

DOC, POC, d13C-POC, PN from a diffuse vent in West Mata sampled in May 2009 using ROV Jason II deployed from R/V Thomas Thompson.

Website: <https://www.bco-dmo.org/dataset/844580>

Data Type: Cruise Results

Version: 1

Version Date: 2021-03-09

Project

» [Collaborative Research: Rapid Response to a Submarine Eruption at W. Mata Volcano](#) (West Mata Volcano)

Contributors	Affiliation	Role
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Abstract

DOC, POC, d13C-POC, PN from a diffuse vent in West Mata sampled in May 2009 using ROV Jason II deployed from R/V Thomas Thompson.

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Coverage

Spatial Extent: N:15.4231 E:-173.748 S:15.0936 W:-174.285

Temporal Extent: 2009-05-07 - 2009-05-11

Methods & Sampling

Seawater samples were collected with Niskin bottles on a CTD rosette deployed from the research vessel Thomas Thompson. Hydrothermal fluid samples were collected via ROV JASON II using the PMEL Hydrothermal Fluid and Particulate Sampler into 800 mL Tedlar bags.

Particulates were collected by pumping 2-5 L of hydrothermal vent fluids through combusted GF/F filters (precombusted) using the HFPS in situ. About 10 L of seawater collected with CTD-rosette Niskin bottles were filtered on board ship through combusted GF/F filters.

Data Processing Description

Dissolved organic carbon (DOC) and total dissolved nitrogen (TDN) concentrations were measured by high-temperature (720°C) combustion using a Shimadzu TOC-VCSH analyzer. Two consensus reference materials (CRM, from University of Miami, Dickson et al., 2007), Florida Strait 700 m-deep seawater (DSW) and low carbon water (LCW), were used.

Nitrate-plus-nitrite (N+N) analysis was carried out with a colorimetric flow injection analyzer (Grasshoff et al., 1999).

Ammonium concentrations were measured at the University of Hawaii with a flow injection-fluorometric method (Jones, 1991) and calibrated against gravimetrically prepared standards. The detection limit was 0.1 µM at the setting for measuring low concentrations of ammonium in the vent fluids. The analytical uncertainty was 0.03 µM.

Silicate was measured by colorimetry (Grasshoff et al., 1999).

Total dissolved iron (1-sigma precision 4%) in vent fluids was measured by atomic absorption at PMEL/Seattle on samples preserved shipboard with ultra-pure HCl (TraceMetal Grade).

The total iron of acidified plume samples was measured by a Ferrozine colorimetry method (Gibbs, 1976; Stookey, 1970).

The pH of was measured shipboard at laboratory temperature in a closed vessel using a glass pH electrode (Ross Sure-Flow) calibrated with NBS-certified buffers (Fisher Scientific). The precision of the measurement is 0.02 pH units.

The POC and particulate nitrogen (PN) and isotopic compositions of acidified (with 1 N HCl) GF/F samples were measured with a CN elemental analyzer (Costech, ECS 4010) connected in-line with an isotope ratio mass spectrometer (IRMS; Thermo Finnigan Delta XP) interfaced with a ConFloIV, at the University of Hawaii. The reference materials were extensively characterized with certified reference materials, including NBS 18, NBS 19, NIST 1547, NIST 3, USGS 32, USGS 34, and USGS 35.

BCO-DMO Processing notes:

- Converted date and time columns to 1 datetime column (ISO format)
- Longitude on western hemisphere were converted to negative (-180,180 scale)
- Renamed fields to comply with database requirements

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Data Files

File
particulates.csv (Comma Separated Values (.csv), 3.00 KB) MD5:8947ed550aaceb70da31ccd1f8ad226
Primary data file for dataset ID 844580

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Related Publications

Dickson, A.G., Sabine, C.L. and Christian, J.R. (Eds.) 2007. Guide to Best Practices for Ocean CO₂ Measurements. PICES Special Publication 3, 191 pp <https://isbnsearch.org/isbn/1-897176-07-4>

Methods

Gibbs, C. R. (1976). Characterization and application of FerroZine iron reagent as a ferrous iron indicator. Analytical Chemistry, 48(8), 1197–1201. doi:[10.1021/ac50002a034](https://doi.org/10.1021/ac50002a034)

Methods

Grasshoff, K., Ehrhardt, M., Kremling, K., Almgren, T., 1999. Methods of seawater analysis <https://isbnsearch.org/isbn/3-527-29589-5>

Methods

Jones, R. D. (1991). An improved fluorescence method for the determination of nanomolar concentrations of ammonium in natural waters. Limnology and Oceanography, 36(4), 814–819. doi:[10.4319/lo.1991.36.4.0814](https://doi.org/10.4319/lo.1991.36.4.0814)

Methods

Lin, H. -T., Butterfield, D. A., Baker, E. T., Resing, J. A., Huber, J. A., & Cowen, J. P. (2021). Organic Biogeochemistry in West Mata, NE Lau Hydrothermal Vent Fields. Geochemistry, Geophysics, Geosystems. doi:10.1029/2020gc009481 <https://doi.org/10.1029/2020GC009481>

