

CTD Profile Data from R/V Atlantis cruise AT50-36 to the East Pacific Rise at 9 North in 2025

Website: <https://www.bco-dmo.org/dataset/1008325>

Data Type: Cruise Results

Version: 1

Version Date: 2026-09-28

Project

» [Collaborative Research: Hydrothermal vent systems mediate the formation and fate of refractory aromatic carbon in the deep ocean](#) (VentAromaticCarbon)

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Abstract

The measurements in this dataset were collected on a research cruise to 9 50N East Pacific Rise aboard the R/V Atlantis in April-May 2025 using shipboard CTD rosette equipment (dual CTD (temperature, conductivity, pressure), dissolved oxygen, transmissometer). This dataset represents 38 casts over 23 days spanning from 9° 45' N to 9° 54' N at vents including Tica, Bio9, Pvent, Biovent, YBW-Sentry, and Vvent. There are a mix of standard vertical casts, as well as extended tow-yos. Casts include those taken before and after a major eruption on April 29th, 2025.

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Coverage

Location: East Pacific Rise at 9° 50' N.

Spatial Extent: N:9.90578 E:-104.28294 S:9.78782 W:-104.29454

Temporal Extent: 2025-04-19 - 2025-05-03

Methods & Sampling

CTD casts targeting hydrothermal plumes were conducted at hydrothermal vent locations from April 10, 2025 to May 3, 2025. Casts at individual vents include CTD11, CTD13, CTD14, CTD16, CTD17 and CTD19. Extended

casts with multiple vents include CTD15.

Data Processing Description

Raw CTD data files (.XMLCON and .hex files) were converted to .cnv files with SBE Data Processing software v7.26.7. Data were extracted from .cnv files using readCnv.m (created by UAR IMAGO, IRD) and converted to .csv format.

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 seven CTD cast files: AT50-36_CTD011.csv, AT50-36_CTD013.csv, AT50-36_CTD014.csv, AT50-36_CTD015.csv, AT50-36_CTD016.csv, AT50-36_CTD017.csv, AT50-36_CTD019X.csv.
- Values recorded as "-9.99e-29" set to missing-value indicators and set to blank cells.
- Concatenated all seven tables into single table and added source resource name (ctd cast id)
- Concatenated the five resources into a single table, used filename as tow identifier
- Renamed file to "1008325_v1_ctd"
- Added raw data (.hex, .xmlcon & .pro files) as supplemental files

CURATION ACTIONS PERFORMED ON METADATA

- Standard metadata entry and text formatting steps were performed.

ISSUES POTENTIALLY IMPACTING REUSE

- N/A

Problem Description

Performance of the dissolved oxygen sensor appears to be degraded on casts CTD14, CTD15, CTD16, CTD17 and CTD19.

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Parameters

Parameter	Description	Units
cast	CTD cast identifier	unitless
CStarTr0	Beam transmission, WET Labs C-star	%
T2_T190C	Temperature difference	ITS-90, °C
altM	Altimeter	m
bpos	Bottle position in carousel	unitless

c0Sm	Conductivity	S/m
c1Sm	Conductivity 2	S/m
density00	Density	kg/m3
density11	Density 2	kg/m3
depSM	Depth (salt water)	m
fIECO_AFL	Fluorescence, WET Labs ECO-AFL/FL	mg/m3
flag	flag	NA
latitude	Latitude (south is negative)	Decimal degrees
longitude	Longitude (west is negative)	Decimal degrees
nbf	Bottles fired	unitless
potemp090C	Potential temperature	ITS-90, °C
potemp190C	Potential temperature 2	ITS-90, °C
prDM	Pressure, Digiquartz	db
sal00	Practical salinity	PSU
sal11	Practical salinity 2	PSU
sbeox0MLL	Oxygen, SBE 43	ml/l
sbeox0V	Oxygen, raw	V
sbox0MmKg	Oxygen, SBE 43	μmol/kg
spar	SPAR, Biospherical/Licor	unitless

svCM	Sound velocity	Chen-Millero, m/s
svCM1	Sound velocity 2	Chen-Millero, m/s
t090C	Temperature	ITS-90, °C
t190C	Temperature 2	ITS-90, °C
timeS	Time elapsed	seconds
date	Date and time (UTC)	YYYY-MM-DD hh:mm:ss.sss

