

Processed CTD data from all sensors mounted on the rosette from R/V Knorr cruise KN210-04 in the Western Atlantic Ocean between Uruguay and Barbados in 2013 (Deep Atlantic DOM project)

Website: <https://www.bco-dmo.org/dataset/481164>

Data Type: Cruise Results

Version: 1

Version Date: 2014-01-14

Project

» [Dissolved Organic Matter Composition in the Deep Atlantic Ocean](#) (Deep Atlantic DOM)

Programs

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

» [Center for Chemical Currencies of a Microbial Planet](#) (C-CoMP)

Contributors	Affiliation	Role
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Abstract

Processed CTD data from all sensors mounted on the rosette from the KN210-04 cruise. Data include temperature, salinity, dissolved oxygen, fluorometry, turbidity, PAR, and SPAR.

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Coverage

Spatial Extent: N:9.703869 E:-23.999036 S:-38.0026 W:-55.304343

Temporal Extent: 2013-03-26 - 2013-05-06

Dataset Description

Processed CTD data from all sensors mounted on the rosette from the KN210-04 cruise. Data include temperature, salinity, dissolved oxygen, fluorometry, turbidity, PAR, and SPAR.

Methods & Sampling

The CTD rosette was provided by the Knorr Shipboard Science Support Group (SSSG) and was prepared for initial deployment by the SSSG representative on our cruise, Catie Graver. The system was a SBE9+ CTD with a depth limit of 6000m. The investigators used the dual SBE3T/SBE4C sensor system for temperature and conductivity. The rosette was also equipped with a SBE43 oxygen sensor, a Benthos/Datasonics PSA-916 altimeter, a Wet Labs FLNTURTD combination fluorometer and turbidity sensor, and a WetLabs C-star transmissometer (operating at a wavelength of 660 nm with a 25cm pathlength). For hydrocasts less than 1000m deep, the investigators attached a Biospherical Instruments QSP-200L4S underwater PAR sensor. This sensor was linked to a surface PAR sensor on the ship (QSR-240).

Data Processing Description

After the cruise, Krista Longnecker used SBE Data Processing to convert the data files, filter the data, remove wild edits, and bin average the data into 1-m bins. These processed data were exported to MATLAB and the SBE43 oxygen data were calibrated based on the discrete water samples analyzed during the cruise by Evan Howard (WHOI). Fluorescence values from the WET Labs ECO-AFL/FL have been converted from volts to milligrams per cubic meter using calibration values from WETLabs. The chlorophyll concentrations have not been further calibrated with discrete samples.

BCO-DMO Processing Notes:

- Parameter names were modified to conform with BCO-DMO naming conventions.
- lat_start and lon_start were added by joining the data to the event log and matching on the unique event number.
- Replaced 'NaN' and '-9.99E-29' with 'nd' to indicate 'no data'.

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Data Files

File
CTD.csv (Comma Separated Values (.csv), 26.55 MB) MD5:656bb4ca4fc85dc44e7582a6cf26ffe5 Primary data file for dataset ID 481164

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Parameters

Parameter	Description	Units
cast	Consecutive cast number for the instrument.	dimensionless
station	Identification number of the sampling station.	dimensionless
date_start_utc	Date (UTC) given as 4-digit year -- 2-digit month -- 2-digit day in YYYYmmdd format.	unitless
time_start_utc	Time (UTC) given as hour -- minute.	HHMM
event_start	The event number from the ELOG maintained during the cruise.	dimensionless

