CTD profiles collected from the San Pedro Ocean Time-series (SPOT) station in the San Pedro Basin, Southern California Bight, aboard R/V Yellowfin on February 19, 2025

Website: https://www.bco-dmo.org/dataset/1005588
Data Type: Cruise Results
Version: 1
Version Date: 2026-09-18

Project
» Collaborative Research: The impact of ocean warming on bioactive trace metal requirements and use efficiencies of marine nitrifying microorganisms (Nitrifiers_TMReqs_OceanWarming)

Contributors	Affiliation	Role
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Abstract
This dataset contains CTD profiles collected during the SPOT cruise in the San Pedro Ocean Time-series (Southern California Bight) on February 19, 2025. Measurements include depth, temperature, salinity, pH, dissolved oxygen, PAR, and related optical and physical parameters, collected using a CTD system to characterize water column conditions.

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Coverage

Location: The study area is the SPOT station in the Southern California Bight (33°33′N, 118°24′W), a coastal marine environment.
Spatial Extent: **Lat**:33.55 **Lon**:-118.4
Temporal Extent: 2025-02-19

Methods & Sampling

CTD profiles were collected using a Sea-Bird CTD system deployed from the research vessel during the SPOT cruise. The dataset includes two CTD casts conducted on February 19, 2025, which are distinguished using a Cast_ID column. The instrument was stabilized near the surface (0–5 m) prior to profiling and then lowered

through the water column at a controlled rate of approximately 10–40 m min^{-1}. Sensor data were recorded continuously during the downcast, and discrete water samples were collected during the upcast using Niskin bottles mounted on the rosette.

The CTD system consisted of a Sea-Bird Electronics SBE 9plus equipped with sensors for pressure, temperature (SBE 3), conductivity (SBE 4C), and dissolved oxygen (SBE 43), as well as auxiliary sensors including photosynthetically active radiation (PAR), chlorophyll fluorescence (WET Labs ECO-AFL), turbidity, and beam transmission (C-Star transmissometer). Sensors were regularly calibrated by the manufacturer to ensure data accuracy.

Data Processing Description

CTD data were acquired at high frequency (24 Hz) using Sea-Bird software (Seasoft/Seasave) and processed using standard Sea-Bird protocols. Raw data files (.hex) and associated configuration files were used to generate processed profile data, including derived variables such as salinity from conductivity and temperature. Bottle data were matched to CTD profiles using time and depth records.

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 Cast_1 data from Sheet1 of SPOT_CTD_20250219.xlsx, with header on row 1, applying floating point error adjustment and preserved formatting; empty strings and "nd" set as missing values
- Loaded Cast_2 data from Sheet2 of the same file, which lacked Date_of_sampling, Latitude, Longitude, and Cast_ID columns; noted that its Flag column was stored in scientific notation (e.g. 0.00E+00); same missing value and formatting settings applied
- Added constant column Date_of_sampling ("2025-02-19") from sheet1 to all sheet2 rows, constant column Latitude (33.55) from sheet1 to all sheet2 rows via math operation, constant column Longitude (-118.4) from sheet1 to all sheet2 rows via math operation, and constant column Cast_ID ("Cast_2") to all sheet2 rows, which represent data from the second cast
- Concatenated sheet1 and sheet2 into a single table named combined_ctd, mapping matching columns (C0S/m, CStarTr0, Cast_ID, Date_of_sampling, DepSM, FlECO-AFL, Flag, Latitude, Longitude, Par/sat/log, Ph, PrdE, Sal00, Sbeox0Mg/L, Sbeox0PS, T090C, TimeS, TurbWETntu0)
- Renamed columns based on BCO-DMO conventions: T090C to Temp, C0S/m to Conductivity, Sal00 to Salinity, PrdE to Pressure, Sbeox0Mg/L to Oxygen_mg_l, Sbeox0PS to Oxygen_percent_sat, Par/sat/log to PAR, FlECO-AFL to Fluorescence, TurbWETntu0 to Turbidity, CStarTr0 to Beam_transmission, TimeS to Elapsed_time, DepSM to Depth
- Set Flag column to number type first to correctly parse scientific-notation values (e.g. 0.00E+00) originating from sheet2
- Rounded Flag to zero decimal places without preserving trailing zeros, converting it to integer type, resolving the scientific-notation casting issue
- Output as 1005588_v1_spot_ctd_20250219.csv
- Loaded 1005588_v1_spot_ctd_20250219_submitter_edit.csv (a deduplicated draft provided by the submitter after review of the initial draft), using filename as resource name, treating "" and "nd" as missing values
- Removed first draft 1005588_v1_spot_ctd_20250219.csv
- Output 1005588_v1_spot_ctd_20250219_submitter_edit as 1005588_v1_spot_ctd_20250219.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
- Used context from methods section to provide more detail for parameter descriptions

ISSUES POTENTIALLY IMPACTING REUSE

- N/A

Problem Description

The dataset includes two CTD casts conducted on the same date. A precise start time is available for Cast_2 based on instrument metadata (10:33:22 PST, UTC−8), whereas the exact start time for Cast_1 could not be confidently determined.