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Instruments

Dataset-specific Instrument Name	SBE 43 Oxygen
Generic Instrument Name	Sea-Bird SBE 43 Dissolved Oxygen Sensor
Dataset-specific Description	SBE 43 Oxygen O1960
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 the manufacturer: https://www.seabird.com/products/sbe-43-dissolved-oxygen-sensor

Dataset-specific Instrument Name	dual SeaBird 911 plus/917 plus CTD
Generic Instrument Name	Sea-Bird SBE 911plus CTD
Generic Instrument Description	[tethered, real-time] The Sea-Bird SBE 911 plus is a type of CTD instrument package for continuous measurement of conductivity, temperature and pressure. The SBE 911 plus includes the SBE 9plus Underwater Unit and the SBE 11plus Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 plus and SBE 11 plus is called a SBE 911 plus. The SBE 9 plus uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 plus and SBE 4). The SBE 9 plus CTD can be configured with up to eight 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	dual SeaBird 911 plus/917 plus CTD
Generic Instrument Name	Sea-Bird SBE 917plus CTD
Generic Instrument Description	[self-logging, autonomous] High precision and accuracy CTD comprising an SBE 9plus underwater unit (SBE 3 temperature and SBE 4 conductivity sensors) and an SBE 17plus SEARAM data logger. Sensors may be connected to a pump-fed plastic tubing circuit (usually temperature, salinity and oxygen) or stand-alone. All instruments (8 channels available) on the package are logged by the SBE 17+, which provides battery power, has memory for CTD data recording, and provides autonomous carousel water sampler control.

Dataset-specific Instrument Name	SBE 9plus Pressure
Generic Instrument Name	Sea-Bird SBE 9plus CTD
Dataset-specific Description	SBE 9plus build-in pressure sensor
Generic Instrument Description	High precision and accuracy CTD comprising an SBE 9plus underwater unit (SBE 3plus temperature, SBE 4C conductivity, and Paroscientific Digiquartz pressure sensors, and an SBE 5T submersible pump). Can be used for either real-time data acquisition or for autonomous operations at a sampling speed of up to 24 Hz. The instrument package also includes a TC duct, to reduce salinity spiking caused by ship heave for improved resolution of water column features, and to ensure that temperature and conductivity measurements are made on the same parcel of water. Supplied with both an aluminium and titanium main housing, allowing for use up to 6800 and 10,500 metre depths respectively. Also capable of measuring from eight auxiliary sensors.

Dataset-specific Instrument Name	SBE 3 Temperature
Generic Instrument Name	Sea-Bird SBE-3 Temperature Sensor
Dataset-specific Description	SBE 3 Temperature
Generic Instrument Description	The SBE-3 is a slow response, frequency output temperature sensor manufactured by Sea-Bird Electronics, Inc. (Bellevue, Washington, USA). It has an initial accuracy of +/- 0.001 degrees Celsius with a stability of +/- 0.002 degrees Celsius per year and measures seawater temperature in the range of -5.0 to +35 degrees Celsius. More information from Sea-Bird Electronics: https://www.seabird.com/products/sbe-3-oceanographic-temperature-sensor

Dataset-specific Instrument Name	SBE 4 Conductivity
Generic Instrument Name	Sea-Bird SBE-4 Conductivity Sensor
Dataset-specific Description	SBE 4 Conductivity
Generic Instrument Description	The Sea-Bird SBE-4 conductivity sensor is a modular, self-contained instrument that measures conductivity from 0 to 7 Siemens/meter. The sensors (Version 2; S/N 2000 and higher) have electrically isolated power circuits and optically coupled outputs to eliminate any possibility of noise and corrosion caused by ground loops. The sensing element is a cylindrical, flow-through, borosilicate glass cell with three internal platinum electrodes. Because the outer electrodes are connected together, electric fields are confined inside the cell, making the measured resistance (and instrument calibration) independent of calibration bath size or proximity to protective cages or other objects.