lat_start	Latitude at the time the event started (from the cruise event log).	decimal degrees
lon_start	Longitude at the time the event started (from the cruise event log).	decimal degrees
depth	Depth. (Originally called 'depSM'.)	meters
press	Pressure. (Originally called 'prDM'.)	decibars (db)
temp	Temperature from primary sensor on CTD. (Originally called 't090C'.)	degrees Celsius (ITS-90)
temp2	Temperature from secondary sensor on CTD. (Originally called 't190C'.).	degrees Celsius (ITS-90)
sal	Salinity from primary sensor on CTD. (Originally called 'sal00'.)	Practical Salinity Units (PSU)
sal2	Salinity from secondary sensor on CTD. (Originally called 'sal11'.)	Practical Salinity Units (PSU)
O2_mL_L	Oxygen from SBE43.	milliliters per liter (mL/L)
density	Density from primary sensor on CTD. (Originally called 'density00'.)	kilograms per cubic meter (kg/m ³)
density2	Density from secondary sensor on CTD. (Originally called 'density11'.)	kilograms per cubic meter (kg/m ³)
latitude	Latitude.	decimal degrees
longitude	Longitude.	decimal degrees
fluor	Fluorescence from WET Labs ECO-AFL/FL. (Originally called 'fIECO_AFL'.)	milligrams per cubic meter (mg/m ³)
trans	Beam transmission from WET Labs C-Star. (Originally called 'CStarTr0'.)	percent (%)
turbidity	Turbidity from WET Labs ECO. (Originally called 'tubWETntu0'.)	Nephelometric Turbidity Units (NTU)

par	PAR / irradiance from Biospherical/Licor.	microEinsteins per square meter per second ($\mu\text{E}/\text{m}^2\text{-sec}$)
spar	SPAR / surface irradiance.	microEinsteins per square meter per second ($\mu\text{E}/\text{m}^2\text{-sec}$)
sound_vel	Sound velocity. (Originally called 'svCM1'.)	meters per second (m/s) (Chen-Millero)
flag	Data quality flag.	dimensionless

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Instruments

Dataset-specific Instrument Name	Benthos/Datasonics PSA-916 altimeter
Generic Instrument Name	Altimeter
Dataset-specific Description	A Benthos/Datasonics PSA-916 altimeter was equipped on the CTD rosette.
Generic Instrument Description	An instrument that measures height above a fixed surface. The data can be used to map ocean-surface topography and generate gridded surface height fields.

Dataset-specific Instrument Name	Biospherical Instruments QSP-200L4S underwater PAR sensor
Generic Instrument Name	Biospherical QSP-200L underwater PAR Sensor
Dataset-specific Description	For hydrocasts less than 1000m deep, a Biospherical Instruments QSP-200L4S underwater PAR sensor was attached to the CTD rosette. This sensor was linked to a surface PAR sensor on the ship (QSR-240).
Generic Instrument Description	Underwater radiometer with a PAR spectral response (400-700nm). Standard configuration had a spherical collector measuring 4-pi scalar irradiance but a flat plate cosine collector was available as an identically-designated option.

Dataset-specific Instrument Name	QSR-240 surface PAR sensor
Generic Instrument Name	Biospherical QSR-240 surface PAR
Dataset-specific Description	For hydrocasts less than 1000m deep, a Biospherical Instruments QSP-200L4S underwater PAR sensor was attached to the CTD rosette. This sensor was linked to a surface PAR sensor on the ship (QSR-240).
Generic Instrument Description	Shipboard radiometer with a PAR spectral response (400-700nm) designed to monitor surface irradiance during underwater light profile measurement. Hemispherical collector measuring 2-pi scalar irradiance.

Dataset-specific Instrument Name	CTD SBE 911plus
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	SBE43 oxygen sensor
Generic Instrument Name	Sea-Bird SBE 43 Dissolved Oxygen Sensor
Dataset-specific Description	An SBE43 oxygen sensor was equipped on the CTD rosette.
Generic Instrument Description	The Sea-Bird SBE 43 dissolved oxygen sensor is a redesign of the Clark polarographic membrane type of dissolved oxygen sensors. more information from Sea-Bird Electronics

Dataset-specific Instrument Name	Dual SBE3T/SBE4C
Generic Instrument Name	Sea-Bird SBE-3 Temperature Sensor
Dataset-specific Description	A dual SBE3T/SBE4C sensor system for temperature and conductivity was equipped on the CTD rosette.
Generic Instrument Description	The SBE-3 is a slow response, frequency output temperature sensor manufactured by Sea-Bird Electronics, Inc. (Bellevue, Washington, USA). It has an initial accuracy of +/- 0.001 degrees Celsius with a stability of +/- 0.002 degrees Celsius per year and measures seawater temperature in the range of -5.0 to +35 degrees Celsius. more information from Sea-Bird Electronics

