Basic CTD hydrography data collected during R/V Savannah cruises conducted in the South Atlantic Bight off the coast of Georgia from 2015-2017

Website: https://www.bco-dmo.org/dataset/815732
Data Type: Cruise Results
Version: 1
Version Date: 2020-06-19

Project
» RUI: Vitamin B12 and nitrogen regulation of oceanic dimethylsulfoniopropionate and dimethylsulfide (B12 Impacts on DMSP)

Contributors	Affiliation	Role
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Abstract
Basic CTD data collected using a Sea-Bird Scientific SBE 911 during several R/V Savannah cruises conducted from 2015 to 2017 along a transect from shelf waters to oligotrophic waters in the South Atlantic Bight off the coast of Georgia (Navy Op Area NA06).

Table of Contents

Coverage

Spatial Extent: **N**:31.865276 **E**:-76.334083 **S**:31.005317 **W**:-81.121513
Temporal Extent: 2015-03-16 - 2017-01-27

Dataset Description

Basic CTD data collected using a Sea-Bird Scientific SBE 911 during several R/V Savannah cruises conducted from 2015 to 2017 along a transect from shelf waters to oligotrophic waters in the South Atlantic Bight off the coast of Georgia (Navy Op Area NA06).

Methods & Sampling

Data were collected using a Sea-Bird Scientific SBE 911 CTD carousel with SBE-25 CTD and Satlantic ISUS.

Data Processing Description

Basic data processing was done using SBE Data Processing v7.23.2 (1m bins with downcast data reported).

BCO-DMO Processing:
- concatenated all CTD data files into one dataset;
- renamed fields;
- added date/time field in ISO8601 format.

[table of contents | back to top]

Data Files

File
CTD.csv (Comma Separated Values (.csv), 8.58 MB) MD5:79ba90d5ed6c2ee72b0557e5d606f6e1 Primary data file for dataset ID 815732

[table of contents | back to top]

Parameters

Parameter	Description	Units
Cruise_ID	Cruise ID number	unitless
Cast_ID	Cast ID number	unitless
Station_ID	Station ID number	unitless
UTC_Date	Date (UTC); format: MM/DD/YYYY	unitless
UTC_Time	Time (UTC); format: hh:mm:ss	unitless
ISO_DateTime_UTC	Date and time (UTC) formatted to ISO8601 standard: YYYY-MM-DDThh:mm:ssZ	unitless
Latitude	Latitude	decimal degrees North
Longitude	Longitude	decimal degrees East
Depth	Sample depth	meter (m)
Strain_Gauge_Pressure	Pressure	psi
Conductivity	Conductivity	millisiemens per centimeter (mS/cm)

Salinity	Salinty	PSU
Temperature	Water temperature	degrees Celsius
Potential_Temp	Potential temperature	degrees Celsius
Density	density	kilograms per cubic meter (kg/m^3)
Sigma_theta	Sigma theta density	kilograms per cubic meter (kg/m^3)
Oxygen_mLL	Oxygen concentration	milliliters per liter (ml/l)
Oxygen_pcnt	Oxygen percent saturation	unitless (percent)
PAR_Irradiance	PAR irradiance	unitless
ISUS	Satlantic ISUS (nitrate sensor) measurement in volts	volts
flag	Flag	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Sea-Bird Scientific SBE 911 CTD carousel
Generic Instrument Name	CTD Sea-Bird 911
Generic Instrument Description	The Sea-Bird SBE 911 is a type of CTD instrument package. The SBE 911 includes the SBE 9 Underwater Unit and the SBE 11 Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 and SBE 11 is called a SBE 911. The SBE 9 uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 and SBE 4). The SBE 9 CTD can be configured with 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	Satlantic ISUS
Generic Instrument Name	ISUS Nitrate sensor
Generic Instrument Description	The Satlantic ISUS nitrate sensor is an in-situ UV absorption sensor which calculates nitrate concentration from the seawater spectrum. The ISUS V2 has a 1cm path length, a 200-400 nm wavelength range., and is depth rated to 1000 m. Satlantic's ISUS V3 nitrate sensor uses advanced UV absorption technology to measure nitrate concentration in real-time.

Dataset-specific Instrument Name	SBE-25 CTD
Generic Instrument Name	Sea-Bird SBE 25 Sealogger CTD
Generic Instrument Description	The Sea-Bird SBE 25 SEALOGGER CTD is battery powered and is typically used to record data in memory, eliminating the need for a large vessel, electrical sea cable, and on-board computer. All SBE 25s can also operate in real-time, transmitting data via an opto-isolated RS-232 serial port. Temperature and conductivity are measured by the SBE 3F Temperature sensor and SBE 4 Conductivity sensor (same as those used on the premium SBE 9plus CTD). The SBE 25 also includes the SBE 5P (plastic) or 5T (titanium) Submersible Pump and TC Duct. The pump-controlled, TC-ducted flow configuration significantly reduces salinity spiking caused by ship heave, and in calm waters allows slower descent rates for improved resolution of water column features. Pressure is measured by the modular SBE 29 Temperature Compensated Strain-Gauge Pressure sensor (available in eight depth ranges to suit the operating depth requirement). The SBE 25's modular design makes it easy to configure in the field for a wide range of auxiliary sensors, including optional dissolved oxygen (SBE 43), pH (SBE 18 or SBE 27), fluorescence, transmissivity, PAR, and optical backscatter sensors. More information from Sea-Bird Electronics: http:www.seabird.com.

