CTD data collected in the Guaymas Basin, Gulf of California from R/V Atlantis cruise AT42-05 in 2018 and R/V Falkor cruise FK190211 in 2019

Website: https://www.bco-dmo.org/dataset/818993
Version: 2
Version Date: 2023-03-23

Project
» Collaborative Research: Microbial Carbon cycling and its interactions with Sulfur and Nitrogen transformations in Guaymas Basin hydrothermal sediments (Guaymas Basin Interactions)

Contributors	Affiliation	Role
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Abstract
CTD data collected in the Guaymas Basin, Gulf of California from R/V Atlantis cruise AT42-05 in 2018 and R/V Falkor cruise FK190211 in 2019.

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Coverage

Spatial Extent: **N**:27.04546 **E**:-111.4042 **S**:27.00654 **W**:-111.4106
Temporal Extent: 2018-11-18 - 2019-03-12

Methods & Sampling

Data processed using Sea-Bird's SBE Data Processing program/SeaSoft, version 7.23.2

Data processing protocol adapted from CalCOFI methods, found here: https://calcofi.org/data/ctd/165-ctd-processing/330-ctd-data-processing-protocol.html

Raw .hex files were converted to ASCII .cnv files without skipping scans; hysteresis correction was applied to oxygen data. A 9 s median window filter applied to all variables, and a 0.15 low pass filter was applied to pressure data only. A 4 s delay was applied to the raw oxygen data and v1 (also oxygen) as recommended in Sea-Bird's software manual. Default settings were used for the cell thermal mass correction. Depth, potential temperature, salinity, density, oxygen concentration (tau correction applied), oxygen saturation, dynamic meters, and specific volume anomaly were derived from existing data using the EOS-8 option in SeaSoft.

Casts were not split or binned, because these steps obscure or eliminate the hydrothermal plume signal seen in the temperature data at the bottom depths of the casts.

Files were converted to .csv format using the text to column function in Microsoft Excel.

Data Processing Description

BCO-DMO Data Manager Processing Notes:
* Data submitted as seabird .cnv files (see "Data Files" section for originally submitted cnv files)

```
│   ├── [ 83M]  at4205001_derived.cnv
│   ├── [109M]  at4205002_derived.cnv
│   ├── [ 61M]  at4205003_derived.cnv
│   ├── [ 69M]  at4205004_derived.cnv
│   ├── [107M]  at4205005_derived.cnv
│   ├── [ 76M]  at4205006_derived.cnv
│   ├── [ 61M]  at4205007_derived.cnv
│   ├── [106M]  at4205008_derived.cnv
│   ├── [ 75M]  at4205009_derived.cnv
│   └── [ 63M]  at4205010_derived.cnv

├── [ 69M]  FK190211_CTD002actual_28022019.cnv
├── [ 73M]  FK190211_CTD003actual_28022019.cnv
├── [ 97M]  FK190211_CTD004_01032019.cnv
├── [142M]  FK190211_CTD006_02032019.cnv
├── [ 65M]  FK190211_CTD007_03032019.cnv
├── [ 24M]  FK190211_CTD008_03032019.cnv
├── [ 97M]  FK190211_CTD009_04032019.cnv
├── [ 17M]  FK190211_CTD010_04032019.cnv
├── [ 86M]  FK190211_CTD011_05032019.cnv
├── [ 39M]  FK190211_CTD012_05032019.cnv
├── [100M]  FK190211_CTD013_06032019.cnv
├── [ 99M]  FK190211_CTD014_06032019.cnv
├── [140M]  FK190211_CTD015_07032019.cnv
├── [ 84M]  FK190211_CTD016_08032019.cnv
├── [ 95M]  FK190211_CTD017_08032019.cnv
├── [ 12M]  FK190211_CTD018_08032019.cnv
├── [ 11M]  FK190211_CTD019_08032019.cnv
├── [ 70M]  FK190211_CTD020_09032019.cnv
├── [ 13M]  FK190211_CTD021_09032019.cnv
├── [ 81M]  FK190211_CTD022_10032019.cnv
├── [100M]  FK190211_CTD023_11032019.cnv
├── [152M]  FK190211_CTD024_11032019.cnv
├── [ 20M]  FK190211_CTD025_12032019.cnv
└── [7.9M]  FK190211_CTDtest_22022019.cnv
```