Dataset-specific Instrument Name	Dual SBE3T/SBE4C
Generic Instrument Name	Sea-Bird SBE-4 Conductivity Sensor
Dataset-specific Description	A dual SBE3T/SBE4C sensor system for temperature and conductivity was equipped on the CTD rosette.
Generic Instrument Description	The Sea-Bird SBE-4 conductivity sensor is a modular, self-contained instrument that measures conductivity from 0 to 7 Siemens/meter. The sensors (Version 2; S/N 2000 and higher) have electrically isolated power circuits and optically coupled outputs to eliminate any possibility of noise and corrosion caused by ground loops. The sensing element is a cylindrical, flow-through, borosilicate glass cell with three internal platinum electrodes. Because the outer electrodes are connected together, electric fields are confined inside the cell, making the measured resistance (and instrument calibration) independent of calibration bath size or proximity to protective cages or other objects.

Dataset-specific Instrument Name	WL CSTAR Trans
Generic Instrument Name	WET Labs {Sea-Bird WETLabs} C-Star transmissometer
Dataset-specific Description	A WetLabs C-star transmissometer (operating at a wavelength of 660 nm with a 25cm pathlength) was equipped on the CTD rosette.
Generic Instrument Description	The C-Star transmissometer has a novel monolithic housing with a highly integrated opto-electronic design to provide a low cost, compact solution for underwater measurements of beam transmittance. The C-Star is capable of free space measurements or flow-through sampling when used with a pump and optical flow tubes. The sensor can be used in profiling, moored, or underway applications. Available with a 6000 m depth rating. More information on Sea-Bird website: https://www.seabird.com/c-star-transmissometer/product?id=60762467717

Dataset-specific Instrument Name	Wet Labs FLNTURTD
Generic Instrument Name	WetLabs FLNTU
Dataset-specific Description	A Wet Labs FLNTURTD combination fluorometer and turbidity sensor was equipped on the CTD rosette.
Generic Instrument Description	The WetLabs ECO FLNTU is a dual-wavelength, single-angle sensor for simultaneously determining both chlorophyll fluorescence and turbidity. It detects light scattered by particles suspended in water, generating an output voltage proportional to turbidity or suspended solids. Scaling factors are used to convert the voltage readings to values representing chlorophyll concentration and turbidity expressed in Nephelometric Turbidity Units (NTUs).

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Deployments

KN210-04

Website	https://www.bco-dmo.org/deployment/59057
Platform	R/V Knorr
Start Date	2013-03-25
End Date	2013-05-09
Description	Western Atlantic cruise started at Montevideo, Uruguay and ended at Bridgetown, Barbados. Science Objectives: 1. Characterize deep ocean dissolved organic matter in water masses of western Atlantic Ocean. 2. Characterize microbial community at selected stations and at selected depths. 3. Characterize metabolic capabilities of surface, mesopelagic and bathypelagic microbial consortia vis-a-vis the degradation of organic matter from each zone. 4. Examine metabolic and phylogenetic links between microbes in different marine zones (surface, meso-pelagic and bathypelagic depths). Science Activities: 1. Collection of discrete water samples by Niskin-bottles. 2. Collection of microbial communities from these water samples, by in-situ pumping, or by net-traps and net-tows. 3. Incubation experiments in lab and on deck. 4. Underway mass spectrometry and flow cytometry, from seawater intake. More information is available from the WHOI Cruise Planning Synopsis. Additional cruise information and original data are available from the NSF R2R Data Catalog.

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Project Information

Dissolved Organic Matter Composition in the Deep Atlantic Ocean (Deep Atlantic DOM)

Coverage: Western Atlantic Ocean

Transformations of dissolved organic matter (DOM) in the deep ocean have profound impacts on the global carbon cycle due to the sequestration of carbon dioxide (CO₂) away from the atmosphere. Although research has been conducted on the high molecular weight component of this material, the same cannot be said for low molecular weight DOM because the needed analytical techniques have not been available to determine its composition and reactivity.