[table of contents | back to top]

Deployments

SAV-15-04

Website	https://www.bco-dmo.org/deployment/815737
Platform	R/V Savannah
Start Date	2015-03-15
End Date	2015-03-21
Description	More information is available from Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/SAV-15-04

SAV-15-16

Website	https://www.bco-dmo.org/deployment/815853
Platform	R/V Savannah
Start Date	2015-06-20
End Date	2015-06-26
Description	More information is available from Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/SAV-15-16

SAV-15-20

Website	https://www.bco-dmo.org/deployment/815880
Platform	R/V Savannah
Start Date	2015-08-07
End Date	2015-08-13
Description	More information is available from Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/SAV-15-20

SAV-15-26

Website	https://www.bco-dmo.org/deployment/672531
Platform	R/V Savannah
Start Date	2015-10-13
End Date	2015-10-19
Description	More information is available from Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/SAV-15-26

SAV-16-06

Website	https://www.bco-dmo.org/deployment/672529
Platform	R/V Savannah
Start Date	2016-03-06
End Date	2016-03-12
Description	More information is available from Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/SAV-16-06

SAV-16-22

Website	https://www.bco-dmo.org/deployment/672589
Platform	R/V Savannah
Start Date	2016-06-21
End Date	2016-06-27
Description	More information is available from Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/SAV-16-22

SAV-16-28

Website	https://www.bco-dmo.org/deployment/815964
Platform	R/V Savannah
Start Date	2016-08-15
End Date	2016-08-21
Description	More information is available from Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/SAV-16-28

SAV-17-02

Website	https://www.bco-dmo.org/deployment/815980
Platform	R/V Savannah
Start Date	2017-01-21
End Date	2017-01-27
Description	More information is available from Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/SAV-17-02

[table of contents | back to top]

Project Information

RUI: Vitamin B12 and nitrogen regulation of oceanic dimethylsulfoniopropionate and dimethylsulfide (B12 Impacts on DMSP)

Coverage: North Atlantic Ocean in the South Atlantic Bight off the coast of Georgia; Navy Op Area NA06

Description from NSF award abstract:
Vitamin B12 and nitrogen are nutrients critical to phytoplankton growth. Since B12 is produced solely by bacteria, phytoplankton must acquire their B12 from bacteria. Nitrogen is used to produce the amino acid methionine and B12 is required by the enzymes that form methionine. Methionine is the precursor to the algal metabolite dimethylsulfoniopropionate (DMSP). Bacteria degrade this compound to the climatically-active compound dimethylsulfide (DMS). Subsequent DMS transfer into the atmosphere is considered a significant driver of cloud formation and a possible climate feedback mechanism. DMSP can also be degraded via a secondary pathway to form methylmercaptopropionate (MMPA), which is not released to the atmosphere. Consequently, DMSP formation and the extent of DMSP degradation to DMS or MMPA are susceptible to B12 availability. Nitrogen availability influences this effect by controlling methionine production. Thus, the overarching premise for this study is that B12 availability regulates oceanic DMSP and DMS formation, and is synergistically impacted by nitrogen limitation. By providing a mechanistic understanding of relevant biogeochemical parameters this study will significantly improve the incorporation of sulfur-related microbial processes into climate models.

This project will combine established biogeochemistry-based measurements with cutting-edge metabolomics, transcriptomics and proteomics techniques in laboratory and field studies. Culture experiments will examine the interactive effect of B12 and nitrogen availability on DMSP formation in several ecologically-relevant phytoplankton taxa. Second, the microbial degradation of DMSP and DMS in relation to B12 availability will be examined using several environmentally-important bacteria and archaea. Finally, field studies will examine the seasonal variability of B12, DMSP and DMS, and the relative importance of DMS and MMPA formation in the South Atlantic Bight. Gene and protein expression will be assessed at each level of this study to identify gene products, metabolic pathways, and cellular mechanisms underlying the interconnections between B12, sulfur, and nitrogen cycles. The results generated will have a major impact on current understanding of the role of B12 and nitrogen on the DMSP and DMS cycling, as well as the potential role of these stressors in global climate change. In addition to providing evidence for microbe-based mechanisms behind the modulation of oceanic DMS, this project will (1) furnish an explanation for "summer DMS paradox", thus having significant implications for the development of future DMS models, (2) assess the interactive impact of B12 and nitrogen

availability on intracellular DMSP production and (3) provide insight as to whether B12 may play a far more critical role in modulating climate feedback mechanisms on phytoplankton productivity.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1436458

[table of contents | back to top]