Geochemical measurements of porewater and sediment from push core samples collected in the Gulf of California during R/V Atlantis cruise AT50-22 in 2024

Website: https://www.bco-dmo.org/dataset/1000880
Data Type: Cruise Results
Version: 1
Version Date: 2026-09-04

Project
» Collaborative research: Regulation and dynamics of microbial communities and biogeochemical cycling in hydrothermally-influenced habitats in the Gulf of California (GoC Microbial Biogeochem)

Contributors	Affiliation	Role
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Abstract
This dataset presents geochemical measurements of porewater and sediment collected via HOV Alvin push cores during R/V Atlantis cruise AT50-22 (April 6–30, 2024) in the Gulf of California, spanning the Guaymas and Pescadero Basins. Porewater parameters include nutrients (DOC, TDN, NOx, NO2, NH4, PO4, TDP, NO3, DIN, DON, DOP), dissolved gases (methane, ethane, propane, iso-butane, n-butane, n-pentane), major ions (SO4, Cl, Na, K, Mg, Ca), volatile fatty acids, DIC, H2S, Fe(II), alkalinity, pH, Eh, and salinity. Solid-phase sediment parameters include organic matter content (SOM/LOI), total particulate nitrogen and carbon (TPN, TPC), particulate organic and inorganic carbon (POC, PIC), reported by site, depth, and sediment depth interval.

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Coverage

Location: Gulf of CaliforniaGuaymas Basin, 27 00.00 N, -111 24.00 WPescadero Basin, 24 00.00 N, -108 51.00 W
Spatial Extent: **N**:27.58194 **E**:-108.85566 **S**:23.94152 **W**:-111.46374
Temporal Extent: 2024-04-08 - 2024-04-25

Methods & Sampling

Sediment samples were collected by the HOV Alvin using PVC push cores. Upon arrival at the surface the cores were described and cataloged prior to being sectioned into discrete depth intervals. Porewater was separated from the sediment using a manually-actuated porewater press as described by Joye et al., 2004. Following the collection of porewater, the pressed sediment sample (mud-cake) was stored at -20°C for solid-phase analysis. Porewater and sediment samples were preserved and analyzed as follows:

1) Nutrients (DOC, TDN, NOx, NO2, NH4, PO4, TDP): Water sample was filtered through a pre-rinsed 0.2 um regenerated cellulose Target2 syringe filter (Thermo Scientific, Prod. No. F25047), collected into an HDPE bottle and stored frozen at -20°C until analysis. Individual analytes were analyzed as follows:

- DOC was determined using high temperature catalytic combustion and an NDIR detector following the method described in Sugimura and Suzuki, 1988.
- TDN was determined using high temperature combustion and a chemiluminescence detector following the method described in Watanabe et. al, 2007.
- NOx was determined using chemical reduction and a nitric oxide detector following the method described by Garside, 1982.
- NO2 was determined using the colorimetric method described by Bendschneider and Robinson, 1952 (A new spectrophotometric method for the determination of nitrite in sea water. J. Mar. Res., 11: 87) as reproduced by Parsons, Marta, and Lalli, 1984.
- NH4 was determined using the colorimetric method described by Solorzano, 1969.
- PO4 was determined using the colorimetric method described by Strickland and Parsons, 1972.
- TDP was determined using the colorimetric method described by Solorzano and Sharp, 1980.

2) NH4: Water sample was filtered through a pre-rinsed 0.2 µm regenerated cellulose Target2 syringe filter (Thermo Scientific, Prod. No. F25047) into a 15 mL centrifuge tube, preserved with phenol reagent and stored at 5°C until analysis using the colorimetric method described by Solorzano, 1969. Samples were analyzed on a Hach DR 3900 spectrophotometer.

3) Alkalinity: Water sample was filtered through a pre-rinsed 0.2 µm regenerated cellulose Target2 syringe filter (Thermo Scientific, Prod. No. F25047) into a 15 mL centrifuge tube and stored at 5°C until analysis. Alkalinity was determined using the spectrophotometric method described by Sarazin et al., 1999. Samples were analyzed on a Hach DR 3900 spectrophotometer.

4) H2S: 2.0 mL unfiltered water sample was collected into a 15 mL centrifuge tube containing 500 uL of 20% zinc acetate and stored at 5°C until analysis. H2S was determined using the colorimetric method described by Cline, 1969. Samples were analyzed on a Hach DR 3900 spectrophotometer.

5) VFA: Water sample was filtered through a pre-rinsed 0.2 µm regenerated cellulose Target2 syringe filter (Thermo Scientific, Prod. No. F25047) into a 7 mL scintillation vial and stored frozen at -20°C until analysis. VFA (Glycolate, Lactate, Acetate, Formate, iso-Butyric Acid, Butyric Acid, iso-Valeric Acid, Valeric Acid) analysis was performed on a Dionex UltiMate 3000 HPLC with Hamilton PRP-1 Guard Column (Prod. No. 79445), Brownlee NewGuard RP-8 7 µm 15 x 3.2 mm guard column (Prod. No. 0711-0090) and Brownlee SPHERI-5 RP-8 5 µm 250 x 4.6 mm analytical column (Prod. No. 4427064) following the method of Albert and Martens, 1997.

