Bacterial abundance, thymidine & leucine incorporation 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/3059
Data Type: Cruise Results
Version: 26 March 2008
Version Date: 2008-03-26

Project
» Eddies Dynamics, Mixing, Export, and Species composition (EDDIES)

Program
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
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Abstract
Bacterial abundance, thymidine & leucine incorporation from R/V Weatherbird II WB0409, WB0413, WB0506, WB0508 cruises in the Sargasso Sea, 2004-2005.

Table of Contents

Coverage

Temporal Extent: 2004-06-23 - 2005-08-17

Dataset Description

Bacterial abundance, thymidine & leucine incorporation from R/V Weatherbird II WB0409, WB0413, WB0506, WB0508 cruises in the Sargasso Sea, 2004-2005.

dataset: Bacterial abundance, thymidine & leucine incorporation
project/cruise: EDDIES/WB0409 2004 Transect 1 (EDT1)
EDDIES/WB0413 2004 Transect 2 (EDT2)
EDDIES/WB0506 2005 Transect 1 (EDT3)
EDDIES/WB0508 2005 Transect 2 (EDT4)
platform: R/V Weatherbird II

Methods & Sampling

Methodology: (applies to entire data set)
Ewart, C.S., Meyers, M.K., Wallner, E., McGillicuddy, D.J., and Carlson, C.A. (2008). Microbial dynamics in cyclonic and anticylonic mode-water eddies in the Northwestern Sargasso Sea. Deep-Sea Research II, 55: 1334-1347.

Bacterial abundance:
Porter, K.G., Feig, Y.S., 1980. The use of DAPI for identifying and counting aquatic microflora. Limnology and Oceanography 25 (5), 943-948.

Campbell, L., 2001. Flow cytometric analysis of autotrophic picoplankton. In: Paul, J.H. (Ed.), Methods in Microbiology: Marine Microbiology. Academic Press, San Diego, CA, 317-341.

Marie, D., Partensky, F., Jacquet, S., Vaulot, D., 1997. Enumeration and cell cycle analysis of natural populations of marine picoplankton by flow cytometry using the nucleic acid stain SYBR Green I. Applied and Environmental Microbiology 63 (1), 186-193.

Bacterial Production:
Fuhrman, J.A., Azam, F., 1982. Thymidine incorporation as a measure of heterotrophic bacterioplankton production in marine surface waters: Evaluation and field results. Marine Biology 66, 109-120.

Smith, D.C., Azam, F., 1992. A simple, economical method for measuring bacterial protein synthesis rates in seawater using 3H-leucine. Marine Microbial Food Webs 6, 107-114.

Carbon Conversion factors:
Caron, D.A., Dam, H.G., Kremer, P., Lessard, E.J., Madin, L.P., Malone, T.C., Napp, J.M., Peele, E.R., Roman, M.R., Youngbluth, M.J., 1995. The contribution of microorganisms to particulate carbon and nitrogen in surface waters of the Sargasso Sea near Bermuda. Deep-Sea Research 42 (6), 943-972.

Ducklow, H., 2000. Bacterial production and biomass in the ocean. In: Kirchman, D.L. (Ed.), Microbial Ecology of the Oceans. Wiley-Liss, Inc, New York, 85-120.

Data Processing Description

BCO-DMO Processing Notes:
Change history: YYMMDD
080213: downloaded Excel file from EDDIES data Web site
080326: added to OCB database by Nancy Copley and Cyndy Chandler

090810: metadata records completed; cruise_ID corrected

Parameter names were modified to be consistent with OCB database.

[table of contents | back to top]

Related Publications

Campbell, L. (2001). Flow cytometric analysis of autotrophic picoplankton. Marine Microbiology, 317–343. doi:10.1016/s0580-9517(01)30051-x https://doi.org/10.1016/S0580-9517(01)30051-X
Methods

Caron, D. A., Dam, H. G., Kremer, P., Lessard, E. J., Madin, L. P., Malone, T. C., … Youngbluth, M. J. (1995). The contribution of microorganisms to particulate carbon and nitrogen in surface waters of the Sargasso Sea near Bermuda. Deep Sea Research Part I: Oceanographic Research Papers, 42(6), 943–972. doi:10.1016/0967-0637(95)00027-4
Methods

Ducklow, H. (2000). Bacterial production and biomass in the oceans. In: Kirchman, D.L. (Ed.), Microbial ecology of the oceans. Wiley-Liss, Inc, New York, 1, 85-120. https://www.researchgate.net/profile/David_Kirchman/publication/200146569_Bacterial_Production_and_Biomass_in_the_Oceans/links/00b49524b21efdf89f000000/Bacterial-Production-and-Biomass-in-the-Oceans.pdf
Methods

Ewart, C. S., Meyers, M. K., Wallner, E. R., McGillicuddy, D. J., & Carlson, C. A. (2008). Microbial dynamics in cyclonic and anticyclonic mode-water eddies in the northwestern Sargasso Sea. Deep Sea Research Part II: Topical Studies in Oceanography, 55(10-13), 1334–1347. doi:10.1016/j.dsr2.2008.02.013
Methods

