Net primary production and nutrient data from R/V Hugh R. Sharp cruise HRS1414 CTD casts in the Mid and South-Atlantic Bight from July to August of 2014 (DANCE project)

Website: https://www.bco-dmo.org/dataset/733711
Data Type: Cruise Results
Version: 1
Version Date: 2018-04-19

Project
» Collaborative Research: Impacts of atmospheric nitrogen deposition on the biogeochemistry of oligotrophic coastal waters (DANCE)

Contributors	Affiliation	Role
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Abstract
Net primary production (NPP) and nutrient data were acquired from R/V Hugh R. Sharp cruise HRS1414 CTD casts in the Mid and South-Atlantic Bight from July to August of 2014 between latitudes 31.60°N and 38.89°N, and longitudes 71.09°W and 75.16°W.

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Coverage

Spatial Extent: **N**:38.89 **E**:-71.09 **S**:31.6 **W**:-75.16
Temporal Extent: 2014-07-31 - 2014-08-14

Methods & Sampling

Codes in the data:
* ND: not determined
* BDL: below detection limit
* DNP: Data not presented

Water column sample collection and in-situ measurements:

Water-column samples for analysis of Chl a, nitrate, nitrite, phosphate, urea, ammonium and net primary productivity, and continuous profiles of temperature and salinity were collected using a conductivity-temperature-depth sensor (SBE 911 plus) with a 12 Bottle Frame & Carousel (SBE 32) consisting of 12 niskin

bottles. Nutrient samples were collected from the niskin bottles using acid cleaned tubing and were filtered through a 0.2 µm filter. Whole water samples to measure net primary production were collected directly from CTD bottles using acid cleaned tubing and drained into acid cleaned 10L carboys. Measurement of net primary production was done using stable isotopes. Whole water samples were taken with a niskin bottle from the surface, mix layer, and chlorophyll maximum and transferred into acid-cleaned 250 mL, 500mL, 1000ml or 2000ml PETG incubation bottles in triplicate. Primary productivity was measured by adding tracer additions (<10% of the ambient dissolved inorganic carbon) of NaH13CO2 and incubating for 12-24 hours in flow-through seawater incubators under neutral density screening. Dark bottles were also incubated. After 12-24 hours, incubations were terminated by filtration through pre-combusted (450 degree C for 2 h) GF/F filters. Filters were stored at -20 degree C until analysis in the laboratory. Filters were analyzed on a Europa 20/20 isotope ratio mass spectrometer equipped with an automated nitrogen and carbon analysis for gas, solids, and liquids (ANCA-GSL) preparation module. Analysis also resulted in particulate nitrogen (PN) and particulate carbon (PC) values.

NO3 & NO2: Dissolved nitrate and nitrite was determined at sea using an Astoria Pacific nutrient autoanalyzer using standard colorimetric methods with a detection limit of 0.14 µM (Parsons et al., 1984; Price and Harrison, 1987). In surface waters, nitrate and nitrite were determined using the same autoanalyzer equipped with a liquid waveguide capillary cell (World Precision Instruments) (Zhang, 2000) to achieve a detection limit of 0.02 µM.

PO4: Dissolved phosphate was determined at sea using an Astoria Pacific nutrient autoanalyzer using standard colorimetric methods with a detection limit of 0.03 µM (Parsons et al., 1984; Price and Harrison, 1987).

NH4: Dissolved ammonium was determined at sea using the manual orthophthaldialdehyde method (Holmes et al., 1999).

Urea: Dissolved urea was determined at sea using an Astoria Pacific nutrient autoanalyzer using standard colorimetric methods with a detection limit of 0.08 µM (Parsons et al., 1984; Price and Harrison, 1987).

Temperature: In-situ temperature was measured using a conductivity-temperature-depth sensor (SBE 911 plus).

Salinity: Salinity was calculated from in-situ conductivity, as measured using a conductivity-temperature-depth (CTD) sensor (SBE 911 plus).

