

# Niskin bottle and CTD data; nutrients, oxygen, DIC, POC, PON from R/V Weatherbird II WB0409, WB0413, WB0506, WB0508 cruises in the Sargasso Sea, 2004-2005 (EDDIES project)

**Website:** <https://www.bco-dmo.org/dataset/3050>

**Version:** 15 October 2007

**Version Date:** 2007-10-15

## Project

» [Eddies Dynamics, Mixing, Export, and Species composition](#) (EDDIES)

## Program

» [Ocean Carbon and Biogeochemistry](#) (OCB)

Contributors	Affiliation	Role
<a href="#">Bates, Nicholas</a>	Bermuda Biological Station for Research (BBSR)	Principal Investigator
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## Table of Contents

- [Dataset Description](#)
- [Parameters](#)
- [Instruments](#)
- [Deployments](#)
- [Project Information](#)
- [Program Information](#)
- [Funding](#)

## Dataset Description

**PI:** Nick Bates  
**of:** Bermuda Biological Station for Research (BBSR)  
**dataset:** Niskin bottle and CTD data; nutrients, oxygen, DIC, POC, PON  
**platform:** R/V Weatherbird II

Methodology: see Chapter 3: CTD & Related Measurements in U.S. JGOFS BATS Method Manual Version 4 (1997). Bermuda Atlantic Time-Series Study April 1997. Anthony H. Knap, Anthony F. Michaels et al., 136 pp.  
(link to [BATS Method Manual version 4](#) local copy)

OCB DMO Note: Longitude changed to negative values indicating West; depth\_n estimated, surface at 1 meter; Niskin\_id (90409##nn) split into sta '##' and Nis bottle number 'nn'. HPLC from original datafile not included because newer HPLC pigment data are already in database; all data are from primary sensors; event number is taken from cruise event log, and DMO added bot numbers to support data integration

PI note: All bottle fires included; most include sampling data. Level of Detection (LOD) not imposed for nutrient data. Typical methodology suggests LOD's of ~ 0.03 umol/kg for NO<sub>3</sub>+NO<sub>2</sub> and SRP. No sample, Missing or bad data set to nd. Fluometric analysis for chl\_a and Phaeo using 500ml sample were performed by BIOS BBOP lab.

Analysis Note: files listing SiO<sub>4</sub> data from the sample rerun:  
[WB Silicate reruns](#)

Caution: this data set is considered final, but it is unknown whether the CTD data have had any post-cruise calibrations applied.

## Parameters

Parameter	Description	Units
event	unique sampling event number from cruise event log	YYYYMMDDhhmm
date	start date of event (GMT)	YYYYMMDD
time	start time of event (GMT)	hhmm
lon	longitude, negative denotes West	decimal degrees
lat	latitude, negative denotes South	decimal degrees
sta	cast number for sampling event	dimensionless
bot	Niskin bottle number	dimensionless
Nis	Niskin bottle order number	dimensionless
Q_btl	bottle quality flag 1 = good, -1 = misfire, -2 = suspect leaker	signed integer
press	pressure; from CTD	decibars
depth	depth, calculated from pressure	meters
depth_n	depth, nominal bottle firing	meters
temp	temperature; from CTD	degrees Celsius
sal_CTD	salinity; from CTD	dimensionless
sigma_t	sigma-T (density)	kilograms/meter <sup>3</sup>
chla_fluor	fluorescence, from CTD profiler rescaled, units are numerically equivalent to chlorophyll-a concentrations	micrograms/liter
sal_bot	salinity from bottle sample	dimensionless
O2_umol_kg	oxygen; dissolved; from bottle	micromoles/kilogram
DIC	dissolved inorganic carbon	micromoles C/kilogram
Alkalinity	total alkalinity	micromoles/kilogram
NO3_NO2	nitrates plus nitrites (NO2 in this region is essentially non-detectable)	micromoles/kilogram
SRP	soluble reactive phosphorus	micromoles/kilogram
SiO4	Silicate	micromoles/kilogram
POC_ug_kg	particulate organic Carbon	micrograms/kilogram
PON_ug_kg	particulate organic Nitrogen	micrograms/kilogram
Pmax_n	pressure, nominal maximum for station	decibars
fluor	fluorescence from CTD	micrograms/liter