Fuhrman, J. A., & Azam, F. (1982). Thymidine incorporation as a measure of heterotrophic bacterioplankton production in marine surface waters: Evaluation and field results. Marine Biology, 66(2), 109–120. doi:10.1007/bf00397184 https://doi.org/10.1007/BF00397184
Methods

Marie, D., Partensky, F., Jacquet, S., and Vaulot, D. (1997) Enumeration and cell cycle analysis of natural populations of marine picoplankton by flow cytometry using the nucleic acid stain SYBR Green I. Applied and Environmental Microbiology 63: 186-193. https://aem.asm.org/content/63/1/186.short
Methods

Porter, K. G., & Feig, Y. S. (1980). The use of DAPI for identifying and counting aquatic microflora. Limnology and Oceanography, 25(5), 943–948. doi:10.4319/lo.1980.25.5.0943
Methods

Smith, D.C. and F. Azam (1992). A simple, economical method for measuring bacterial protein synthesis rates in seawater using 3H-leucine. Marine Microbial Food Webs 6:107-114 http://www.gso.uri.edu/dcsmith/page3/page19/assets/smithazam92.PDF
Methods

[table of contents | back to top]

Parameters

Parameter	Description	Units
event	unique sampling event number	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	station number	dimensionless
depth_n	depth, nominal bottle firing	meters
Cruise_ID	cruise ID designation code	dimensionless
temp	temperature, from CTD, ITS-90	degrees Celsius
sal_CTD	salinity, from CTD, PSS-78 (PSU) (from primary T0,C0 sensors)	dimensionless
fluor	fluorescence; from CTD profiler	micrograms/liter
O2_umol_kg	oxygen, dissolved from SBE 43 CTD sensor	micromoles/kilogram
O2_CTD_S_umol_kg	oxygen, dissolved from SBE CTD (secondary)	micromoles/kilogram
cond	conductivity, from CTD (from primary C0 sensor)	Siemens/meter
temp_S	temperature, from CTD, ITS-90 (from secondary T1 sensor)	degrees Celsius
sal_S	salinity, from CTD, PSS-78 (PSU) (from secondary T1,C1 sensors)	dimensionless
sigma_t	sigma-T (density)	kilograms/meter^3
density	density	kilograms/liter
sta_ref	reference station indicator	dimensionless
staName	name of station (as a text string)	dimensionless
thym_incorp	thymine incorporation	picomoles/liter/hour
thym_sd	standard deviation of thymidine incorp	picomoles/liter/hour
leuc_incorp	leucine incorporation	picomoles/liter/hour
leuc_sd	standard deviation of leucine	picomoles/liter/hour
bacteria	bacteria cell concentration	cells x 10^9/liter
bact_sd	standard deviation of bacteria conc.	cells x 10^9/liter

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Niskin Bottle
Generic Instrument Name	Niskin bottle
Generic Instrument Description	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]

Deployments

WB0409

Website	https://www.bco-dmo.org/deployment/57955
Platform	R/V Weatherbird II
Start Date	2004-06-23
End Date	2004-07-02
Description	EDT1 2004 Transect 1 cruise Funded by: NSF OCE-0241310 **Processing Description** WB0409 20080215: changed dates from 36562 and 36531 to 20070701 and 20070702. This appears to have been an Excel error. 20080221: changed sta_ref ###-# to ###.# to be consistent with event log

WB0413

Website	https://www.bco-dmo.org/deployment/57960
Platform	R/V Weatherbird II
Start Date	2004-08-02
End Date	2004-08-11
Description	EDT2 2004 Transect 2 cruise Funded by: NSF OCE-0241310

WB0506

Website	https://www.bco-dmo.org/deployment/57963
Platform	R/V Weatherbird II
Start Date	2005-07-06
End Date	2005-07-15
Description	EDT3 2005 Transect 1 cruise Funded by: NSF OCE-0241310

WB0508

Website	https://www.bco-dmo.org/deployment/57966
Platform	R/V Weatherbird II
Start Date	2005-08-17
End Date	2005-08-26
Description	EDT4 2005 Transect 2 Funded by: NSF OCE-0241310 **Processing Description** 20080215: changed WB0508 sta_ref 1949-08 to 1949.08 to be consistent with event log

[table of contents | back to top]

Project Information

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

Website: 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 N2-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.

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Jenkins, W.J., McGillicuddy, D.J., and Lott III, D.E.. "The Distributions of, and Relationship Between 3 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 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 Chemica 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.

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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 CO2 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]

Funding

Funding Source	Award
NSF Division of Molecular and Cellular Biosciences (NSF MCB)	MCB-0237728
NSF Division of Ocean Sciences (NSF OCE)	OCE-0425615

[table of contents | back to top]