Niskin bottle data, including salinity, O2, temperature, conductivity, etc, from R/V Knorr cruise KN207-03 in the North Atlantic (transect from Ponta Delgada, Azores to Reykjavik, Iceland) in 2012 (NA-VICE project)

Website: https://www.bco-dmo.org/dataset/3902
Data Type: Cruise Results
Version: 1
Version Date: 2013-03-28

Project
» Lipid lubrication of oceanic carbon and sulfur biogeochemistry via a host-virus chemical arms race (NA-VICE)

Program
» Ocean Carbon and Biogeochemistry (OCB)

Contributors	Affiliation	Role
Bidle, Kay D.	Rutgers University (Rutgers IMCS)	Principal Investigator
DiTullio, Giacomo	College of Charleston (CofC)	Principal Investigator
Van Mooy, Benjamin A.S.	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator
Coolen, Marco	Woods Hole Oceanographic Institution (WHOI)	Co-Principal Investigator
Vardi, Assaf	Weizmann Institute of Science	Co-Principal Investigator
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Niskin bottle data, including salinity, O2, temperature, conductivity, etc, from R/V Knorr cruise KN207-03 in the North Atlantic (transect from Ponta Delgada, Azores to Reykjavik, Iceland) in 2012 (NA-VICE project).

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Coverage

Spatial Extent: **N**:63.3478 **E**:-26.4407 **S**:40.6573 **W**:-35.0738
Temporal Extent: 2012-06-16 - 2012-07-10

Dataset Description

Niskin bottle data from CTD casts from the KN207-03 cruise. The raw bottle data was processed using Seasave software version 7.21e (QA/QC has not been performed).

Methods & Sampling

Header information from Sea-Bird SBE 9 Bottle (.btl) Data file:
Software Version Seasave V 7.21e
Temperature SN = 4406; Conductivity SN = 1474
Number of Bytes Per Scan = 44; Number of Voltage Words = 5
Number of Scans Averaged by the Deck Unit = 1

Sensor Channel 1: Frequency 0, Temperature; SensorID = 55; Serial Number = 4406
Calibration Date: 14-Feb-12
Use G_J: 1
A: 0.00000000e+000; B: 0.00000000e+000; C: 0.00000000e+000; D: 0.00000000e+000; F0_Old: 0.000
G: 4.33630903e-003; H: 6.36463726e-004; I: 2.06290680e-005; J: 1.71729728e-006
F0: 1000.000
Slope: 1.00000000; Offset: 0.0000

Sensor Channel 2: Frequency 1, Conductivity; Sensor ID = 3; Serial Number = 1474
Calibration Date: 14-Feb-12
Use G_J: 1; Cell const and series R are applicable only for wide range sensors.
Series R: 0.0000; CellConst: 2000.0000; Conductivity Type: 0
Coefficients equation = 0
  A: 0.00000000e+000; B: 0.00000000e+000; C: 0.00000000e+000; D: 0.00000000e+000; M: 0.0
  CPcor: -9.57000000e-008
Coefficients equation = 1
  G: -4.21351634e+000; H: 5.39243337e-001; I: -2.08827162e-004; J: 3.95099976e-005
  CPcor: -9.57000000e-008; CTcor: 3.2500e-006
WBOTC not applicable unless ConductivityType = 1.
WBOTC: 0.00000000e+000
Slope: 1.00000000; Offset: 0.00000

Sensor Channel 3: Frequency 2, Pressure; Digiquartz with TC; Sensor ID = 45; Serial Number: 69685 in 090484 vertical orientation
Calibration Date: 12/18/2002
C1: -4.680530e+004; C2: -8.320595e-001; C3: 1.450810e-002
D1: 3.903100e-002; D2: 0.000000e+000
T1: 3.038361e+001; T2: -5.411459e-004; T3: 4.085080e-006; T4: 2.564540e-009
Slope: 0.99995000; Offset: 0.00000
T5: 0.000000e+000
AD590M: 1.280820e-002; AD590B: -9.210198e+000

