE NSF |


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