## Instruments

<b>Dataset-specific Instrument Name</b>	CTD Sea-Bird SBE 911plus
<b>Generic Instrument Name</b>	CTD Sea-Bird SBE 911plus
<b>Generic Instrument Description</b>	The Sea-Bird SBE 911 plus is a type of CTD instrument package for continuous measurement of conductivity, temperature and pressure. The SBE 911 plus includes the SBE 9plus Underwater Unit and the SBE 11plus Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 plus and SBE 11 plus is called a SBE 911 plus. The SBE 9 plus uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 plus and SBE 4). The SBE 9 plus CTD can be configured with up to eight auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorescence, light (PAR), light transmission, etc.). more information from Sea-Bird Electronics

<b>Dataset-specific Instrument Name</b>	Niskin Bottle
<b>Generic Instrument Name</b>	Niskin bottle
<b>Generic Instrument Description</b>	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

[ [table of contents](#) | [back to top](#) ]

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## Deployments

WB0409

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/57955">https://www.bco-dmo.org/deployment/57955</a>
<b>Platform</b>	R/V Weatherbird II
<b>Start Date</b>	2004-06-23
<b>End Date</b>	2004-07-02
<b>Description</b>	<p>EDT1 2004 Transect 1 cruise Funded by: NSF OCE-0241310</p> <p><b>Methods &amp; Sampling</b>  PI: Nick Bates of: Bermuda Biological Station for Research (BBSR) dataset: Niskin bottle and CTD data; nutrients, oxygen, DIC, POC, PON dates: 24 June 2004 to 02 July 2004 (20040624-20040702) location: N: 31.928 S: 29.779 W: -66.178 E: -64.082 project/cruise: EDDIES/WB0409 2004 Transect 1 (EDT1) platform: R/V Weatherbird II Methodology: see Chapter 3: CTD &amp; Related Measurements in U.S. JGOFS BATS Method Manual Version 4 (1997). Bermuda Atlantic Time-Series Study April 1997. Anthony H. Knap, Anthony F. Michaels et al., 136 pp. (link to BATS Method Manual version 4 local copy) Change history: YYMMDD 060306: downloaded x0409phys_sigt.n01 from EDDIES data web site 060307: added to OCB database by Cyndy Chandler, OCB DMO; event, date, time, lon and lat are from cruise event log; blank field (all zeroes) removed from data 070314: rename bot and Nis columns for EDDIES database consistency (bot was originally bf and Nis was extracted from nicken_id) 070601: all data replaced with final version bottle data file downloaded from EDDIES Web site and prepared by Nancy Copley; /eddies/data/2004_data/wbII-section1/bottle/x0409_botdata.txt 071015: Silicate (SiO4) data updated with values from select sample reruns OCB DMO Note: Longitude changed to negative values indicating West; depth_n estimated, surface at 1 meter; Niskin_id (90409##nn) split into sta '##' and Nis bottle number 'nn'. HPLC from original datafile not included because newer HPLC pigment data are already in database; all data are from primary sensors; event number is taken from cruise event log, and DMO added bot numbers to support data integration PI note: All bottle fires included; most include sampling data. Level of Detection (LOD) not imposed for nutrient data. Typical methodology suggests LOD's of ~ 0.03 umol/kg for NO3+NO2 and SRP. No sample, Missing or bad data set to nd. Fluometric analysis for chl_a and Phaeo using 500ml sample were performed by BIOS BBOP lab. Analysis Note: files listing SiO4 data from the sample rerun: WB Silicate reruns Caution: this data set is considered final, but it is unknown whether the CTD data have had any post-cruise calibrations applied.</p>