Sensor Channel 4: Frequency 3, Temperature, 2; Sensor ID = 55; Serial Number: 2271
Calibration Date: 14-Feb-12
Use G_J: 1
A: 0.00000000e+000; B: 0.00000000e+000; C: 0.00000000e+000; D: 0.00000000e+000; F0_Old: 0.000
G: 4.33365550e-003; H: 6.41046238e-004; I: 2.31654312e-005; J: 2.15092946e-006
F0: 1000.000
Slope: 1.00000000; Offset: 0.0000

Sensor Channel 5: Frequency 4, Conductivity, 2; Sensor ID = 3; Serial Number: 2707
Calibration Date: 14-Feb-12
Use G_J: 1
Cell const and series R are applicable only for wide range sensors.
Series R: 0.0000
CellConst: 2000.0000
Conductivity Type: 0
Coefficients equation = 0
  A: 0.00000000e+000; B: 0.00000000e+000; C: 0.00000000e+000; D: 0.00000000e+000; M: 0.0
  CPcor: -9.57000000e-008
Coefficients equation = 1
  G: -1.07258216e+001; H: 1.55968861e+000; I: -1.50749109e-003; J: 2.09512327e-004
  CPcor: -9.57000000e-008; CTcor: 3.2500e-006

WBOTC not applicable unless ConductivityType = 1.
WBOTC: 0.00000000e+000
Slope: 1.00000000; Offset: 0.00000

Sensor Channel 6: A/D voltage 0, Fluorometer, WET Labs ECO-AFL/FL; Sensor ID = 20; Serial Number = FLNTURTD-1013
Calibration Date: april 18, 2008
ScaleFactor: 6.00000000e+000
Vblank: 0.0800

Sensor Channel 7: A/D voltage 1, User Polynomial; Sensor ID = 61; Serial Number = FLNTURTD-1013
Calibration Date: april 18, 2008
SensorName: turbidity
A0: 0.15800000; A1: 2.00000000; A2: 0.00000000; A3: 0.00000000

Sensor Channel 8: A/D voltage 2, PAR/Irradiance, Biospherical/Licor; Sensor ID = 42; Serial Number = 4550
Calibration Date: 13-Mar-2008
M: 1.00000000; B: 0.00000000
Calibration Constant: 77519400000.00000000
Multiplier: 1.00000000; Offset: -0.01906000

Sensor Channel 9: A/D voltage 3, Transmissometer, Chelsea/Seatech/WET Lab CStar; Sensor ID = 59; Serial Number = CST-1117DR
Calibration Date: 05-Aug-2011
M: 21.0530; B: -0.1537
PathLength: 0.250

Sensor Channel 10: A/D voltage 4, Altimeter; Sensor ID = 0; Serial Number: 1133
Calibration Date:
ScaleFactor: 14.950; Offset: 0.200

Sensor Channel 11: A/D voltage 5, Oxygen, SBE 43; Sensor ID = 38; Serial Number: 0723
Calibration Date: 11-Feb-12
Use2007Equation: 1
CalibrationCoefficients equation = 0
  Coefficients for Owens-Millard equation.
  Boc: 0.0000; Soc: 0.0000e+000; Offset: 0.0000
  Pcor: 0.00e+000; Tcor: 0.0000; Tau: 0.0
CalibrationCoefficients equation = 1
  Coefficients for Sea-Bird equation - SBE calibration in 2007 and later.
  Soc: 5.5281e-001; Offset: -0.5125
  A: -2.4781e-003; B: 9.2148e-005; C: -1.8426e-006
  D0: 2.5826e+000; D1: 1.92634e-004; D2: -4.64803e-002; E: 3.6000e-002
  Tau20: 1.3300
  H1: -3.3000e-002; H2: 5.0000e+003; H3: 1.4500e+003

Sensor Channel 12: A/D voltage 6, User Polynomial, 2; Sensor ID = 61; Serial Number = SUNA
Calibration Date: N/A
Sensor Name: SUNA Nitrate
A0: -3.73832000; A1: 10.68091000; A2: 0.00000000; A3: 0.00000000

