Sea and Sun Sensor data from a post-urban fire water quality study in Lahaina, West Maui, Hawaii from Nov 2023 to Feb 2024

Website: https://www.bco-dmo.org/dataset/1001870
Data Type: Other Field Results
Version: 1
Version Date: 2026-08-25

Project
» RAPID: Coral reef stress responses to an urban fire (Reef stress urban fire)

Contributors	Affiliation	Role
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Abstract
These data include CTD (Conductivity-Temperature-Depth), dissolved oxygen, and chlorophyll a measurements recorded by a Sea and Sun CTD sensor. This dataset was collected as part of a coastal water quality study using sensors to measure salinity, conductivity, temperature, pressure, water flow direction and velocity, dissolved oxygen, pH, chlorophyll, and turbidity. Sensors were all deployed in West Maui in coral reef systems that were within and adjacent to the burn zone of the Lahaina fires. The temporal range of deployments in the project span from October of 2023 to October of 2024 with this data set spanning from November of 2023 to February of 2024. The aim of these data is to understand the effects on coral reef health in response to the urban fires that occurred in August of 2023. Samples were collected by a collaborative effort of scientists Dr. Andrea K Kealoha, Dr. Craig Nelson, Dr. Eileen Nalley, and Dr. Nicholas Hawco. These high-resolution time series provide critical baseline and post-disturbance information for assessing short- and long-term environmental change. The dataset is intended to support ongoing monitoring efforts and inform management strategies aimed at enhancing reef resilience and recovery.

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Coverage

Location: Lahaina, Maui, Hawai'i 20.878525, -156.683746
Spatial Extent: **N**:20.9373 **E**:-156.6076 **S**:20.8088 **W**:-156.6935
Temporal Extent: 2023-11-12 - 2024-02-07

Methods & Sampling

Sensors were deployed within the benthic reef system at the listed sites.

Sea and Sun Technology CTD 48Mc:

Calibrations were done on the fluorescence and conductivity sensors using reference materials prior to deployment. The sensors were configured using log at 10 minute intervals with five 5 second burst samples.

Data Processing Description

Quality control processing was carried out in python.

QC Process for Sea and Sun Sensors:
Raw data: Data taken from each sensor as it was pulled out of the water.
QC-H: The raw data was analyzed by Hereon Institute, and quality flags were added.
QC-1: Quality flags placed by Hereon Institute were removed, and burst samples were averaged to make singular points.
QC-2: QC-1 data points with a large standard error of the mean were flagged if they exceeded the determined threshold.
QC-3: QC-2 data points were cross-referenced with the adjacent sensor in the milk-crate

BCO-DMO Curation Notes

Curation Actions Performed on Data

Main data table:
- Loaded SNS_QC_data.csv from source submission files, treating empty strings "" as missing values, with all fields cast as strings initially
- Renamed columns: Serial.Number to Serial_Number, Site Name to Site_Name, Timestamps.HST to ISO_DateTime_Local, Timestamps.UTC to ISO_DateTime_UTC, Salinity..PSU. to Salinity, Sal_STDEV to Salinity_stdev, Sal_STDERR to Salinity_stderr, MaxPerBurst.Salinity..PSU. to Salinity_max_per_burst, Temperature..Celcius. to Temperature, Temperature_STDEV to Temperature_stdev, Temperature_STDERR to Temperature_stderr, Pressure..decibar. to Pressure, Pressure_STDEV to Pressure_stdev, Pressure_STDERR to Pressure_stderr, Oxygen..mg.L. to Oxygen, Oxygen_STDEV to Oxygen_stdev, Oxygen_STDERR to Oxygen_stderr, OxygenSat.... to Oxygen_sat, OxygenSat_STDEV to Oxygen_sat_stdev, OxygenSat_STDERR to Oxygen_sat_stderr, Chlorophyll..FluCycl. to Chlorophyll, Chlorophyll_STDEV to Chlorophyll_stdev, Chlorophyll_STDERR to Chlorophyll_stderr
- Converted ISO_DateTime_Local from format %m/%d/%y %H:%M in HST timezone to ISO 8601 datetime string format %Y-%m-%dT%H:%M%z, HST timezone indicated by -1000
- Converted ISO_DateTime_UTC from format %m/%d/%y %H:%M in UTC timezone to ISO 8601 datetime string format %Y-%m-%dT%H:%MZ, UTC timezone indicated by Z
- Set column data types: numeric types for Chlorophyll, Chlorophyll_stderr, Chlorophyll_stdev, Latitude, Longitude, Oxygen, Oxygen_sat, Oxygen_sat_stderr, Oxygen_sat_stdev, Oxygen_stderr, Oxygen_stdev, Pressure, Pressure_stderr, Pressure_stdev, Salinity, Salinity_max_per_burst, Salinity_stderr, Salinity_stdev,

Temperature, Temperature_stderr, Temperature_stdev; datetime type for ISO_DateTime_Local and ISO_DateTime_UTC; string type for Serial_Number and Site_Name
- Updated column metadata with finalized BCO-DMO standard name IDs, descriptions, and supplied units for all columns; flagged Latitude, Longitude, and ISO_DateTime_UTC as primary parameters
- Output final table as CSV file named 1001870_v1_lahaina-sea-and-sun.csv

Supplemental files:
* Supplemental site and deployment tables formatted from listed information provided in the original dataset submission metadata section "Location." Added as lahaina_site_list.csv and lahaina_sensor_deployment.csv. These tables list all sites and deployments of the related datasets in the study.