**WB0413**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/57960">https://www.bco-dmo.org/deployment/57960</a>
<b>Platform</b>	R/V Weatherbird II
<b>Start Date</b>	2004-08-02
<b>End Date</b>	2004-08-11
<b>Description</b>	<p>EDT2 2004 Transect 2 cruise Funded by: NSF OCE-0241310</p> <p><b>Methods &amp; Sampling</b>  PI: Nick Bates of: Bermuda Biological Station for Research (BBSR) dataset: Niskin bottle and CTD data; nutrients, oxygen, POC, PON dates: 02 August 2004 to 11 August 2004 (20040802-20040811) location: N: 31.761 S: 30.331 W: -65.970 E: -64.164 project/cruise: EDDIES/WB0413 2004 Transect 2 (EDT2) platform: R/V Weatherbird II Methodology: see Chapter 3: CTD &amp; Related Measurements in U.S. JGOFS BATS Method Manual Version 4 (1997). Bermuda Atlantic Time-Series Study April 1997. Anthony H. Knap, Anthony F. Michaels et al., 136 pp. (link to BATS Method Manual version 4 local copy) Change history: YYMMDD 060308: downloaded x0413phys_sigt.n01 from EDDIES data web site added to OCB database by Cyndy Chandler, OCB DMO; event, date, time, lon and lat are from cruise event log; blank field (all zeroes) removed from data 070314: rename bot and Nis columns for EDDIES database consistency (bot was originally bf and Nis was extracted from nissen_id) 070601: all data replaced with final version bottle data file downloaded from EDDIES Web site and prepared by Nancy Copley; /eddies/data/2004_data/wbII-section2/bottle/x0413_botdata.txt 071015: Silicate (SiO4) data updated with values from select sample reruns OCB DMO Note: Longitude changed to negative values indicating West; depth_n estimated, surface at 1 meter; Niskin_id (90413##nn) split into sta '##' and Nis bottle number 'nn'. HPLC from original datafile not included because newer HPLC pigment data are already in database; all data are from primary sensors; event number is taken from cruise event log, and DMO added bot numbers to support data integration PI note: All bottle fires included; most include sampling data. Level of Detection (LOD) not imposed for nutrient data. Typical methodology suggests LOD's of ~ 0.03 umol/kg for NO3+NO2 and SRP. No sample, Missing or bad data set to nd. Fluometric analysis for chl_a was performed by BIOS BBOP lab. Analysis Note: files listing SiO4 data from the sample rerun: WB Silicate reruns</p>

**WB0506**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/57963">https://www.bco-dmo.org/deployment/57963</a>
<b>Platform</b>	R/V Weatherbird II
<b>Start Date</b>	2005-07-06
<b>End Date</b>	2005-07-15
<b>Description</b>	<p>EDT3 2005 Transect 1 cruise Funded by: NSF OCE-0241310</p> <p><b>Methods &amp; Sampling</b>  PI: Nick Bates of: Bermuda Biological Station for Research (BBSR) dataset: Niskin bottle and CTD data; nutrients, oxygen, DIC, POC, PON dates: 06 July 2005 to 15 July 2005 (20050706-20050715) location: N: 31.669 S: 30.174 W: -67.114 E: -64.168 project/cruise: EDDIES/WB0506 2005 Transect 1 (EDT3) platform: R/V Weatherbird II Methodology: see Chapter 3: CTD &amp; Related Measurements in U.S. JGOFS BATS Method Manual Version 4 (1997). Bermuda Atlantic Time-Series Study April 1997. Anthony H. Knap, Anthony F. Michaels et al., 136 pp. (link to BATS Method Manual version 4 local copy) Change history: YYMMDD 070222: downloaded original merged data from EDDIES data web site; /data/2005_data/wbII_x0506/bottle/x0506_botdata.txt 070313: prepared for OCB database by Nancy Copley (OCB DMO) 070315: added to database by Cyndy Chandler (OCB DMO) 071015: Silicate (SiO4) data updated with values from select sample reruns OCB DMO Note: Longitude changed to negative values indicating West; depth_n estimated, surface at 1 meter; Niskin_id (90506###nn) split into cast and Nis bottle number. HPLC from original datafile not included because newer HPLC pigment data are already in database; event number and nominal max pressure are from cruise event log. PI note: All bottle fires included; most include sampling data. Level of Detection (LOD) not imposed for nutrient data. Typical methodology suggests LOD's of ~ 0.03 umol/kg for NO3+NO2 and SRP. No sample, Missing or bad data set to nd. Analysis Note: files listing SiO4 data from the sample rerun: WB Silicate reruns</p>