Sensor Channel 13: A/D voltage 7, Free

Sensor Channel 14: SPAR voltage, Unavailable

Sensor Channel 15: SPAR voltage, SPAR/Surface Irradiance; Sensor ID = 51; Serial Number: 6294
Calibration Date: 2008-03-13
Conversion Factor: 1826.90000000; Ratio Multiplier: 1.00000000

datcnv_ox_hysteresis_correction = yes
datcnv_ox_tau_correction = no
datcnv_bottle_scan_range_source = scans marked with bottle confirm bit, 0, 5
bottlesum_ox_tau_correction = yes

Data Processing Description

Raw data was processed using Seasave software version 7.21e. BCO-DMO retrieved the processed data from the WHOI Data Library & Archives and made the following edits to the bottle (.btl) files:
- Changed parameter names to conform to BCO-DMO conventions.
- Converted latitude and longitude from degrees and decimal minutes to decimal degrees.
- Added cast, date_gmt, time_start, lat_start, lon_start from the CTD file headers.
- Added ISO_DateTime_UTC using the original date and time fields.
- Bottle file '20703015' (bottle data from cast 15),contained only invalid/undecipherable values. Possible instrument or processing failure, or data file corruption. BCO-DMO replaced these characters with 'nd' to indicate 'no data'.

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Data Files

File
KN207-03_bottle.csv (Comma Separated Values (.csv), 925.64 KB) MD5:579b71c612f0f23b5ce7e757efccb78d Primary data file for dataset ID 3902

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Parameters

Parameter	Description	Units
cast	CTD cast number.	dimensionless
date_gmt	Date (GMT) at the start of the CTD cast in YYYYmmdd format.	dimensionless
time_start	Time (GMT) at start of the CTD cast in HHMM format (seconds have been rounded to the nearest minute).	dimensionless
lat_start	Latitude in decimal degrees at start of CTD cast; negative = South.	decimal degrees
lon_start	Longitude in decimal degrees at start of CTD cast; negative = West.	decimal degrees
bottle	Niskin bottle number. Originally named 'Bottle Position'.	unitless
time_gmt	Time (GMT) the bottle was fired. In hours, minutes, and decimal minutes; 24-hour clock.	HHMM.mm
press_avg	Average pressure. Column originally named 'PrDM'.	decibars
press_sd	Standard deviation of press_avg.	decibars

press_min	Minimum pressure.	decibars
press_max	Maximum pressure.	decibars
depth_avg	Average depth. Column originally named 'DepSM'.	meters
depth_sd	Standard deviation of depth_avg.	meters
depth_min	Minimum depth.	meters
depth_max	Maximum depth.	meters
potemp	Potential temperature from primary sensor. Originally named 'Potemp090C'.	degrees C
potemp2	Potential temperature from secondary sensor. Originally named 'Potemp190C'.	degrees C
sal	Salinity from the primary sensor. Originally named 'Sal00'.	PSU
sal2	Salinity from the secondary sensor. Originally named 'Sal11'.	PSU
O2	Oxygen in milliliters per liter measured by the SBE 43. Originally named 'Sbeox0ML/L'.	mL/L
O2_sat_pcnt	Percent oxygen saturation. Originally named 'Sbeox0PS'.	%
sigma_0	Density, sigma-theta, in kilograms per cubic meter from primary sensor. Originally named 'Sigma_e00'.	kg/m^3
sigma_0_2	Density, sigma-theta, in kilograms per cubic meter from secondary sensor. Originally named 'Sigma-e11'.	kg/m^3
sigma_t	Sigma-t density from primary sensor. Originally named 'Sigma-t00'.	kg/m^3
sigma_t_2	Sigma-t density from secondary sensor. Originally named 'Sigma-t11'.	kg/m^3
temp_avg	Average temperature from primary sensor. Column originally named 'T090C'.	degrees C