6) SO4: Water sample was filtered through a pre-rinsed 0.2 µm regenerated cellulose Target2 syringe filter (Thermo Scientific, Prod. No. F25047) into a 7 mL scintillation vial. Samples were acidified with 10 µL of concentrated HNO3 per 1 mL sample, sealed with a PTFE lined cap, and stored at room temperature until analysis. Sample analysis was performed with a Dionex Integrion HPIC using KOH eluent supplied by a Dionex EGC 500 KOH Eluent Generator Cartridge (Prod. No. 075778), Dionex CR-ATC Continuously Regenerated Trap Column (Prod. No. 088662), Dionex ADRS 600 Dynamically Regenerated Suppressor (Prod. No. 088666), Dionex IonPac AG18 Guard Column (Prod. No. 060551), Dionex IonPac AS18 Analytical Column (Prod. No. 060549) and Dionex CRD 200 Carbonate Removal Device (Prod. No. 062983). See Weston et al., 2006.

7) Cl: Water sample was filtered through a pre-rinsed 0.2 µm regenerated cellulose Target2 syringe filter (Thermo Scientific, Prod. No. F25047) into a 7 mL scintillation vial. Samples were acidified with 10 µL of concentrated HNO3 per 1 mL sample, sealed with a PTFE lined cap, and stored at room temperature until analysis. Sample analysis was performed with a Dionex Integrion HPIC using KOH eluent supplied by a Dionex EGC 500 KOH Eluent Generator Cartridge (Prod. No. 075778), Dionex CR-ATC Continuously Regenerated Trap Column (Prod. No. 088662), Dionex ADRS 600 Dynamically Regenerated Suppressor (Prod. No. 088666), Dionex IonPac AG18 Guard Column (Prod. No. 060551), Dionex IonPac AS18 Analytical Column (Prod. No. 060549) and Dionex CRD 200 Carbonate Removal Device (Prod. No. 062983). See Weston et al., 2006.

8) Na: Water sample was filtered through a pre-rinsed 0.2 µm regenerated cellulose Target2 syringe filter (Thermo Scientific, Prod. No. F25047) into a 7 mL scintillation vial. Samples were acidified with 10 µL of concentrated HNO3 per 1 mL sample, sealed with a PTFE lined cap, and stored at room temperature until analysis. Sample analysis was performed with a Dionex Integrion HPIC using Methanesulfonic Acid eluent supplied by a Dionex EGC 500 MSA Eluent Generator Cartridge (Prod. No. 076779), Dionex CR-CTC Continuously Regenerated Trap Column (Prod. No. 088663), Dionex CDRS 600 Dynamically Regenerated Suppressor (Prod. No. 088670CMD), Dionex IonPac CG12A Guard Column (Prod. No. 046076), Dionex IonPac CS12A Analytical Column (Prod. No. 046075).

9) K: Water sample was filtered through a pre-rinsed 0.2 µm regenerated cellulose Target2 syringe filter (Thermo Scientific, Prod. No. F25047) into a 7 mL scintillation vial. Samples were acidified with 10 µL of concentrated HNO3 per 1 mL sample, sealed with a PTFE lined cap, and stored at room temperature until analysis. Sample analysis was performed with a Dionex Integrion HPIC using Methanesulfonic Acid eluent supplied by a Dionex EGC 500 MSA Eluent Generator Cartridge (Prod. No. 076779), Dionex CR-CTC Continuously Regenerated Trap Column (Prod. No. 088663), Dionex CDRS 600 Dynamically Regenerated Suppressor (Prod. No. 088670CMD), Dionex IonPac CG12A Guard Column (Prod. No. 046076), Dionex IonPac CS12A Analytical Column (Prod. No. 046075).

10) Mg: Water sample was filtered through a pre-rinsed 0.2 µm regenerated cellulose Target2 syringe filter (Thermo Scientific, Prod. No. F25047) into a 7 mL scintillation vial. Samples were acidified with 10 µL of concentrated HNO3 per 1 mL sample, sealed with a PTFE lined cap, and stored at room temperature until analysis. Sample analysis was performed with a Dionex Integrion HPIC using Methanesulfonic Acid eluent supplied by a Dionex EGC 500 MSA Eluent Generator Cartridge (Prod. No. 076779), Dionex CR-CTC Continuously Regenerated Trap Column (Prod. No. 088663), Dionex CDRS 600 Dynamically Regenerated Suppressor (Prod. No. 088670CMD), Dionex IonPac CG12A Guard Column (Prod. No. 046076), Dionex IonPac CS12A Analytical Column (Prod. No. 046075).

11) Ca: Water sample was filtered through a pre-rinsed 0.2 µm regenerated cellulose Target2 syringe filter (Thermo Scientific, Prod. No. F25047) into a 7 mL scintillation vial. Samples were acidified with 10 µL of concentrated HNO3 per 1 mL sample, sealed with a PTFE lined cap, and stored at room temperature until analysis. Sample analysis was performed with a Dionex Integrion HPIC using Methanesulfonic Acid eluent supplied by a Dionex EGC 500 MSA Eluent Generator Cartridge (Prod. No. 076779), Dionex CR-CTC Continuously Regenerated Trap Column (Prod. No. 088663), Dionex CDRS 600 Dynamically Regenerated Suppressor (Prod. No. 088670CMD), Dionex IonPac CG12A Guard Column (Prod. No. 046076), Dionex IonPac CS12A Analytical Column (Prod. No. 046075).