* all cnv files imported into the BCO-DMO data system as one combined data table.
* added a conventional header with dataset name, PI name, version date
* modified parameter names to conform with BCO-DMO naming conventions (spaces, +, and - changed to underscores). Units in parentheses removed and added to Parameter Description metadata section.
* The defualt missing identifier in the original file N.D. for "not determined" is displayed as "nd" in the data. nd is the default missing data identifier in the BCO-DMO system.
* Added column "cast_datetime_start" from the NMEA timestamp in UTC within the seabird headerlines in each cnv file.
* Added column "station_name" with the station name used in the .cnv filename.
* Added column "cruise_id"
* Lat/lon converted to decimal degrees from degrees decimal minutes
* Comment column added to contain comments in the original seabird file header.

Version 2 (2023-03-23) replaces version 1(2020-08-27) :
* Version 2 has the data from the faulty sensors removed from the FK190211 files but is otherwise the same as version 1

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Supplemental Files

File

AT42-05 seabird .cnv files

filename: AT42-05_CTD_data_cnv.zip

(ZIP Archive (ZIP), 66.11 MB)
MD5:8fd57b97dfaf2a10c8ead357fb9e2e53

AT42-05 CTD data in 10 seabird .cnv format files. See the seabird This is the format originally submitted to BCO-DMO. The files include header lines containing parameter descriptions and sensor calibration information. See seabird's seasave manual for more documentation.

Parameters included in these files:

name 0 = scan: Scan Count

name 1 = prDM: Pressure, Digiquartz [db]

name 2 = t090C: Temperature [ITS-90, deg C]

name 3 = t190C: Temperature, 2 [ITS-90, deg C]

name 4 = c0S/m: Conductivity [S/m]

name 5 = c1S/m: Conductivity, 2 [S/m]

name 6 = v0: Voltage 0

name 7 = v1: Voltage 1

name 8 = v2: Voltage 2

name 9 = v3: Voltage 3

name 10 = v4: Voltage 4

name 11 = v5: Voltage 5

name 12 = v6: Voltage 6

name 13 = v7: Voltage 7

name 14 = sbeox0V: Oxygen raw, SBE 43 [V]

name 15 = CStarAt0: Beam Attenuation, WET Labs C-Star [1/m]

name 16 = CStarTr0: Beam Transmission, WET Labs C-Star [%]

name 17 = flECO-AFL: Fluorescence, WET Labs ECO-AFL/FL [mg/m^3]

name 18 = turbWETntu0: Turbidity, WET Labs ECO [NTU]

name 19 = altM: Altimeter [m]

name 20 = latitude: Latitude [deg]

name 21 = longitude: Longitude [deg]

name 22 = timeS: Time, Elapsed [seconds]

name 23 = depSM: Depth [salt water, m], lat = 27.0115

name 24 = potemp090C: Potential Temperature [ITS-90, deg C]

name 25 = potemp190C: Potential Temperature, 2 [ITS-90, deg C]

name 26 = sal00: Salinity, Practical [PSU]

name 27 = sal11: Salinity, Practical, 2 [PSU]

name 28 = sigma-é00: Density [sigma-theta, kg/m^3]

name 29 = sigma-é11: Density, 2 [sigma-theta, kg/m^3]

name 30 = sbeox0Mg/L: Oxygen, SBE 43 [mg/l], WS = 2

name 31 = sbeox0Mm/L: Oxygen, SBE 43 [umol/l], WS = 2

name 32 = oxsolMg/L: Oxygen Saturation, Garcia & Gordon [mg/l]

name 33 = oxsatMg/L: Oxygen Saturation, Weiss [mg/l]

name 34 = dm: Dynamic Meters [10 J/kg]