temp_sd	Standard deviation of temp_avg.	degrees C
temp_min	Minimum temperature from primary sensor.	degrees C
temp_max	Maximum temperature from primary sensor.	degrees C
temp2_avg	Average temperature from secondary sensor. Column originally named 'T190C'.	degrees C
temp2_sd	Standard deviation of temp2_avg.	degrees C
temp2_min	Minimum temperature from secondary sensor.	degrees C
temp2_max	Maximum temperature from secondary sensor.	degrees C
cond_avg	Average conductivity in Siemens per meter from primary sensor. Column originally named 'C0S/m'.	S/m
cond_sd	Standard deviation of cond_avg.	S/m
cond_min	Minimum conductivity from primary sensor.	S/m
cond_max	Maximum conductivity from primary sensor.	S/m
cond2_avg	Average conductivity in Siemens per meter from secondary sensor. Column originally named 'C1S/m'.	S/m
cond2_sd	Standard deviation of cond2_avg.	S/m
cond2_min	Minimum conductivity from secondary sensor.	S/m
cond2_max	Maximum conductivity from secondary sensor.	S/m
O2_v_avg	Average raw oxygen reading from the SBE 43. Column originally named 'Sbeox0V'.	volts
O2_v_sd	Standard deviation of O2_v_avg.	volts
O2_v_min	Minimum raw oxygen reading from the SBE 43.	volts

O2_v_max	Maximum raw oxygen reading from the SBE 43.	O2_v_max
trans_avg	Average beam transmission from Chelsea/Seatech/WET Labs CStar. Column originally named 'Xmiss'.	%
trans_sd	Standard deviation of trans_avg.	%
trans_min	Minimum beam transmission from Chelsea/Seatech/WET Labs CStar.	%
trans_max	Maximum beam transmission from Chelsea/Seatech/WET Labs CStar.	%
beam_c_avg	Average beam attenuation from Chelsea/Seatech/WET Labs CStar (in inverse meters). Column originally named 'Bat'.	1/m
beam_c_sd	Standard deviation of beam_c_avg.	1/m
beam_c_min	Minimum beam attenuation from Chelsea/Seatech/WET Labs CStar (in inverse meters).	1/m
beam_c_max	Maximum beam attenuation from Chelsea/Seatech/WET Labs CStar (in inverse meters).	1/m
fluor_avg	Average fluorescence from WET Labs ECO-AFL/FL in milligrams per cubic meter. Column originally named 'FlECO-AFL'.	mg/m^3
fluor_sd	Standard deviation of fluor_avg.	mg/m^3
fluor_min	Minimum fluorescence from WET Labs ECO-AFL/FL in milligrams per cubic meter.	mg/m^3
fluor_max	Maximum fluorescence from WET Labs ECO-AFL/FL in milligrams per cubic meter.	mg/m^3
turbidity_avg	Average turbidity. Column originally named 'Upoly0'.	NTU
turbidity_sd	Standard deviation of turbidity_avg.	NTU
turbidity_min	Minimum turbidity.	NTU
turbidity_max	Maximum turbidity.	NTU

scan_avg	Average scan number.	unitless
scan_sd	Standard deviation of scan_avg.	unitless
scan_min	Minimum scan number.	unitless
scan_max	Maximum scan number.	unitless
ISO_DateTime_UTC	Date/Time (UTC) formatted to ISO 8601 standard. T indicates start of time string; Z indicates UTC.	YYYY-mm-ddTHH:MM:SS.ssZ

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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.