12) Fe(II): Water sample was filtered through a pre-rinsed 0.2 µm regenerated cellulose Target2 syringe filter (Thermo Scientific, Prod. No. F25047) into a 15 mL centrifuge tube and analyzed following a modified version of Stookey, 1970. Samples were analyzed on Hach DR 3900 and Shimadzu UV-1601 spectrophotometers.

13) pH: Sediment pH was determined using an Oakton pH5S pH spear (Prod. No. 3563452) and measured immediately during core sectioning.

14) Eh: Sediment Eh was measured using a Mettler Toledo InLab Redox ORP Electrode (Prod. No. 51343203) and a Fisherbrand Accumet AP125 Portable Meter (Prod. No. 13-636-AP125A).

15) Salinity: Porewater salinity was determined using a Fisherbrand handheld refractometer (Prod. No. 12-561-335).

16) DIC: Water sample was filtered through a pre-rinsed 0.2 µm regenerated cellulose Target2 syringe filter (Thermo Scientific, Prod. No. F25047). A 2.0 mL sample was injected into a N2-purged serum vial crimp-sealed with a butyl rubber stopper. Samples were stored frozen at -20°C until analysis. Sample analysis was performed after thawing and acidifying samples with concentrated HCl to pH 0. DIC concentration was determined by injecting headspace samples onto a Shimadzu GC-2014 FID-Methanizer with Supelco Carboxen 1010 PLOT 30 m x 0.53 mm Fused Silica Capillary Column (Prod. No. 25467). Weston et al. 2006

17) Gases: Methane, Ethane, Propane, iso-Butane, n-Butane and n-Pentane samples (3 cc whole sediment) were collected into a glass serum vial, preserved with 2 mL 2M N2-purged NaOH, crimp-sealed with a butyl rubber stopper and stored at room temperature until analysis. Concentrations were determined by headspace analysis using an SRI 8610 GC-FID with Agilent J&W HP-PLOT Al2O3 S Capillary Column, 50 m, 0.53 mm, 15.00 µm (Prod. No. 19095P-S25E). See Joye et al., 2004.

18) SOM: Sediment samples collected and analyzed for porosity were subsequently analyzed for Sediment Organic Matter. SOM was determined by drying a sample of known mass at 80C, weighing, ashing at 500C, weighing and calculating weight loss on ignition.

19) TPN: The pressed sediment sample (mud-cake) was dried at 60C and then homogenized via grinding. TPN was determined by the method described by Gordon, Jr., 1969 as reproduced by Sharp, 1974. Samples were analyzed on a ThermoFinnigan FlashEA 1112 series NC Soil Analyzer.

20) TPC: The pressed sediment sample (mud-cake) was dried at 60C and then homogenized via grinding. TPC was determined by the method described by Gordon, Jr., 1969 as reproduced by Sharp, 1974. Samples were analyzed on a ThermoFinnigan FlashEA 1112 series NC Soil Analyzer.

21) POC: The pressed sediment sample (mud-cake) was dried at 60C, homogenized via grinding and then acidified via fuming in a desiccator with concentrated HCl. POC was determined by the method described by Gordon, Jr., 1969 as reproduced by Sharp, 1974. Samples were analyzed on a ThermoFinnigan FlashEA 1112 series NC Soil Analyzer.

22) Calculated Values (NO3, DIN, DON, DOP, PIC): These values were calculated as follows:

- NO3 = NOx - NO2
- DIN = NOx + NH4
- DON = TDN - DIN
- DOP = TDP - PO4
- PIC = TPC - POC

Data Processing Description

DOC and TDN data were processed using Shimadzu TOC-Control V software. NOx and CH4 data were processed using SRI Instruments PeakSimple software. VFA, SO4, Cl, Na, K, Mg, and Ca data were processed using DIONEX Chromeleon software. DIC data was processed using Shimadzu GCsolution software.

BCO-DMO Curation Notes

This section documents curation actions performed prior to publication review with the submitter, and additional information relevant to understanding and reusing this dataset. It distinguishes changes made to the submitted (meta)data from unresolved issues and/or enhancements that improve future reuse and interoperability.

