CTD data from R/V Knorr cruise KN223 in the North and West Atlantic Ocean in 2014 (AMOC Last Glacial Max project)

Website: https://www.bco-dmo.org/dataset/567399
Version: 18 Sept 2015
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Project
» North Atlantic Meridional Circulation during the Last Glacial Maximum: Density Structure and Pre-formed Nitrate: Phase I (AMOC Last Glacial Max)

Program
» Center for Dark Energy Biosphere Investigations (C-DEBI)

Contributors	Affiliation	Role
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Dataset Description

CTD hydrocasts were performed during the KN223 cruise in the North Atlantic with a Sea-Bird SBE 911/917 plus CTD.

Methods & Sampling

CTD Hydrocasts were performed with a Sea-Bird SBE 911/917 plus CTD mounted near the base of a Niskin 24 Bottle Rosette. The CTD instrumentation included Conductivity (S/N 2147 & 2768), Temperature (ITS-90, S/N 4195 & 4252), Pressure (S/N 63505 SBE090462), Oxygen (SBE 43, S/N 0264), Fluorescence (Wetlab ECO-AFL/FL, S/N FLNTURTD-304), and Beam Transmission (Chelsea/Seatech/Wetlab CStar, S/N CST-1118DR). Processing firmware is SBE11plus v 5.

At each station, a hydrocast was conducted with a rosette carrying 24 10-L Niskin bottles. The rosette was instrumented with sensors for conductivity, temperature, pressure, oxygen, fluorescence, and beam transmission, as listed above. The downcast was conducted at 30 m per minute in the upper 100 m and increased to 60 m per minute to a maximum depth of ~5 m above the seafloor (based on altimeter data). Features were selected from the downcast data for sampling on the upcast. These features included oxygen minimum layer(s), chlorophyll maximum layer(s), and the thermocline. In addition, standard depths of bottom, 50 m above bottom, 5000 m, 4000 m, 3000 m, 2000 m, 1500 m, 1000 m, 300 m, 200 m, 100 m, 50 m, 10 m, and surface were sampled.

The vent plugs were removed and replaced with t-fittings. A ring of plastic tubing (1/4" inner diameter) was used to construct a manifold to deliver pressure to each Niskin bottle. Each bottle was connected individually to the manifold to prevent any potential mixing between bottles. The compressor was connected to the initial t-valve in the series and the final t-valve was plugged. The compressor was set to 8 - 10 psi.

Cylindrical, 0.2 um retention membrane filters (Sterivex) were attached to the petcock valve of the Niskin bottles with 1/4" tubing (Fig. 8). The valves were opened and the water was pushed through the filters with the compressed air. The filtration rate is ~200 mL per minute. When the water stopped dripping through the filter, the filters were removed, capped at both ends, placed into freezer boxes and stored at -70 degrees C in the main lab freezer.

Data Processing Description

The CTD data were processed with Seasave v. 7.21k.

BCO-DMO Processing:
- Modified parameter names to conform with BCO-DMO naming conventions;
- Obtained lat_start, lon_start, date_start, and time_start from the CTD file headers;
- Converted lat and lon to decimal degrees;
- Added ISO_DateTime_Start column.

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Data Files

File
KN223_CTD.csv (Comma Separated Values (.csv), 15.72 MB) MD5:09d119ed69695c30d5f34eb63837315d Primary data file for dataset ID 567399

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Parameters

Parameter	Description	Units
cruise_id	Cruise identification number.	dimensionless
cast	Cast number.	dimensionless
lat_start	Latitude at start of cast.	decimal degrees
lon_start	Longitude at start of cast.	decimal degrees
date_start	Date (YYYYmmdd) at start of cast.	YYYYmmdd
time_start	Time (HH:MM:SS) at start of cast.	HH:MM:SS
ISO_DateTime_Start	Date and time at start of cast, formatted to ISO8601 standard.	YYYY-mm-ddTHH:MM:SS.xx
press	Pressure. Originally named 'PrDM'.	decibars (db)
temp	Temperature, ITS-90 (primary). Originally named 'T090C'.	degrees Celsius
temp2	Temperature, ITS-90 (secondary). Originally named 'T190C'.	degrees Celsius
cond	Conductivity (primary). Originally named 'C0S/m'.	Siemens per meter (S/m)
cond2	Conductivity (secondary). Originally named 'C1S/m'.	Siemens per meter (S/m)
O2_volt	Raw oxygen voltage from SBE43. Originally named 'Sbeox0V'.	volts (V)
O2	Oxygen from SBE43. Originally named 'Sbeox0ML/L'.	milliliters per liter (mL/L)
fluor	Fluorescence from Wetlab ECO-AFL/FL. Originally named 'FlECO-AFL'.	milligrams per cubic meter (mg/m^3)
beam_att	Beam attenuation from WET Labs C-Star. Originally named 'CStarAt0'.	reciprocal meters (1/m)
beam_trans	Beam transmission from WET Labs C-Star. Originally named 'CStarTr0'.	percent (%)
turbidity	Turbidity from WET Labs ECO. Originially named 'TurbWETntu0'.	NTU
depth	Depth. Originally named 'DepSM'.	meters (m)
sal	Salinity (primary). Originally named 'Sal00'.	practical salinity units (PSU)
sal2	Salinity (secondary). Originally named 'Sal11'.	practical salinity units (PSU)
sound_vel	Sound velocity. Originally named 'SvDM'.	Delgrosso meters per second (m/s)
O2_2	Oxygen from SBE43. Originally named 'Sbeox0ML/L'.	milliliters per liter (mL/L)
O2_pcnt_sat	Oxygen percent saturation from SBE43. Originally named 'Sbeox0PS'.	percent (%)
flag	Flag.	nd