Dataset-specific Instrument Name	Sonardyne USBL beacon
Generic Instrument Name	Ultra Short Baseline Positioning System
Generic Instrument Description	Systems dedicated to the positioning of subsea vehicles such as ROV and AUV. They are based on acoustic transmitted signals between one or several transponders and one acoustic antenna installed on a surface vessel. The transponders are mounted on the underwater vehicle or are fixed on the seafloor. These underwater acoustic positioning systems are coupled with inertial navigation systems.

Dataset-specific Instrument Name	SeaBird C-Star Transmissometer
Generic Instrument Name	WET Labs {Sea-Bird WETLabs} C-Star transmissometer
Dataset-specific Description	SeaBird C-Star Transmissometer 1118-DR
Generic Instrument Description	The C-Star transmissometer has a novel monolithic housing with a highly integrated 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

AT50-36

Website	https://www.bco-dmo.org/deployment/1008329
Platform	R/V Atlantis
Start Date	2025-04-03
End Date	2025-05-08

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Project Information

Collaborative Research: Hydrothermal vent systems mediate the formation and fate of refractory aromatic carbon in the deep ocean (VentAromaticCarbon)

Coverage: East Pacific Rise 9N

NSF Award Abstract:

Oceanic dissolved organic carbon (DOC) is one of the largest reservoirs of reduced carbon on Earth. Most of this DOC is housed in the deep ocean, where it cycles extremely slowly. Radiocarbon dating shows that the oldest components of oceanic DOC are condensed aromatic compounds. These compounds are also presumed to be unreactive and persistent. This project will investigate whether mid-ocean ridge hydrothermal vents are a source for this fraction of deep ocean DOC, through a field campaign at the well-studied East Pacific Rise 9°N hydrothermal site. Results of this work will advance the understanding of slowly cycling aromatic carbon pools in the abyssal ocean and its sediments, which controls the sequestration of carbon on short and geologic timescales. The project involves three early career researcher investigators, a postdoctoral investigator, and two graduate students.

Recent discoveries of (nano)particulate graphite in venting fluids and marine-like isotopic signature of condensed aromatics in oceanic bottom waters suggests a hydrothermal source for those condensed aromatics and warrants further consideration. The proposed research builds upon this previous work by asking: Do hydrothermal vent systems control the formation and distribution of the refractory aromatic carbon that persists in the deep ocean? To answer this question, samples will be collected from hydrothermal vent fields along the well-studied East Pacific Rise 9°N segment to target three main objectives: 1) quantify and characterize aromatic carbon and inorganic geochemistry along a hydrothermal continuum from a range of focused and diffuse fluid temperatures, 2) determine whether thermally altered marine organic matter is the main source of refractory aromatic carbon emitted by hydrothermal vents, 3) provide a preliminary model of the hydrothermal fluxes, dispersal, and fate of particulate and dissolved refractory aromatic carbon in the deep Eastern Pacific Ocean that can be validated and refined with future work. Using multiple analytical proxies to quantify and characterize graphite and soot-type molecules emitted across a broad geochemical range of venting fluids will allow for the determination of which hydrothermal conditions are favorable for the production of refractory aromatic carbon. By studying organic-inorganic interactions, novel datasets for elucidating linked biogeochemical processes will be produced. Complementary isotopic and molecular measurements will reveal whether hydrothermal aromatic carbon is sourced from the thermal alteration of preexisting marine organic matter, challenging the previously-held assumption of a mantle-derived CO₂ source. Assessment of off-axis water and sediment transects will confirm whether condensed aromatic carbon that persists in the deep ocean and its sediments is hydrothermal in origin.

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-2147634
NSF Division of Ocean Sciences (NSF OCE)	OCE-2148471

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