CURATION ACTIONS PERFORMED ON DATA

- Loaded AT50-22 Porewater Geochemistry V2.xlsx (Sheet1), header row 11, units row 12 skipped, deduplicated blank headers, missing values "", "nd", "ND" configured, preserving Excel display formatting and adjusting floating point error
- Deleted two blank spacer columns (named " (1)" and " (2)") between salinity/NO2 and DON:DOP/DOC
- Renamed columns containing disallowed characters to underscore-based names (e.g. Collection Date to Collection_Date, Lat (N) to Lat, Long (W) to Long, Depth Range to Depth_Range, Mid-point Depth to Midpoint_Depth, DIN:DIP to DIN_DIP, DON:DOP to DON_DOP, Iso-Butyric Acid to Iso_Butyric_Acid, Butyric Acid to Butyric_Acid, Iso-Valeric Acid + Succinate to Iso_Valeric_Acid_Succinate, Valeric Acid to Valeric_Acid, Tot VFA to Tot_VFA, iso-Butane to iso_Butane, n-Butane to n_Butane, n-Pentane to n_Pentane, Fe (II) to Fe_II, SOM (LOI) to SOM_LOI, Alvin Dive # to Alvin_Dive_number)
- Normalized date separators in Collection_Date from "/" to "-" for consistent DD-MM-YY format
- Combined normalized Collection_Date and Collection_Time into new Collection_DateTime string column in ISO 8601 format without seconds or timezone, since source lacked seconds and UTC offset
- Converted Collection_Date to an ISO date-typed column in UTC
- Reordered columns into a defined sequence
- Extracted non-numeric values (e.g. "BDL") from numeric-capable chemistry columns into new "_flag" columns, leaving the original numeric columns null where non-numeric
- Removed flag columns with no BDL occurrences in the sample data (TDP_flag, DIN_DIP_flag, DON_DOP_flag, DOC_flag, Tot_VFA_flag, Alkalinity_flag, DIC_flag, Cl_flag, Na_flag, K_flag, Mg_flag, Ca_flag, SOM_LOI_flag, TPN_flag, TPC_flag, POC_flag, PIC_flag, DIN_flag, TDN_flag, NH4_flag, DON_flag, PO4_flag, Lactate_flag, Methane_flag)
- Output as 1000880_v1_porewater_geochemistry.csv

CURATION ACTIONS PERFORMED ON METADATA

- BCO-DMO's standard metadata entry and text formatting steps were performed. See: https://www.bco-dmo.org/how-to/standard-curation-edits

ISSUES POTENTIALLY IMPACTING REUSE

- Collection times provided do not clarify timezone.

Related Publications

Albert, D. B., & Martens, C. S. (1997). Determination of low-molecular-weight organic acid concentrations in seawater and pore-water samples via HPLC. Marine Chemistry, 56(1–2), 27–37. https://doi.org/10.1016/s0304-4203(96)00083-7 https://doi.org/10.1016/S0304-4203(96)00083-7
Methods

Cline, J. D. (1969). Spectrophotometric Determination of Hydrogen Sulfide in Natural Waters. Limnology and Oceanography, 14(3), 454–458. doi:10.4319/lo.1969.14.3.0454
Methods

Garside, C. (1982). A chemiluminescent technique for the determination of nanomolar concentrations of nitrate and nitrite in seawater. Marine Chemistry, 11(2), 159–167. doi:10.1016/0304-4203(82)90039-1
Methods

Gordon, D. G. (1969). Examination of methods of particulate organic carVon analysis. Deep Sea Research and Oceanographic Abstracts, 16(6), 661–665. doi:10.1016/0011-7471(69)90066-7
Methods

Joye, S. B., Boetius, A., Orcutt, B. N., Montoya, J. P., Schulz, H. N., Erickson, M. J., & Lugo, S. K. (2004). The anaerobic oxidation of methane and sulfate reduction in sediments from Gulf of Mexico cold seeps. Chemical Geology, 205(3-4), 219–238. doi:10.1016/j.chemgeo.2003.12.019
Methods

Parsons, T. R., Y. Maita, and C. M. Lalli. "A Manual of Chemical and Biological Methods of Seawater Analysis", Pergamon Press (1984). ISBN: 9780080302874
Methods

Sarazin, G., Michard, G., & Prevot, F. (1999). A rapid and accurate spectroscopic method for alkalinity measurements in sea water samples. Water Research, 33(1), 290–294. doi:10.1016/s0043-1354(98)00168-7 https://doi.org/10.1016/S0043-1354(98)00168-7
Methods

Sharp, J. H. (1974). Improved analysis for “particulate” organic carbon and nitrogen from seawater1. Limnology and Oceanography, 19(6), 984–989. doi:10.4319/lo.1974.19.6.0984
Methods

Solórzano, L. (1969). Determination of ammonia in natural waters by the phenolhypochlorite method 1 1.This research was fully supported by U.S. Atomic Energy Commission Contract No. ATS (11-1) GEN 10, P.A. 20. Limnology and Oceanography, 14(5), 799–801. doi:10.4319/lo.1969.14.5.0799
Methods

Solórzano, L., & Sharp, J. H. (1980). Determination of total dissolved phosphorus and particulate phosphorus in natural waters1. Limnology and Oceanography, 25(4), 754–758. doi:10.4319/lo.1980.25.4.0754
Methods

Stookey, L. L. (1970). Ferrozine---a new spectrophotometric reagent for iron. Analytical Chemistry, 42(7), 779–781. doi:10.1021/ac60289a016
Methods

Strickland, J. D. H. and Parsons, T. R. (1972). A Practical Hand Book of Seawater Analysis. Fisheries Research Board of Canada Bulletin 157, 2nd Edition, 310 p.
Methods