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	CTD Sea-Bird SBE 911plus
Dataset-specific Description	CTD Hydrocasts were performed with a Sea-Bird SBE 911/917 plus CTD mounted near the base of a Niskin 24 Bottle Rosette.
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

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Deployments

KN223

Website	https://www.bco-dmo.org/deployment/567408
Platform	R/V Knorr
Start Date	2014-10-25
End Date	2014-12-02

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Project Information

North Atlantic Meridional Circulation during the Last Glacial Maximum: Density Structure and Pre-formed Nitrate: Phase I (AMOC Last Glacial Max)

Coverage: North Atlantic Ocean

Description from NSF award abstract:
The large-scale conveyor-belt-like circulation of the Atlantic Ocean (the Atlantic Meridional Overturning Circulation, or AMOC) significantly affects climate via its heat flux and its impact on atmospheric carbon dioxide levels. A number of lines of evidence suggest that the structure of the circulation was different during the last ice age, however these reconstructions are indirect. Sedimentary pore waters in the deep sea preserve ancient seawater, and offer the possibility of more directly documenting how AMOC of the last glacial maximum differed from that of the present.

This project, led by a team of researchers from the University of Rhode Island, will address these fundamental questions about the links between ocean circulation and climate change. Specifically, funding supports a month-long research expedition to collect long sediment cores along a transect between Puerto Rico and New England. Coring sites would range in depth from 1 to more than 5 km. Coring targets will be chosen with a combination of multibeam swath bathymetry, seafloor backscatter, and CHIRP sub-bottom seismic data. The team would analyze the composition (chloride, dissolved oxygen, and nitrate concentrations) of pore waters in the recovered sediments shipboard to detect the relict signal of deep water chemistry during the last glacial

maximum. These measurements will allow the researchers to directly test the influence of glacial circulation on climate (via the pre-formed nitrate content of deep and intermediate water in the LGM North Atlantic). The expedition will include several graduate and undergraduate students, offering a valuable training activity and a strong educational experience.

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Program Information

Center for Dark Energy Biosphere Investigations (C-DEBI)

Website: http://www.darkenergybiosphere.org

Coverage: Global

The mission of the Center for Dark Energy Biosphere Investigations (C-DEBI) is to explore life beneath the seafloor and make transformative discoveries that advance science, benefit society, and inspire people of all ages and origins.

C-DEBI provides a framework for a large, multi-disciplinary group of scientists to pursue fundamental questions about life deep in the sub-surface environment of Earth. The fundamental science questions of C-DEBI involve exploration and discovery, uncovering the processes that constrain the sub-surface biosphere below the oceans, and implications to the Earth system. What type of life exists in this deep biosphere, how much, and how is it distributed and dispersed? What are the physical-chemical conditions that promote or limit life? What are the important oxidation-reduction processes and are they unique or important to humankind? How does this biosphere influence global energy and material cycles, particularly the carbon cycle? Finally, can we discern how such life evolved in geological settings beneath the ocean floor, and how this might relate to ideas about the origin of life on our planet?

C-DEBI's scientific goals are pursued with a combination of approaches:
(1) coordinate, integrate, support, and extend the research associated with four major programs—Juan de Fuca Ridge flank (JdF), South Pacific Gyre (SPG), North Pond (NP), and Dorado Outcrop (DO)—and other field sites;
(2) make substantial investments of resources to support field, laboratory, analytical, and modeling studies of the deep subseafloor ecosystems;
(3) facilitate and encourage synthesis and thematic understanding of submarine microbiological processes, through funding of scientific and technical activities, coordination and hosting of meetings and workshops, and support of (mostly junior) researchers and graduate students; and
(4) entrain, educate, inspire, and mentor an interdisciplinary community of researchers and educators, with an emphasis on undergraduate and graduate students and early-career scientists.

Note: Katrina Edwards was a former PI of C-DEBI; James Cowen is a former co-PI.

Data Management:
C-DEBI is committed to ensuring all the data generated are publically available and deposited in a data repository for long-term storage as stated in their Data Management Plan (PDF) and in compliance with the NSF Ocean Sciences Sample and Data Policy. The data types and products resulting from C-DEBI-supported research include a wide variety of geophysical, geological, geochemical, and biological information, in addition to education and outreach materials, technical documents, and samples. All data and information generated by C-DEBI-supported research projects are required to be made publically available either following publication of research results or within two (2) years of data generation.

To ensure preservation and dissemination of the diverse data-types generated, C-DEBI researchers are working with BCO-DMO Data Managers make data publicly available online. The partnership with BCO-DMO helps ensure that the C-DEBI data are discoverable and available for reuse. Some C-DEBI data is better served by specialized repositories (NCBI's GenBank for sequence data, for example) and, in those cases, BCO-DMO provides dataset documentation (metadata) that includes links to those external repositories.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1433150

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