Chl: Chlorophyll a was determined at sea using the non-acidification method with a Turner 10-AU fluorometer (Welschmeyer et al., 1994).

NPP: Net primary production was measured using stable isotopes (Mulholland et al., 2006).

PNPC: Particulate nitrogen and carbon samples were collected by filtering whole water samples through pre-combusted (450 degree C for 2 h) GF/F filters. Filters were stored at -20 degree C until analysis in the laboratory. Filters were analyzed on a Europa 20/20 isotope ratio mass spectrometer equipped with an automated nitrogen and carbon analysis for gas, solids, and liquids (ANCA-GSL) preparation module.

Data Processing Description

BCO-DMO Data Manager Processing Notes:
* added a conventional header with dataset name, PI name, version date
* modified parameter names to conform with BCO-DMO naming conventions
* After discussing with data contributors:
* Formatted date as yyyy-mm-dd
* rounded lat/lon to four decimal places, depth to 0 decimal places, and temp/sal to one decimal place.

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Data Files

File
DANCE_DATASET_CTD_NUTS_NPP.csv (Comma Separated Values (.csv), 22.01 KB) MD5:37f07a39b1d1cc6f3168cbbd23a3a5d0
Primary data file for dataset ID 733711

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Related Publications

Holmes, R. M., Aminot, A., Kérouel, R., Hooker, B. A., & Peterson, B. J. (1999). A simple and precise method for measuring ammonium in marine and freshwater ecosystems. Canadian Journal of Fisheries and Aquatic Sciences, 56(10), 1801–1808. doi:10.1139/f99-128
Methods

Mulholland, M. R., Bernhardt, P. W., Heil, C. A., Bronk, D. A., & O'Neil, J. M. (2006). Nitrogen fixation and release of fixed nitrogen by Trichodesmium spp. in the Gulf of Mexico. Limnology and Oceanography, 51(4), 1762–1776. doi:10.4319/lo.2006.51.4.1762
Methods

Parsons, T. R., Y. Maita, and C. M. Lalli. "A Manual of Chemical and Biological Methods of Seawater Analysis", Pergamon Press (1984). ISBN: 9780080302874
Methods

Price, N. M., & Harrison, P. J. (1987). Comparison of methods for the analysis of dissolved urea in seawater. Marine Biology, 94(2), 307–317. doi:10.1007/bf00392945 https://doi.org/10.1007/BF00392945
Methods

Welschmeyer, N. A. (1994). Fluorometric analysis of chlorophyll a in the presence of chlorophyll b and pheopigments. Limnology and Oceanography, 39(8), 1985–1992. doi:10.4319/lo.1994.39.8.1985
Methods

Zhang, J.-Z. (2000). Shipboard automated determination of trace concentrations of nitrite and nitrate in oligotrophic water by gas-segmented continuous flow analysis with a liquid waveguide capillary flow cell. Deep Sea Research Part I: Oceanographic Research Papers, 47(6), 1157–1171. doi:10.1016/s0967-0637(99)00085-0 https://doi.org/10.1016/S0967-0637(99)00085-0
Methods

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Parameters

Parameter	Description	Units
Station	DANCE cruise station number	unitless
Cast	DANCE CTD cast number	unitless
Bottle	CTD bottle number	unitless
Date	local date (EDT) of collection in format yyyy-mm-dd	unitless
Latitude	latitude at start of CTD deployment	decimal degrees
Longitude	longitude at start of CTD deployment	decimal degrees
Depth	sample collection depth (below surface)	meters
Sal	salinity calculated from CTD conductivity	Practical Salinity Units (PSU)
Temperature	in-situ temperature from CTD	degrees Celsius
CHL_a	chlorophyll a concentration	micrograms per liter (ug/l)
NO3	dissolved nitrate concentration	micromoles per liter (umol/l)
NO2	dissolved nitrite concentration	micromoles per liter (umol/l)
PO4	dissolved phosphate concentration	micromoles per liter (umol/l)
NH4	dissolved ammonium concentration	nanomoles per liter (nmol/l)
Urea	dissolved urea concentration	micromoles per liter (umol/l)
NPP	net primary productivity	micromoles C per liter per day(umol/l/d)
PC	particulate carbon	micromoles C per liter (umol/l)
PN	particulate nitrogen	micromoles N per liter (umol/l)