Sugimura, Y., & Suzuki, Y. (1988). A high-temperature catalytic oxidation method for the determination of non-volatile dissolved organic carbon in seawater by direct injection of a liquid sample. Marine Chemistry, 24(2), 105–131. doi:10.1016/0304-4203(88)90043-6
Methods

Watanabe, K., Badr, E.-S., Pan, X., & Achterberg, E. P. (2007). Conversion efficiency of the high-temperature combustion technique for dissolved organic carbon and total dissolved nitrogen analysis. International Journal of Environmental Analytical Chemistry, 87(6), 387–399. doi:10.1080/03067310701237023
Methods

Weston, N. B., Porubsky, W. P., Samarkin, V. A., Erickson, M., Macavoy, S. E., & Joye, S. B. (2006). Porewater Stoichiometry of Terminal Metabolic Products, Sulfate, and Dissolved Organic Carbon and Nitrogen in Estuarine

Intertidal Creek-bank Sediments. Biogeochemistry, 77(3), 375–408. doi:10.1007/s10533-005-1640-1
Methods

Zhou, Y., Zhang, F. s., Yang, H. s., Zhang, S., & Ma, X. n. (2003). Comparison of effectiveness of different ashing auxiliaries for determination of phosphorus in natural waters, aquatic organisms and sediments by ignition method. Water Research, 37(16), 3875–3882. https://doi.org/10.1016/s0043-1354(03)00267-7
Methods

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Parameters

Parameter	Description	Units
Site	Site name	unitless
Collection_DateTime	Datetime of samples collection	unitless
Collection_Date	Date of samples collection	unitless
Collection_Time	Time of sample collection (24 hr)	unitless
Alvin_Dive_number	Alvin dive number	unitless
Lat	Latitude of sample collection, positive is North	Degrees, decimal min
Long	Longitude of sample collection, negative is West	Degrees, decimal min
Depth	Seafloor depth from which sample was collected	Meters (m)
Depth_Range	Depth range below the seafloor. Range equals the minimum (shallowest) depth of the sediment layer from which the sample was taken to the maximum (deepest) depth of the sediment layer from which the sample was taken. OWL = Overlying water sample.	Centimeters (cm)
Midpoint_Depth	The mid-point depth of the sediment layer from which the sample was taken. OWL = Overlying water sample.	Centimeters (cm)
pH	pH of the sediment layer	pH scale
Eh	Eh of the sediment layer	Millivolts (mV)
salinity	Salinity of the sediment layer. Method detection limit = 0	Practical salinity units (psu)

salinity_flag	Flag indicating quality of salinity value	unitless
NO2	Nitrite. Method detection limit = 0.1 umol/L	micromolar (umol/L)
NO2_flag	Flag indicating whether NO2 value is below detection limit (BDL)	unitless
NOx	Nitrate + Nitrite. Method detection limit = 0.5 umol/L	micromolar (umol/L)
NOx_flag	Flag indicating whether NOx value is below detection limit (BDL)	unitless
NO3	Nitrate. Method detection limit = 0.5 umol/L	micromolar (umol/L)
NO3_flag	Flag indicating whether NO3 value is below detection limit (BDL)	unitless
DIN	Dissolved Inorganic Nitrogen. Method detection limit = 0.1 umol/L	micromolar (umol/L)
TDN	Total Dissolved Nitrogen. Method detection limit = 1 umol/L	micromolar (umol/L)
NH4	Ammonium, home laboratory measurement. Method detection limit = 0.1 umol/L	micromolar (umol/L)
DON	Dissolved Organic Nitrogen. Method detection limit = 1 umol/L	micromolar (umol/L)
PO4	Phosphate. Method detection limit = 0.1 umol/L	micromolar (umol/L)
TDP	Total Dissolved Phosphate. Method detection limit = 0.1 umol/L	micromolar (umol/L)
DOP	Dissolved Organic Phosphate. Method detection limit = 0.1 umol/L	micromolar (umol/L)
DOP_flag	Flag indicating whether DOP value is below detection limit (BDL)	unitless
DIN_DIP	Dissolved Inorganic N:P ratio. molar ratio.	unitless
DON_DOP	Dissolved Organic N:P ratio. molar ratio.	unitless
DOC	Dissolved Organic Carbon. Method detection limit = 1 umol/L	micromolar (umol/L)