File

name 35 = sva: Specific Volume Anomaly [10^-8 * m^3/kg]

name 36 = T2-T190C: Temperature Difference, 2 - 1 [ITS-90, deg C]

name 37 = secS-priS: Salinity, Practical, Difference, 2 - 1 [PSU]

name 38 = flag: flag

FK190211 seabird .cnv files

filename: FK190211_CTD_cnv.zip

(ZIP Archive (ZIP), 138.91 MB)
MD5:2892b3ea441a5e6253c3c09274ce6042

FK190211 CTD data in 10 seabird .cnv format files. See the seabird This is the format originally submitted to BCO-DMO. The files include header lines containing parameter descriptions and sensor calibration information. See seabird's seasave manual for more documentation.

name 0 = scan: Scan Count

name 1 = timeY: Time, System [seconds]

name 2 = prDM: Pressure, Digiquartz [db]

name 3 = t090C: Temperature [ITS-90, deg C]

name 4 = t190C: Temperature, 2 [ITS-90, deg C]

name 5 = c0S/m: Conductivity [S/m]

name 6 = c1S/m: Conductivity, 2 [S/m]

name 7 = v0: Voltage 0

name 8 = v1: Voltage 1

name 9 = v2: Voltage 2

name 10 = v3: Voltage 3

name 11 = v4: Voltage 4

name 12 = v5: Voltage 5

name 13 = sbeox0V: Oxygen raw, SBE 43 [V]

name 14 = sbeox1V: Oxygen raw, SBE 43, 2 [V]

name 15 = CStarAt0: Beam Attenuation, WET Labs C-Star [1/m]

name 16 = CStarTr0: Beam Transmission, WET Labs C-Star [%]

name 17 = flECO-AFL: Fluorescence, WET Labs ECO-AFL/FL [mg/m^3]

name 18 = turbWETntu0: Turbidity, WET Labs ECO [NTU]

name 19 = altM: Altimeter [m]

name 20 = latitude: Latitude [deg]

name 21 = longitude: Longitude [deg]

name 22 = depSM: Depth [salt water, m], lat = 27.5827

name 23 = potemp090C: Potential Temperature [ITS-90, deg C]

name 24 = potemp190C: Potential Temperature, 2 [ITS-90, deg C]

name 25 = sal00: Salinity, Practical [PSU]

name 26 = sal11: Salinity, Practical, 2 [PSU]

name 27 = sigma-é00: Density [sigma-theta, kg/m^3]

name 28 = sigma-é11: Density, 2 [sigma-theta, kg/m^3]

name 29 = sbeox0Mg/L: Oxygen, SBE 43 [mg/l], WS = 2

name 30 = sbeox0Mm/L: Oxygen, SBE 43 [umol/l], WS = 2

name 31 = sbeox1Mg/L: Oxygen, SBE 43, 2 [mg/l], WS = 2

name 32 = sbeox1Mm/L: Oxygen, SBE 43, 2 [umol/l], WS = 2

File
name 33 = oxsolMg/L: Oxygen Saturation, Garcia & Gordon [mg/l]
name 34 = oxsatMg/L: Oxygen Saturation, Weiss [mg/l]
name 35 = dm: Dynamic Meters [10 J/kg]
name 36 = sva: Specific Volume Anomaly [10^-8 * m^3/kg]
name 37 = T2-T190C: Temperature Difference, 2 - 1 [ITS-90, deg C]
name 38 = secS-priS: Salinity, Practical, Difference, 2 - 1 [PSU]
name 39 = flag: flag

