# 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 $NaH13CO_2$ 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)<br><div align="center">MD5:37f07a39b1d1cc6f3168cbbd23a3a5d0</div><br>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) |

## Instruments

| Dataset-specific Instrument Name | |
|---|---|
| Generic Instrument Name | CTD Sea-Bird SBE 911plus |
| Generic Instrument Description | 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 |

| | |
|---|---|
| **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. |

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|---|---|
| **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. |

## 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 |

## 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.

## Funding

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