Glycolate	Glycolate: Method detection limit = 0.1 umol/L	micromolar (umol/L)
Glycolate_flag	Flag indicating whether Glycolate value is below detection limit (BDL)	unitless
Lactate	Lactate: Method detection limit = 0.1 umol/L	micromolar (umol/L)
Acetate	Acetate: Method detection limit = 0.1 umol/L	micromolar (umol/L)
Acetate_flag	Flag indicating whether Acetate value is below detection limit (BDL)	unitless
Formate	Formate: Method detection limit = 0.1 umol/L	micromolar (umol/L)
Formate_flag	Flag indicating whether Formate value is below detection limit (BDL)	unitless
Propionate	Propionate: Method detection limit = 0.1 umol/L	micromolar (umol/L)
Propionate_flag	Flag indicating whether Propionate value is below detection limit (BDL)	unitless
Iso_Butyric_Acid	Iso-Butyric Acid: Method detection limit = 0.1 umol/L	micromolar (umol/L)
Iso_Butyric_Acid_flag	Flag indicating whether Iso_Butyric_Acid value is below detection limit (BDL)	unitless
Butyric_Acid	Butyric Acid: Method detection limit = 0.1 umol/L	micromolar (umol/L)
Butyric_Acid_flag	Flag indicating whether Butyric_Acid value is below detection limit (BDL)	unitless
Iso_Valeric_Acid_Succinate	Iso-Valeric Acid and Succinate: Method detection limit = 0.1 umol/L	micromolar (umol/L)
Iso_Valeric_Acid_Succinate_flag	Flag indicating whether Iso_Valeric_Acid_Succinate value is below detection limit (BDL)	unitless
Valeric_Acid	Valeric Acid: Method detection limit = 0.1 umol/L	micromolar (umol/L)

Valeric_Acid_flag	Flag indicating whether Valeric_Acid value is below detection limit (BDL)	unitless
Tot_VFA	Total Volatile Fatty Acids: Method detection limit = 0.1 umol/L	micromolar (umol/L)
Alkalinity	Alkalinity. Method detection limit = 0.1 mm/L	millimolar (mm/L)
Methane	Dissolved Methane. Method detection limit = 1 umol/L	micromolar (umol/L)
Ethane	Dissolved Ethane. Method detection limit = 1 umol/L	micromolar (umol/L)
Ethane_flag	Flag indicating whether Ethane value is below detection limit (BDL)	unitless
Propane	Dissolved Propane. Method detection limit = 1 umol/L	micromolar (umol/L)
Propane_flag	Flag indicating whether Propane value is below detection limit (BDL)	unitless
iso_Butane	Dissolved iso-Butane. Method detection limit = 1 umol/L	micromolar (umol/L)
iso_Butane_flag	Flag indicating whether iso_Butane value is below detection limit (BDL)	unitless
n_Butane	Dissolved n-Butane. Method detection limit = 1 umol/L	micromolar (umol/L)
n_Butane_flag	Flag indicating whether n_Butane value is below detection limit (BDL)	unitless
n_Pentane	Dissolved n-Pentane. Method detection limit = 1 umol/L	micromolar (umol/L)
n_Pentane_flag	Flag indicating whether n_Pentane value is below detection limit (BDL)	unitless
DIC	Dissolved Inorganic Carbon. Method detection limit = 0.1 mm/L	millimolar (mm/L)
H2S	Hydrogen Sulfide. Method detection limit = 1 mm/L	millimolar (mm/L)
H2S_flag	Flag indicating whether H2S value is below detection limit (BDL)	unitless

SO4	Sulfate. Method detection limit = 0.1 mm/L	millimolar (mm/L)
SO4_flag	Flag indicating whether SO4 value is below detection limit (BDL)	unitless
Cl	Chloride. Method detection limit = 1 mm/L	millimolar (mm/L)
Na	Sodium. Method detection limit = 1 mm/L	millimolar (mm/L)
K	Potassium. Method detection limit = 0.1 mm/L	millimolar (mm/L)
Mg	Magnesium. Method detection limit = 0.1 mm/L	millimolar (mm/L)
Ca	Calcium. Method detection limit = 0.1 mm/L	millimolar (mm/L)
Fe_II	Dissolved Iron (II). Method detection limit = 0.1 mm/L	micromolar (umol/L)
Fe_II_flag	Flag indicating whether Fe_II value is below detection limit (BDL)	unitless
SOM_LOI	Sediment Organic matter. Method detection limit = 1%	percent
TPN	Total Particulate Nitrogen. Method detection limit = 0.1%	percent
TPC	Total Particulate Carbon. Method detection limit = 0.1%	percent
POC	Particulate Organic Carbon. Method detection limit = 0.1%	percent
PIC	Particulate Inorganic Carbon. Method detection limit = 0.1%	percent

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Instruments

Dataset-specific Instrument Name	Antek Instruments 7050 Nitric Oxide Detector
Generic Instrument Name	Chemiluminescence NOx Analyzer
Dataset-specific Description	NOx: Antek Instruments 7050 Nitric Oxide Detector with 745 Nitrate/Nitrite Reduction Assembly
Generic Instrument Description	The chemiluminescence method for gas analysis of oxides of nitrogen relies on the measurement of light produced by the gas-phase titration of nitric oxide and ozone. A chemiluminescence analyzer can measure the concentration of NO/NO2/NOX. One example is the Teledyne Model T200: https://www.teledyne-api.com/products/nitrogen-compound-instruments/t200

Dataset-specific Instrument Name	SRI 8610 GC-FID
Generic Instrument Name	Gas Chromatograph
Dataset-specific Description	CH4: SRI 8610 GC-FID
Generic Instrument Description	Instrument separating gases, volatile substances, or substances dissolved in a volatile solvent by transporting an inert gas through a column packed with a sorbent to a detector for assay. (from SeaDataNet, BODC)

Dataset-specific Instrument Name	Dionex UltiMate 3000 HPLC with UV/VIS Variable Wavelength Detector
Generic Instrument Name	High-Performance Liquid Chromatograph
Dataset-specific Description	VFA: Dionex UltiMate 3000 HPLC with UV/VIS Variable Wavelength Detector
Generic Instrument Description	A High-performance liquid chromatograph (HPLC) is a type of liquid chromatography used to separate compounds that are dissolved in solution. HPLC instruments consist of a reservoir of the mobile phase, a pump, an injector, a separation column, and a detector. Compounds are separated by high pressure pumping of the sample mixture onto a column packed with microspheres coated with the stationary phase. The different components in the mixture pass through the column at different rates due to differences in their partitioning behavior between the mobile liquid phase and the stationary phase.