Results

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

Methods

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Parameters

Parameter	Description	Units
Sample_Type	Sample collected from hydrothermal vents or from the water column	unitless
Sample_Site	Names of each sampling sites; W. Mata=west Mata; NELSC=Northeast Lau Spreading Center	unitless
UH_Sample_Series	University of Hawaii sample identification numbers	unitless
Dive_CTD_cast	Dive number or CTD cast numbers	unitless
Fluid_Sampler	Fluid sampler number on the PMEL Hydrothermal Fluid and Particulate Sampler (HFPS)	unitless
Hydrothermal_Fluid_Sampling_ISO_DateTime_UTC	Hydrothermal fluid sampling date & time, ISO format and UTC timezone. na = Not Available	unitless
CTD_Start_ISO_DateTime_UTC	CTD start date & time, ISO format and UTC timezone. na = Not Available	unitless
CTD_End_ISO_DateTime_UTC	CTD end date & time, ISO format and UTC timezone. na=Not Available	unitless
Sampler_Type	Sampler type: Niskin or HFPS	unitless
Latitude	Latitude of sampling location, south is negative	decimal degrees
Longitude	Longitude of sampling location, west is negative	decimal degrees
Sampling_Depth	Sampling depth	meters (m)
Tmax	Maximum temperature during sampling	Degrees Celsius (°C)
pH	The negative log scale of hydrogen ions (H+) in the solution to show the acidity or basicity	unitless

Magnesium	Magnesium	Millimoles (mM)
DOC	Dissolved organic carbon	Micromoles (μM)
TDN	Total dissolved nitrogen	Micromoles (μM)
Ammonium	Ammonium	Micromoles (μM)
Nitrite	Nitrite	Micromoles (μM)
Nitrate	Nitrate	Micromoles (μM)
DON	Dissolved organic nitrogen	Micromoles (μM)
C_N_ratio_DOM	Carbon to nitrogen ratio of dissolved organic matter	unitless
Si	Dissolved silicate	Micromoles (μM)
TdFe	Total dissolved iron	Micromoles (μM)
Phosphate	Phosphate	Micromoles (μM)
POC	Particulate organic carbon	Micromoles (μM)
PN	Particulate nitrogen	Micromoles (μM)
C_N_ration_POM	Carbon to nitrogen ratio of particulate organic matter	unitless
d13C_POC	Stable carbon isotope of particulate organic carbon	Parts per thousand (‰)
d15N_PN	Stable carbon isotope of particulate nitrogen	Parts per thousand (‰)
Cell_L	Cell counts in per liter of vent fluids or seawater	Cells per liters (Cell/L)
dNTU	Turbidity	NTU
ORP_02	Oxidation Reduction Potential probe #2	Millivolts (mV)
ORP_07	Oxidation Reduction Potential probe #7	Millivolts (mV)

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Instruments

Dataset-specific Instrument Name	Costech, ECS 4010- ConFloIV-IRMS Thermo Finnigan Delta XP
Generic Instrument Name	Costech International Elemental Combustion System (ECS) 4010
Dataset-specific Description	Costech, ECS 4010- ConFloIV-IRMS Thermo Finnigan Delta XP
Generic Instrument Description	The ECS 4010 Nitrogen / Protein Analyzer is an elemental combustion analyser for CHNSO elemental analysis and Nitrogen / Protein determination. The GC oven and separation column have a temperature range of 30-110 degC, with control of +/- 0.1 degC.

Dataset-specific Instrument Name	Shimadzu TOC-VCSH analyzer
Generic Instrument Name	Shimadzu TOC-V Analyzer
Dataset-specific Description	Shimadzu TOC-VCSH analyzer
Generic Instrument Description	A Shimadzu TOC-V Analyzer measures DOC by high temperature combustion method.

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Deployments

TN234

Website	https://www.bco-dmo.org/deployment/844592
Platform	R/V Thomas G. Thompson
Start Date	2009-05-05
End Date	2009-05-13

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Project Information

Collaborative Research: Rapid Response to a Submarine Eruption at W. Mata Volcano (West Mata Volcano)

Coverage: West Mata, North East Lau Spreading Center

NSF Award Abstract:

This research is a time critical (RAPID) response cruise by a coalition of investigators to examine a newly discovered explosively erupting undersea volcano (Mata) in the Western Pacific Ocean. The discovery of actively erupting undersea volcanoes is a rarity and data that addresses many fundamental geological, hydrothermal, volcanic, and biological issues will be collected. The volcano being investigated is presently erupting unusual lavas of compositions indicative of the initial stages of arc formation. As such they have an unusual chemistry and are thought to be associated with hydrothermal fluids of exotic and extreme compositions. The likelihood that novel and previously undiscovered microbiological life forms associated with these fluids is a study target. Short lived radiogenic isotopes in lava samples from the volcanic vent will be measured to obtain an eruptive timeline. Coexisting hydrothermal fluids and erupted lava samples will be

examined to elucidate the relationship between volatile and element partitioning between solid and fluid phases during this type of magmatism. Broader impacts of the work include graduate student training, support of a PI whose gender is under-represented in the sciences, support of PIs from an institution in an EPSCoR state, and public outreach. Outreach to the Tongan people in terms of presentations on research activities and results will also be carried out.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0929881

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