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Parameters

Parameter	Description	Units
cruise_id	cruise identifier	untiless
station_name	station name	unitless
cast_datetime_start	Cast Date in ISO 8601 format (UTC time zone)	unitless
scan	Scan Count	unitless
timeY	Time, System	seconds
timeS	Time, Elapsed	seconds
prDM	Pressure, Digiquartz	decibars (db)
t090C	Temperature (ITS-90)	degrees Celsius
t190C	Temperature, 2 (ITS-90)	degrees Celsius
c0S_m	Conductivity	Siemens per meter (S/m)
c1S_m	Conductivity, 2	Siemens per meter (S/m)
v0	Voltage 0 (free)	volts (V)
v1	Voltage 1 (oxygen)	volts (V)

v2	Voltage 2 (transmissometer)	volts (V)
v3	Voltage 3 (free)	volts (V)
v4	Voltage 4 (fluorometer)	volts (V)
v5	Voltage 5 (turbidity)	volts (V)
v6	Voltage 6 (altimeter)	volts (V)
v7	Voltage 7 (free)	volts (V)
sbeox0V	Oxygen raw, SBE 43	volts (V)
sbeox1V	Oxygen raw, SBE 43 2	volts (V)
CStarAt0	Beam Attenuation, WET Labs C-Star	per meter (1/m)
CStarTr0	Beam Transmission, WET Labs C-Star	pecent (%)
flECO_AFL	Fluorescence, WET Labs ECO-AFL/FL	milligrams per cubic meter (mg/m^3)
turbWETntu0	Turbidity, WET Labs ECO	Nephelometric Turbidity Units (NTU)
par	PAR/Irradiance, Biospherical/Licor	unknown
altM	Altimeter	meters (m)
latitude	Latitude	decimal degrees
longitude	Longitude	decimal degrees
depSM	Depth ([salt water, m], lat = 27.0065)	meters (m)
potemp090C	Potential Temperature (ITS-90)	degrees Celsius
potemp190C	Potential Temperature, 2 (ITS-90)	degrees Celsius

sal00	Salinity, Practical	Practical Salinity Units (PSU)
sal11	Salinity, Practical, 2	Practical Salinity Units (PSU)
sigma_e00	Density (sigma-theta)	kilograms per cubic meter (kg/m^3)
sigma_e11	Density, 2 (sigma-theta)	kilograms per cubic meter (kg/m^3)
sbeox0Mg_L	Oxygen, SBE 43. WS = 2	milligrams per liter (mg/L)
sbeox0Mm_L	Oxygen, SBE 43. WS = 2	micromoles per liter (umol/L)
sbeox1Mg_L	Oxygen, 2	milligrams per liter (mg/L)
sbeox1Mm_L	Oxygen, 2	micromoles per liter (umol/L)
oxsolMg_L	Oxygen Saturation, Garcia & Gordon	milligrams per liter (mg/L)
oxsatMg_L	Oxygen Saturation, Weiss	milligrams per liter (mg/L)
dm	Dynamic Meters	[10 J/kg]
sva	Specific Volume Anomaly	[10^-8 * m^3/kg]
T2_T190C	Temperature Difference, 2 - 1 (ITS-90)	degrees Celsius
secS_priS	Salinity, Practical, Difference, 2 - 1	Practical Salinity Units (PSU)
Comments	Comments (from seabird file header)	unitless

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Instruments

Dataset-specific Instrument Name	Sea-Bird SBE 9 CTD rosette used for data and sample collection
Generic Instrument Name	CTD Sea-Bird 9
Dataset-specific Description	Used with a Sea-Bird SBE11plus deck unit
Generic Instrument Description	The Sea-Bird SBE 9 is a type of CTD instrument package. The SBE 9 is the Underwater Unit and is most often combined with the SBE 11 Deck Unit (for real-time readout using conductive wire) when deployed from a research 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, fluorometer, altimeter, etc.). Note that in most cases, it is more accurate to specify SBE 911 than SBE 9 since it is likely a SBE 11 deck unit was used. more information from Sea-Bird Electronics