Dataset-specific Instrument Name	Dionex Integrion HPIC with Dionex AS-AP Autosampler
Generic Instrument Name	Ion Chromatograph
Dataset-specific Description	SO4, Cl, Na, K, Mg, and Ca: Dionex Integrion HPIC with Dionex AS-AP Autosampler
Generic Instrument Description	Ion chromatography is a form of liquid chromatography that measures concentrations of ionic species by separating them based on their interaction with a resin. Ionic species separate differently depending on species type and size. Ion chromatographs are able to measure concentrations of major anions, such as fluoride, chloride, nitrate, nitrite, and sulfate, as well as major cations such as lithium, sodium, ammonium, potassium, calcium, and magnesium in the parts-per-billion (ppb) range. From: http://serc.carleton.edu/microbelife/research_methods/biogeochemical/ic....

Dataset-specific Instrument Name	Fisherbrand Accumet AP125 Portable Meter
Generic Instrument Name	Multi Parameter Portable Meter
Dataset-specific Description	Eh: Fisherbrand Accumet AP125 Portable Meter with Mettler Toledo InLab Redox ORP Electrode
Generic Instrument Description	An analytical instrument that can measure multiple parameters, such as pH, EC, TDS, DO and temperature with one device and is portable or hand-held.

Dataset-specific Instrument Name	Oakton pH5S pH spear
Generic Instrument Name	pH Sensor
Dataset-specific Description	pH: Oakton pH5S pH spear
Generic Instrument Description	An instrument that measures the hydrogen ion activity in solutions. The overall concentration of hydrogen ions is inversely related to its pH. The pH scale ranges from 0 to 14 and indicates whether acidic (more H+) or basic (less H+).

Dataset-specific Instrument Name	Fisherbrand handheld analog salinity refractometer
Generic Instrument Name	Refractometer
Dataset-specific Description	Salinity: Fisherbrand handheld analog salinity refractometer
Generic Instrument Description	A refractometer is a laboratory or field device for the measurement of an index of refraction (refractometry). The index of refraction is calculated from Snell's law and can be calculated from the composition of the material using the Gladstone-Dale relation. In optics the refractive index (or index of refraction) n of a substance (optical medium) is a dimensionless number that describes how light, or any other radiation, propagates through that medium.

Dataset-specific Instrument Name	Shimadzu GC-2014 FID with Methanizer
Generic Instrument Name	Shimadzu GC-2014 gas chromatograph
Dataset-specific Description	DIC: Shimadzu GC-2014 FID with Methanizer
Generic Instrument Description	The Shimadzu GC-2014 is a gas chromatograph that separates and analyses gas mixtures using either packed or capillary columns. The instrument comprises of a column oven, up to three injection units and up to four detectors. The sample is injected into the instrument and enters a gas stream which transports the sample into the column inside which the various components are separated. The detector then measures the quantity of the components that exit the column. Helium or nitrogen is used as the carrier gas. It can be fitted with a variety of detector types; Flame Ionization Detector (FID), Thermal Conductivity Detector (TCD), Electron Capture Detector (ECD), Flame Photometric Detector (FPD) and Flame Thermionic Detector (FTD). The GC-2014 is equipped with advanced flow controller technology which allows for accurate flow rate control and so a higher level repeatability of retention time and peak area. The instrument also includes an LCD which displays chromatograms and method parameters in real time.

Dataset-specific Instrument Name	Shimadzu TOC-Vcph Total Organic Carbon Analyzer with ASI-V Autosampler
Generic Instrument Name	Shimadzu Total Organic Carbon Analyzer TOC-VCPH
Dataset-specific Description	DOC: Shimadzu TOC-Vcph Total Organic Carbon Analyzer with ASI-V Autosampler TDN: Shimadzu TOC-Vcph Total Organic Carbon Analyzer with ASI-V Autosampler and TNM-1 Total Nitrogen Measuring Unit
Generic Instrument Description	The Shimadzu Total Organic Carbon Analyzer TOC-VCPH is a PC-controlled, total organic carbon analyzer (high-sensitivity model), designed to measure total carbon (TC), inorganic carbon (IC), total organic carbon (TOC), and non-purgeable organic carbon (NPOC); an optional accessory enables the measurement of particulate organic carbon (POC) and total nitrogen (TN) as well. The instrument uses the 680 degrees Celsius combustion catalytic oxidation method to analyze aqueous samples, and optionally solid and gas samples.