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Instruments

Dataset-specific Instrument Name	Shimadzu RF-1501
Generic Instrument Name	Fluorometer
Dataset-specific Description	Fluorimetric detector (NH4): Shimadzu RF-1501
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	Turner Designs 10-AU 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	Europa 20/20 isotope ratio mass spectrometer
Generic Instrument Name	Mass Spectrometer
Dataset-specific Description	NPP: Europa 20/20 isotope ratio mass spectrometer equipped with an automated nitrogen and carbon analysis for gas, solids, and liquids (ANCA-GSL) preparation module.
Generic Instrument Description	General term for instruments used to measure the mass-to-charge ratio of ions; generally used to find the composition of a sample by generating a mass spectrum representing the masses of sample components.

Dataset-specific Instrument Name	Astoria Pacific nutrient autoanalyzer
Generic Instrument Name	Nutrient Autoanalyzer
Dataset-specific Description	Macronutrient analysis (NO3, NO2, Urea, PO4)
Generic Instrument Description	Nutrient Autoanalyzer is a generic term used when specific type, make and model were not specified. In general, a Nutrient Autoanalyzer is an automated flow-thru system for doing nutrient analysis (nitrate, ammonium, orthophosphate, and silicate) on seawater samples.

Dataset-specific Instrument Name	
Generic Instrument Name	Sea-Bird SBE 911plus CTD
Generic Instrument Description	[tethered, real-time] 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

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Deployments

HRS1414

Website	https://www.bco-dmo.org/deployment/731505
Platform	R/V Hugh R. Sharp
Start Date	2014-07-29
End Date	2014-08-16

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Project Information

Collaborative Research: Impacts of atmospheric nitrogen deposition on the biogeochemistry of oligotrophic coastal waters (DANCE)

Coverage: Offshore Mid-Atlantic Bight and northern South-Atlantic Bight between latitudes 31.60°N and 38.89°N, and longitudes 71.09°W and 75.16°W

NSF abstract:

Deposition of atmospheric nitrogen provides reactive nitrogen species that influence primary production in nitrogen-limited regions. Although it is generally assumed that these species in precipitation contributes substantially to anthropogenic nitrogen loadings in many coastal marine systems, its biological impact remains poorly understood. Scientists from Pennsylvania State University, William & Mary College, and Old Dominion University will carry out a process-oriented field and modeling effort to test the hypothesis that deposits of wet atmospheric nitrogen (i.e., precipitation) stimulate primary productivity and accumulation of algal biomass in coastal waters following summer storms and this effect exceeds the associated biogeochemical responses to wind-induced mixing and increased stratification caused by surface freshening in oligotrophic coastal waters of the eastern United States. To attain their goal, the researchers would perform a Lagrangian field experiment during the summer months in coastal waters located between Delaware Bay and the coastal Carolinas to determine the response of surface-layer biogeochemistry and biology to precipitation events, which will be identified and intercepted using radar and satellite data. As regards the modeling effort, a 1-D upper ocean mixing model and a 1-D biogeochemical upper-ocean will be calibrated by assimilating the field data obtained a part of the study using the adjoint method. The hypothesis will be tested using sensitivity studies with the calibrated model combined with in-situ data and results from the incubation experiments. Lastly, to provide regional and historical context for the field measurements and the associated 1-D modeling, linked regional atmospheric-oceanic biogeochemical modeling will be conducted.

Broader Impacts. Results from the study would be incorporated into class lectures for graduate courses on marine policy and marine biogeochemistry. One graduate student from Pennsylvania State University, one graduate student from the College of William and Mary, and one graduate and one undergraduate student from Old Dominion University would be supported and trained as part of this project.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1260574
NSF Division of Ocean Sciences (NSF OCE)	OCE-1260454

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