Dataset-specific Instrument Name	
Generic Instrument Name	Sea-Bird SBE 43 Dissolved Oxygen Sensor
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	WET labs ECO-NTU Turbidity Meter
Generic Instrument Name	Turbidity Meter
Generic Instrument Description	A turbidity meter measures the clarity of a water sample. A beam of light is shown through a water sample. The turbidity, or its converse clarity, is read on a numerical scale. Turbidity determined by this technique is referred to as the nephelometric method from the root meaning "cloudiness". This word is used to form the name of the unit of turbidity, the NTU (Nephelometric Turbidity Unit). The meter reading cannot be used to compare the turbidity of different water samples unless the instrument is calibrated. Description from: http://www.gvsu.edu/wri/education/instructor-s-manual-turbidity-10.htm (One example is the Orion AQ4500 Turbidimeter)

Dataset-specific Instrument Name	
Generic Instrument Name	Wet Labs ECO-AFL/FL Fluorometer
Generic Instrument Description	The Environmental Characterization Optics (ECO) series of single channel fluorometers delivers both high resolution and wide ranges across the entire line of parameters using 14 bit digital processing. The ECO series excels in biological monitoring and dye trace studies. The potted optics block results in long term stability of the instrument and the optional anti-biofouling technology delivers truly long term field measurements. more information from Wet Labs

Dataset-specific Instrument Name	
Generic Instrument Name	WET Labs {Sea-Bird WETLabs} C-Star transmissometer
Generic Instrument Description	The C-Star transmissometer has a novel monolithic housing with a highly intgrated 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

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Deployments

AT42-05

Website	https://www.bco-dmo.org/deployment/773347
Platform	R/V Atlantis
Start Date	2018-11-15
End Date	2018-11-29
Description	Alvin dives to hydrothermal vent area.

FK190211

Website	https://www.bco-dmo.org/deployment/820900
Platform	R/V Falkor
Start Date	2019-02-11
End Date	2019-03-14
Description	Start and end port: Manzanillo, Mexico

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Project Information

Collaborative Research: Microbial Carbon cycling and its interactions with Sulfur and Nitrogen transformations in Guaymas Basin hydrothermal sediments (Guaymas Basin Interactions)

Coverage: Guaymas Basin, Gulf of California, 27.00 N, 111.00W

Description from NSF award abstract:
Hydrothermally active sediments in the Guaymas Basin are dominated by novel microbial communities that catalyze important biogeochemical processes in these seafloor ecosystems. This project will investigate genomic potential, physiological capabilities and biogeochemical roles of key uncultured organisms from Guaymas sediments, especially the high-temperature anaerobic methane oxidizers that occur specifically in hydrothermally active sediments (ANME-1Guaymas). The study will focus on their role in carbon

transformations, but also explore their potential involvement in sulfur and nitrogen transformations. First-order research topics include quantifying anaerobic methane oxidation under high temperature,in situ concentrations of phosphorus and methane , and with alternate electron acceptors; sulfate and sulfur-dependent microbial pathways and isotopic signatures under these conditions; and nitrogen transformations in methane-oxidizing microbial communities, hydrothermal mats and sediments.

This integrated biogeochemical and microbiological research will explore the pathways of and environmental controls on the consumption and production of methane, other alkanes, inorganic carbon, organic acids and organic matter that fuel the Guaymas sedimentary microbial ecosystem. The hydrothermal sediments of Guaymas Basin provide a spatially compact, high-activity location for investigating novel modes of methane cycling and carbon assimilation into microbial biomass. In the case of anaerobic methane oxidation, the high temperature and pressure tolerance of Guaymas Basin methane-oxidizing microbial communities, and their potential to uncouple from the dominant electron acceptor sulfate, vastly increase the predicted subsurface habitat space and biogeochemical role for anaerobic microbial methanotrophy in global deep subsurface diagenesis. Further, microbial methane production and oxidation interlocks with syulfur and nitrogen transformations, which will be explored at the organism and process level in hydrothermal sediment microbial communities and mats of Guaymas Basin. In general, first-order research tasks (rate measurements, radiotracer incorporation studies, genomes, in situ microgradients) define the key microbial capabilities, pathways and processes that mediate chemical exchange between the subsurface hydrothermal/seeps and deep ocean waters.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1357360

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