Dataset-specific Instrument Name	Hach DR 3900 spectrophotometer
Generic Instrument Name	Spectrophotometer
Dataset-specific Description	NH4: Hach DR 3900 spectrophotometer Alkalinity: Hach DR 3900 spectrophotometer Fe(II): Hach DR 3900 spectrophotometer and Shimadzu UV-1601 spectrophotometer
Generic Instrument Description	An instrument used to measure the relative absorption of electromagnetic radiation of different wavelengths in the near infra-red, visible and ultraviolet wavebands by samples.

Dataset-specific Instrument Name	ThermoFinnigan FlashEA 1112 series NC Soil Analyzer
Generic Instrument Name	Thermo Fisher Scientific Flash EA 1112 elemental analyzer
Dataset-specific Description	TPN: ThermoFinnigan FlashEA 1112 series NC Soil Analyzer TPC: ThermoFinnigan FlashEA 1112 series NC Soil Analyzer POC: ThermoFinnigan FlashEA 1112 series NC Soil Analyzer
Generic Instrument Description	The Thermo Finnigan {Thermo Fisher Scientific} Flash EA 1112 elemental analyzer is a laboratory instrument used to determine total carbon, hydrogen, nitrogen, sulphur, and oxygen in a sample. The sample is completely and instantaneously oxidised by flash combustion, which converts all organic and inorganic substances into combustion products. The resulting combustion gases pass through a reduction furnace and are swept into the chromatographic column by the helium carrier gas. The gases are separated in the column and detected by the thermal conductivity detector, which gives an output signal proportional to the concentration of the individual components of the mixture. The instrument was originally manufactured by Thermo Finnigan, which was acquired by Thermo Electron and later Thermo Scientific (part of Thermo Fisher Scientific).

Dataset-specific Instrument Name	Shimadzu UV-1601 spectrophotometer
Generic Instrument Name	UV Spectrophotometer-Shimadzu
Dataset-specific Description	NO2: Shimadzu UV-1601 spectrophotometer PO4: Shimadzu UV-1601 spectrophotometer TDP: Shimadzu UV-1601 spectrophotometer H2S: Shimadzu UV-1601 spectrophotometer Fe(II): Hach DR 3900 spectrophotometer and Shimadzu UV-1601 spectrophotometer
Generic Instrument Description	The Shimadzu UV Spectrophotometer is manufactured by Shimadzu Scientific Instruments (ssi.shimadzu.com). Shimadzu manufacturers several models of spectrophotometer; refer to dataset for make/model information.

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Deployments

AT50-22

Website	https://www.bco-dmo.org/deployment/1006998
Platform	R/V Atlantis
Start Date	2024-04-06
End Date	2024-04-30
Description	Project: Collaborative research: Regulation and dynamics of microbial communities and biogeochemical cycling in hydrothermally-influenced habitats in the Gulf of California Chief: Joye, Samantha

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Project Information

Collaborative research: Regulation and dynamics of microbial communities and biogeochemical cycling in hydrothermally-influenced habitats in the Gulf of California (GoC Microbial Biogeochem)

Coverage: Gulf of California

NSF Award Abstract:
Oceanic hydrothermal ecosystems have captivated the imagination of scientists and the general public since their discovery ~40 years ago. These habitats are characterized by extremes in temperature and pH, low oxygen concentrations, and high concentrations of toxic metals. Despite this, these ecosystems support rich and abundant microbial communities that achieve high rates of biogeochemical cycling. This project supports unprecedented studies to identify the impact of chemical regimes on microbial and viral community composition, diversity, and activity in areas in the Gulf of California along a range of hydrothermalism and dissolve oxygen levels. The project provides training opportunities for undergraduate and graduate students. Results are communicated through talks and lectures, publications, and data sharing through public repositories. The work will be shared through Ocean Discovery Camp and Clubs for diverse middle school students, displays at the Georgia Museum of Art, and a collaboration with the BBC Planet Earth III – Oceans team. Through these cumulative efforts, the project will forge a strong legacy in education and in fostering ocean literacy and promoting ocean advocacy in the general public.

The Gulf of California is a system where hydrothermal fluids flow through and alter sediment prior to discharge into deep waters. In sediments, fluid flow modulates biological dynamics through changes in carbon loading and electron accepter availability. In the water column, inorganic and organic energy sources are injected into hypoxic deep waters, creating dynamic chemical niches. This project studies how gradients in geochemistry shape and modulate the microbial and viral communities that carry out key biogeochemical reactions in sediments and in the water column of Guaymas and Pescadero Basins. The research integrates data streams from biogeochemistry, genomics, and microbiology, including single-cell activity approaches, to achieve unprecedented insight into regulatory mechanisms and dynamics. The project includes experiments and observations in the laboratory and at sea during an expedition on the R/V Atlantis with the deep submergence vehicle ALVIN in 2022. Key topics for investigation include: (1) Do variations in geochemical regimes select for metabolically plastic microbial populations? (2) Do different microbes become active under specific geochemical conditions or do the same microbes adapt to changing geochemical conditions? (3) What is the role of viruses in shaping the microbial populations present in highly dynamic hydrothermal habitats?

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.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2049439

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