In recent years, a research team at Woods Hole Oceanographic Institution has acquired the necessary analytical capability. As such, in this project, they will carry out the first systematic survey of deep ocean DOM in the western Atlantic Ocean to characterize the low molecular weight fraction of DOM in southward flowing North Atlantic Deep Water (NADW), northward flowing Antarctic Bottom Water (AABW), and Antarctic Intermediate Water (AAIW). Using ultrahigh resolution mass spectrometry and multi-stage fragmentation coupled to liquid chromatography, the scientists will determine the spatial variability in the composition of DOM along the flow path of the water masses, as well as assess the source water, transport, and surface processes that contribute to temporal changes in DOM composition. These results will be augmented with structural elucidation and quantitative assays of unique marker compounds for each water mass. Results will provide important insights into the biogeochemical reactions that govern DOM dynamics in the deep ocean.

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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.

Center for Chemical Currencies of a Microbial Planet (C-CoMP)

Website: <https://ccomp-stc.org/>

Coverage: North Atlantic, BATS, global/other

Functions carried out by microscopic inhabitants of the surface ocean affect every aspect of life on our planet, regardless of distance from the coast. Ocean phytoplankton are responsible for half of the photosynthesis on Earth, the first step in a complex system that annually withdraws 50 billion metric tons of carbon from the atmosphere to sustain their growth. Of this, 25 billion metric tons participate in a rapid cycle in which biologically reactive material is released into seawater and converted back into carbon dioxide by marine bacteria within hours to days. The chemical-microbe network at the heart of this fast cycle remains poorly constrained; consequently, its primary currencies and controls remain elusive; its sensitivities to changing ocean conditions are unknown; and its responses to future climate scenarios are not predictable. The Center for Chemical Currencies of a Microbial Planet (C-CoMP) integrates research, education and knowledge transfer activities to develop a mechanistic understanding of surface ocean carbon flux within the context of a changing ocean and through increased participation in ocean sciences. C-CoMP supports science teams that merge biology, chemistry, modeling, and informatics to close long-standing knowledge gaps in the identities and dynamics of organic molecules that serve as the currencies of elemental transfer between the ocean and atmosphere. C-CoMP fosters education, outreach, and knowledge transfer activities that engage students of all ages, broaden participation in the next generation of ocean scientists, and extend novel open-science approaches into complementary academic and industrial communities. The Center framework is critical to this mission, uniquely facilitating an open exchange of experimental and computational science, methodological and conceptual challenges, and collaborations that establish integrated science and education partnerships. With expanded participation in ocean science research and ocean literacy across the US society, the next generation of ocean scientists will better reflect the diverse US population.

Climate-carbon feedbacks on the marine carbon reservoir are major uncertainties for future climate projections, and the trajectory and rate of ocean changes depend directly on microbial responses to temperature increases, ocean acidification, and other perturbations driven by climate change. C-CoMP research closes an urgent knowledge gap in the mechanisms driving carbon flow between ocean and atmosphere, with global implications for predictive climate models. The Center supports interdisciplinary science teams following open and reproducible science practices to address: (1) the chemical currencies of surface ocean carbon flux; (2) the structure and regulation of the chemical-microbe network that mediates this flux; and (3) sensitivity of the network and its feedbacks on climate. C-CoMP leverages emerging tools and

technologies to tackle critical challenges in these themes, in synergy with existing ocean programs and consistent with NSF's Big Ideas. C-CoMP education and outreach activities seek to overcome barriers to ocean literacy and diversify participation in ocean research. The Center is developing (1) initiatives to expand ocean literacy in K-12 and the broader public, (2) ocean sciences undergraduate curricula and research opportunities that provide multiple entry points into research experiences, (3) post-baccalaureate programs to transition undergraduates into graduate education and careers in ocean science, and (4) interdisciplinary graduate student and postdoctoral programs that prepare the next generation of ocean scientists. The C-CoMP team includes education faculty who evaluate the impacts of education and outreach activities and export successful STEM initiatives to the education community. C-CoMP is revolutionizing the technologies for studying chemical transformations in microbial systems to build understanding of the outsized impact of microbes on elemental cycles. Open science, cross-disciplinary collaborations, community engagement, and inclusive practices foster strategic advances in critical science problems and STEM initiatives. C-CoMP science, education, and knowledge-transfer themes are efficiently addressed through a sustained network of scientists addressing critical research challenges while broadening the workforce that will tackle multi-disciplinary problems with academic, industrial and policy partners.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

The Program's Data Management Plan (DMP) is available as a [PDF document](#).

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1154320

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