#### WB0508

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/57966">https://www.bco-dmo.org/deployment/57966</a>
<b>Platform</b>	R/V Weatherbird II
<b>Start Date</b>	2005-08-17
<b>End Date</b>	2005-08-26
<b>Description</b>	<p>EDT4 2005 Transect 2 Funded by: NSF OCE-0241310</p> <p><b>Methods &amp; Sampling</b>  PI: Nick Bates of: Bermuda Biological Station for Research (BBSR) dataset: Niskin bottle and CTD data; nutrients, oxygen, POC, PON dates: 18 August 2005 to 25 August 2005 (20050818-20050825) location: N: 30.182 S: 29.819 W: -69.410 E: -67.744 project/cruise: EDDIES/WB0508 2005 Transect 2 (EDT4) platform: R/V Weatherbird II Methodology: see Chapter 3: CTD &amp; Related Measurements in U.S. JGOFS BATS Method Manual Version 4 (1997). Bermuda Atlantic Time-Series Study April 1997. Anthony H. Knap, Anthony F. Michaels et al., 136 pp. (link to BATS Method Manual version 4 local copy) Change history: YYMMDD 070222: downloaded original merged data from EDDIES data web site; /data/2005_data/wbII_x0506/bottle/x0506_botdata.txt 070314: prepared for OCB database by Nancy Copley (OCB DMO) 070315: added to database by Cyndy Chandler (OCB DMO) 071015: Silicate (SiO4) data updated with values from select sample reruns OCB DMO Note: Longitude changed to negative values indicating West; depth_n estimated, surface at 1 meter; Niskin_id (90508###nn) split into cast and Nis bottle number. HPLC from original datafile not included because newer HPLC pigment data are already in database. No DIC or Alkinity data provided yet for this cruise; event number and nominal max pressure are from cruise event log. PI note: All bottle fires included; most include sampling data. Level of Detection (LOD) not imposed for nutrient data. Typical methodology suggests LOD's of ~ 0.03 umol/kg for NO3+NO2 and SRP. No sample, Missing or bad data set to nd. Analysis Note: files listing SiO4 data from the sample rerun: WB Silicate reruns</p>

## Project Information

### Eddies Dynamics, Mixing, Export, and Species composition (EDDIES)

**Website:** [http://science.whoi.edu/users/olga/eddies/EDDIES\\_Project.html](http://science.whoi.edu/users/olga/eddies/EDDIES_Project.html)

**Coverage:** Sargasso Sea

The original title of this project from the NSF award is: Collaborative Research: Impacts of Eddies and Mixing on Plankton Community Structure and Biogeochemical Cycling in the Sargasso Sea".

Prior results have documented eddy-driven transport of nutrients into the euphotic zone and the associated accumulation of chlorophyll. However, several key aspects of mesoscale upwelling events remain unresolved by the extant database, including: (1) phytoplankton physiological response, (2) changes in community structure, (3) impact on export out of the euphotic zone, (4) rates of mixing between the surface mixed layer and the base of the euphotic zone, and (5) implications for biogeochemistry and differential cycling of carbon and associated bioactive elements. This leads to the following hypotheses concerning the complex, non-linear biological regulation of elemental cycling in the ocean:

H1: Eddy-induced upwelling, in combination with diapycnal mixing in the upper ocean, introduces new nutrients into the euphotic zone.

H2: The increase in inorganic nutrients stimulates a physiological response within the phytoplankton community.

H3: Differing physiological responses of the various species bring about a shift in community structure.

H4: Changes in community structure lead to increases in export from, and changes in biogeochemical cycling within, the upper ocean.