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Deployments

KN207-03

Website	https://www.bco-dmo.org/deployment/58868
Platform	R/V Knorr
Start Date	2012-06-15
End Date	2012-07-14
Description	Description from the WHOI Cruise Synopsis: The 30 day "NA-VICE" (North Atlantic Virus Infection of Coccolithophores Expedition) cruise in June-July 2012 aboard the R/V Knorr followed a transect from Ponta Delgada, Azores to Reykjavik, Iceland. The goal for this cruise was to transect the region of the NEA spring bloom and to extensively sample the bloom when it is encountered. The cruise track was modeled after a recent study in this area that documented intense coccolithophore (and other haptophyte) blooms across Rockall Hatton Plateau to the Iceland Basin (55-63°N latitude) and coincided with elevated POC and TEP. The science plan calls for sampling of 12 water depths at 20 station locations. In addition, three stations were occupied for several days to allow opportunities for extended experiments and sinking particulate carbon collection and flux determination. Given that the timing of the bloom is difficult to predict exactly, the precise cruise track was determined by remote sensing data (satellite and autonomous glider from Rutgers) analyzed by the PIs a few days before and during the cruise. The cruise was supported by NSF award OCE-1061883. Additional cruise information and original data are available from the NSF R2R data catalog.

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Project Information

Lipid lubrication of oceanic carbon and sulfur biogeochemistry via a host-virus chemical arms race (NA-VICE)

Coverage: North Atlantic; Azores to Iceland

This project is also called "**NA-VICE**" (North Atlantic Virus Infection of Coccolithophores Expedition).

Project description from NSF award abstract:
Despite the critical importance of viruses in shaping marine microbial ecosystems, very little is known about the molecular mechanisms mediating phytoplankton-virus interactions. As a consequence, we currently lack biomarkers to quantify active viral infection in the oceans, significantly hindering our understanding of its ecological and biogeochemical impacts.

The coccolithophore *Emiliania huxleyi* (Prymnesiophyceae, Haptophyte) is a cosmopolitan unicellular photoautotroph whose calcite skeletons account for about a third of the total marine CaCO3 production. *E. huxleyi* forms massive annual spring blooms in the North Atlantic that are infected and terminated by lytic, giant double-stranded DNA containing coccolithoviruses. Findings that lytic viral infection of *E. huxleyi* recruits the hosts programmed cell death (PCD) machinery demonstrate that viruses employ a sophisticated, co-evolutionary “arms race” in mediating host-virus interactions. The investigators recently demonstrated that viral glycosphingolipids (vGSLs), derived from unexpected cluster of sphingolipid biosynthetic genes, a pathway never before described in a viral genome, play a crucial functional role in facilitating infection of *E. huxleyi*. The observations of vGSLs in the North Atlantic and Norwegian fjords further suggest that they may be novel, diagnostic biomarkers for viral infection of coccolithophore populations. At the same time, the discovery of vGSLs and a distinct, protective 802 lipid argues that a host-virus, co-evolutionary chemical arms race plays a pivotal role in regulating viral infection and in lubricating upper ocean biogeochemical fluxes of carbon and sulfur.

The focus of this collaborative research project is to elucidate the molecular, ecological, and biogeochemical links between vGSLs (and other polar lipids) and the global cycles of carbon and sulfur.

The team of investigators proposes a multi-pronged approach combing a suite of lab-based, mechanistic studies using several haptophyte-virus model systems along with observational studies and manipulative field-

based experiments the Northeast Atlantic. Using these diagnostic markers, they will document active viral infection of natural coccolithophore populations and couple it with a suite of oceanographic measurements in order to quantify how viral infection (via vGSLs) influences cell fate, the dissolved organic carbon (DOC) pool, vertical export of particular organic (POC) and inorganic carbon (PIC; as calcium carbonate, CaCO3) (along with associated alkenone lipid biomarkers and genetic signatures of viruses and their hosts) and the upper ocean sulfur cycle (via the cycling of dimethylsulfide [DMS] and other biogenic sulfur compounds). Furthermore, given they are unique to viruses, the investigators propose that vGSLs can be used to trace the flow of virally-derived carbon and provide quantitative insights into a “viral shunt” that diverts fixed carbon from higher trophic levels and the deep sea.

The overarching hypothesis for this study is that vGSLs are cornerstone molecules in the upper ocean, which facilitate viral infection on massive scales and thereby mechanistically "lubricate" the biogeochemical fluxes of C and S in the 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.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1061883

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