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Data Files

File
1005588_v1_spot_ctd_20250219.csv (Comma Separated Values (.csv), 337.15 KB) MD5:976128447848a98144983c1a1852ce97 Primary data file for dataset ID 1005588, version 1

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Related Datasets

IsRelatedTo

Qin, W., Hutchins, D. A., Fu, F., John, S. G. (2026) **Depth profiles of nutrients and dark carbon fixation rates collected from the San Pedro Ocean Time-series (SPOT) R/V Yellowfin cruise in the San Pedro Basin on February 19, 2025.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2026-08-19 doi:10.26008/1912/bco-dmo.1005611.1 [view at BCO-DMO]
Relationship Description: Data collected during the same SPOT sampling date (February 19, 2025).

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Parameters

Parameter	Description	Units
Date_of_sampling	Date of sampling in Pacific Standard Time	unitless
Latitude	Latitude of sampling location, positive is North	decimal degrees
Longitude	Longitude of sampling location, negative is West	decimal degrees
Cast_ID	Identifier for each CTD cast (e.g., Cast_1, Cast_2)	unitless
Depth	Water depth derived from CTD (DepSM)	meters (m)
Temp	Seawater temperature measured on the ITS-90 scale (T090C)	degrees Celsius (°C)

Conductivity	Electrical conductivity of seawater from the primary conductivity sensor (C0S/m)	siemens per meter (S/m)
Salinity	Practical salinity (Sal00)	practical salinity unit (PSU)
Pressure	Pressure measured by CTD (PrdE)	decibar (dbar)
Oxygen_mg_l	Dissolved oxygen concentration (Sbeox0Mg/L)	milligrams per liter (mg/L)
Oxygen_percent_sat	Dissolved oxygen percent saturation (Sbeox0PS)	percent (%)
Ph	Seawater pH (Ph)	unitless
PAR	Photosynthetically active radiation (Par/sat/log)	microeinstein per square meter per second (µE m^{-2} s^{-1})
Fluorescence	Chlorophyll fluorescence (FlECO-AFL)	relative units
Turbidity	Turbidity (TurbWETntu0)	nephelometric turbidity units (NTU)
Beam_transmission	Beam attenuation coefficient (CStarTr0)	per meter (m^{-1})
Elapsed_time	Elapsed time during cast in seconds (TimeS)	seconds (s)
Flag	Data quality flag, Flag = 0 indicates valid data that passed quality control checks during CTD data processing; other flag values indicate questionable or invalid data.	unitless

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Instruments

Dataset-specific Instrument Name	Niskin bottles
Generic Instrument Name	Niskin bottle
Dataset-specific Description	Sensor data were recorded continuously during the downcast, and discrete water samples were collected during the upcast using Niskin bottles mounted on the rosette.
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

Dataset-specific Instrument Name	Sea-Bird Electronics SBE 9plus
Generic Instrument Name	Sea-Bird SBE 9plus CTD
Dataset-specific Description	The CTD system consisted of a Sea-Bird Electronics SBE 9plus equipped with sensors for pressure, temperature (SBE 3), conductivity (SBE 4C), and dissolved oxygen (SBE 43), as well as auxiliary sensors including photosynthetically active radiation (PAR), chlorophyll fluorescence (WET Labs ECO-AFL), turbidity, and beam transmission (C-Star transmissometer). Sensors were regularly calibrated by the manufacturer to ensure data accuracy.
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.

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Deployments

SPOT_20250219

Website	https://www.bco-dmo.org/deployment/1005709
Platform	R/V Yellowfin
Start Date	2025-02-19
End Date	2025-02-19
Description	San Pedro Ocean Time-series

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Project Information

Collaborative Research: The impact of ocean warming on bioactive trace metal requirements and use efficiencies of marine nitrifying microorganisms (Nitrifiers_TMReqs_OceanWarming)

Coverage: Eastern North Pacific: HNLC and subtropical gyre; SPOT time-series station; HOT time-series station.

NSF Award Abstract:

This project seeks to provide a deeper understanding of how major biogeochemical cycles that support all living marine resources will respond to climate warming in a changing ocean environment. It will train one postdoctoral researcher and three graduate students, and provides research training opportunities for undergraduate students in microbial physiology and ecology, bioinformatics, trace metal biogeochemistry, and oceanography. Project personnel also conduct K-12 education and outreach activities. All data is freely available through the Biological and Chemical Oceanographic Data Management Office (BCO-DMO).

This project investigates how climate warming will interact with the unique trace metal requirements of marine nitrifying microorganisms (nitrifiers) to affect ammonia and nitrite oxidation pathways in the rapidly changing ocean. Four investigators with diverse expertise in microbial global change physiology, nitrogen and trace metal biogeochemistry, and mechanistic transcriptomics and proteomics combine their efforts, using well-controlled pure culture-based laboratory studies along with field incubation experiments with natural communities to systematically investigate 1) thermal effects on iron (Fe) and copper (Cu) requirements and use efficiencies in isolated cultures and natural populations of marine ammonia-oxidizing archaea and bacteria (AOA, AOB) and nitrite-oxidizing bacteria (NOB), 2) the underlying molecular and biochemical mechanisms that facilitate such thermally-driven adaptive responses, and 3) system-level feedbacks between global change, trace metal biogeochemistry, and marine nitrifiers and their associated microbial communities in diverse marine environments. Together, these studies enhance our understanding of the marine nitrogen cycle and trace metal biogeochemistry, and ultimately contribute to a more detailed understanding of the impact of rapid ocean warming on critical major nutrient and micronutrient cycles.

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-2336534
NSF Division of Ocean Sciences (NSF OCE)	OCE-2610907

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