### Publications

Andrews, J.E., Hartin, C., and Buesseler, K.O.. "7Be Analyses in Seawater by Low Background Gamma-Spectroscopy," Journal of Radioanalytical and Nuclear Chemistry, v.277, 2008, p. 253.

Andrews, J.E., Hartin, C., Buesseler, K.O.. "7Be Analyses in Seawater by Low Background Gamma-Spectroscopy," Journal of Radioanalytical and Nuclear Chemistry, v.277, 2008, p. 253.

Benitez-Nelson, C.R. and McGillicuddy, D.J.. "Mesoscale Physical-Biological-Biogeochemical Linkages in the Open Ocean: An Introduction to the Results of the E-Flux and EDDIES Programs.," Deep Sea Research II, v.55, 2008, p. 1133.

Benitez-Nelson, C.R. and McGillicuddy, D.J.. "Mesoscale Physical-Biological-Biogeochemical Linkages in the Open Ocean: An Introduction to the Results of the E-Flux and EDDIES Programs," Deep-Sea Research II, v.55, 2008, p. 1133.

Bibby, T.S., Gorbunov, M.Y., Wyman, K.W., Falkowski, P.G.. "Photosynthetic community responses to upwelling in mesoscale eddies in the subtropical North Atlantic and Pacific Oceans," Deep-Sea Research Part II: Topical Studies in Oceanography, v.55, 2008, p. 1310.

Buesseler, K.O., Lamborg, C., Cai, P., Escoube, R., Johnson, R., Pike, S., Masque, P., McGillicuddy, D.J., Verdeny, E.. "Particle Fluxes Associated with Mesoscale Eddies in the Sargasso Sea," Deep Sea Research II, v.55, 2008, p. 1426.

Carlson, C.A., del Giorgio, P., Herdl, G.. "Microbes and the dissipation of energy and respiration: From cells to ecosystems," Oceanography, v.20, 2007, p. 89.

Davis, C.S., and McGillicuddy, D.J.. "Transatlantic Abundance of the N<sub>2</sub>-Fixing Colonial Cyanobacterium *Trichodesmium*," Science, v.312, 2006, p. 1517.

Ewart, C.S., Meyers, M.K., Wallner, E., McGillicuddy, D.J., Carlson, C.A.. "Microbial Dynamics in Cyclonic and Anticyclonic Mode-Water Eddies in the Northwestern Sargasso Sea," Deep Sea Research II, v.55, 2008, p. 1334.

Ewart, C.S., Meyers, M.K., Wallner, E., McGillicuddy, D.J., Carlson, C.A.. "Microbial Dynamics in Cyclonic and Anticyclonic Mode-Water Eddies in the Northwestern Sargasso Sea," Deep-Sea Research II, v.55, 2008, p. 1334.

Goldthwait, S.A. and Steinberg, D.K.. "Elevated biomass of mesozooplankton and enhanced fecal pellet flux in cyclonic and mode-water eddies in the Sargasso Sea," Deep-Sea Research Part II: Topical Studies in Oceanography, v.55, 2008, p. 1360.

Greenan, B.J.W.. "Shear and Richardson number in a mode-water eddy," Deep-Sea Research Part II: Topical Studies in Oceanography, v.55, 2008, p. 1161.

Jenkins, W.J., McGillicuddy, D.J., and Lott III, D.E.. "The Distributions of, and Relationship Between  $^3\text{He}$  and Nitrate in Eddies," Deep Sea Research II, v.55, 2008, p. 1389.

Jenkins, W.J., McGillicuddy, D.J., Lott III, D.E.. "The Distributions of, and Relationship Between  $^3\text{He}$  and Nitrate in Eddies," Deep-Sea Research II, v.55, 2008, p. 1389.

Ledwell, J.R., McGillicuddy, D.J., and Anderson, L.A.. "Nutrient Flux into an Intense Deep Chlorophyll Layer in a Mode-water Eddy," Deep Sea Research II, v.55, 2008, p. 1139.

Ledwell, J.R., McGillicuddy, D.J., Anderson, L.A.. "Nutrient Flux into an Intense Deep Chlorophyll Layer in a Mode-water Eddy," Deep-Sea Research II, v.55, 2008, p. 1139.

Li, Q.P. and Hansell, D.A.. "Intercomparison and coupling of MAGIC and LWCC techniques for trace analysis of phosphate in seawater," Analytical Chimica Acta, v.611, 2008, p. 68.

Li, Q.P., Hansell, D.A., McGillicuddy, D.J., Bates, N.R., Johnson, R.J.. "Tracer-based assessment of the origin and biogeochemical transformation of a cyclonic eddy in the Sargasso Sea," Journal of Geophysical Research, v.113, 2008, p. 10006.

Li, Q.P., Hansell, D.A., Zhang, J.-Z.. "Underway monitoring of nanomolar nitrate plus nitrite and phosphate in oligotrophic seawater," Limnology and Oceanography: Methods, v.6, 2008, p. 319.

Li, Q.P., Zhang, J.-Z., Millero, F.J., Hansell, D.A.. "Continuous colorimetric determination of trace ammonium in seawater with a long-path liquid waveguide capillary cell," Marine Chemistry, v.96, 2005, p. 73.

McGillicuddy, D.J., et. al.. "Eddy/Wind Interactions Stimulate Extraordinary Mid-Ocean Plankton Blooms," Science, v.316, 2007, p. 1021.

McGillicuddy, D.J., Ledwell, J.R., and Anderson, L.A.. "Response to Comment on "Eddy/Wind Interactions Stimulate Extraordinary Mid-Ocean Plankton Bloom",," Science, v.320, 2008.

McGillicuddy, D.J., Ledwell, J.R., Anderson, L.A.. "Response to Comment on "Eddy/Wind Interactions Stimulate Extraordinary Mid-Ocean Plankton Bloom",," Science, v.320, 2008.

McGillicuddy, et. al.. "Eddy/Wind Interactions Stimulate Extraordinary Mid-Ocean Plankton Blooms,," Science, v.316, 2007, p. 1021.

Mourino B., and McGillicuddy, D.J.. "Mesoscale Variability in the Metabolic Balance of the Sargasso Sea," Limnology & Oceanography, v.51, 2006, p. 2675.

[ [table of contents](#) | [back to top](#) ]

---

## **Program Information**

### **Ocean Carbon and Biogeochemistry (OCB)**

**Website:** <http://us-ocb.org/>



**Coverage:** Global

The Ocean Carbon and Biogeochemistry (OCB) program focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology that inform on and advance our understanding of ocean biogeochemistry. The overall program goals are to promote, plan, and coordinate collaborative, multidisciplinary research opportunities within the U.S. research community and with international partners. Important OCB-related activities currently include: the Ocean Carbon and Climate Change (OCCC) and the North American Carbon Program (NACP); U.S. contributions to IMBER, SOLAS, CARBOOCEAN; and numerous U.S. single-investigator and medium-size research projects funded by U.S. federal agencies including NASA, NOAA, and NSF.

The scientific mission of OCB is to study the evolving role of the ocean in the global carbon cycle, in the face of environmental variability and change through studies of marine biogeochemical cycles and associated ecosystems.

The overarching OCB science themes include improved understanding and prediction of: 1) oceanic uptake and release of atmospheric CO<sub>2</sub> and other greenhouse gases and 2) environmental sensitivities of biogeochemical cycles, marine ecosystems, and interactions between the two.

The OCB Research Priorities (updated January 2012) include: ocean acidification; terrestrial/coastal carbon fluxes and exchanges; climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles; mesopelagic ecological and biogeochemical interactions; benthic-pelagic feedbacks on biogeochemical cycles; ocean carbon uptake and storage; and expanding low-oxygen conditions in the coastal and open oceans.

[ [table of contents](#) | [back to top](#) ]

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## Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	<a href="#">unknown EDDIES NSF OCE</a>

[ [table of contents](#) | [back to top](#) ]