Curation Actions Performed on Metadata
* Standard metadata entry and formatting of provided metadata.
* First sentence of abstract modified to describe the sea and sun data (not minidot which is a related dataset).

Known Issues [Potentially Impacting Reuse]
- N/A

Problem Description

QC procedure noted under Data Processing Section.

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Data Files

File	
1001870_v1_lahaina-sea-and-sun.csv	(Comma Separated Values (.csv), 27.51 MB) MD5:71615ae5cb38559614e21107b7885fff
Primary data file for dataset ID 1001870, version 1	

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Supplemental Files

File	
lahaina_sensor_deployment.csv	(Comma Separated Values (.csv), 1.03 KB) MD5:6462f9fdd31d22d2eee838f5faa90a58
Sensor deployment information table for the related Lahaina sensor datasets in the project. Columns (name, description): Sensor, Sensor (e.g. "Sea and Sun CTD 48Mc") Site_ID, Sensor site identifier (e.g. "SEN_3"). The sensor identifier column is in the related datasets in the project. Site_Name, Local name for the site Deployment_Start, Deployment start date (ISO 8601 format) Deployment_End, Deployment end date (ISO 8601 format) comment, additional information (e.g. "DO")	
lahaina_site_list.csv	(Comma Separated Values (.csv), 307 bytes) MD5:1a7c5680b2e652502eeca68b03934691
Site information table for the related Lahaina sensor datasets in the project. Columns (name, description): Site_ID, Sensor site identifier (e.g. "SEN_3"). The sensor identifier column is in the related datasets in the project., unitless Site_Name, Local name for the site, unitless Latitude, Site latitude, decimal degrees Longitude, Site longitude, decimal degrees	

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Related Datasets

IsRelatedTo

Kealoha, A., Calil, P. H., Hawco, N. J., Masessa, G., Mattos, J., Nalley, E., Nelson, C. E., Summers, T., Swift, S., Peterman, J., Rohrbaugh, N., Tegler, L., Kekuewa, S. (2026) **HydroCAT data from a post-urban fire water quality study in Lahaina, West Maui, Hawaii from Nov 2023 to Feb 2024.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2026-08-27 http://lod.bco-dmo.org/id/dataset/1001844 [view at BCO-DMO]
Relationship Description: Lahaina sensor deployment datasets conducted as part of the same study. These datasets all contain the same lahaina_site_list.csv and lahaina_sensor_deployment.csv tables which includes supplemental site and deployment information for all these related datasets.

Kealoha, A., Calil, P. H., Hawco, N. J., Masessa, G., Mattos, J., Nalley, E., Nelson, C. E., Summers, T., Swift, S., Peterman, J., Rohrbaugh, N., Tegler, L., Kekuewa, S. (2026) **Temperature and dissolved oxygen from a post-urban fire water quality study in Lahaina, West Maui, Hawaii from Dec 2023 to Feb 2024.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2026-08-25 http://lod.bco-dmo.org/id/dataset/1001818 [view at BCO-DMO]
Relationship Description: Lahaina sensor deployment datasets conducted as part of the same study. These datasets all contain the same lahaina_site_list.csv and lahaina_sensor_deployment.csv tables which includes supplemental site and deployment information for all these related datasets.

Kealoha, A., Calil, P. H., Hawco, N. J., Masessa, G., Mattos, J., Nalley, E., Nelson, C. E., Summers, T., Swift, S., Peterman, J., Rohrbaugh, N., Tegler, L., Kekuewa, S. (2026) **Tilt Current Meter data from a post-urban fire water quality study in Lahaina, West Maui, Hawaii from Oct 2023 to Mar 2024.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2026-08-27 http://lod.bco-dmo.org/id/dataset/1001896 [view at BCO-DMO]
Relationship Description: Lahaina sensor deployment datasets conducted as part of the same study. These datasets all contain the same lahaina_site_list.csv and lahaina_sensor_deployment.csv tables which includes supplemental site and deployment information for all these related datasets.

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Parameters

Parameter	Description	Units
Serial_Number	sensor serial number	unitless
Site_Name	name of site	unitless
Latitude	latitude	decimal degrees
Longitude	longitude	decimal degrees
ISO_DateTime_Local	timestamp in local time zone HST (ISO 8601 datetime with timezone format).	unitless
ISO_DateTime_UTC	timestamp in UTC time zone (ISO 8601 datetime with timezone format).	unitless

Salinity	salinity of seawater	Practical Salinity Units (PSU)
Salinity_stdev	standard deviation salinity samples	Practical Salinity Units (PSU)
Salinity_stderr	standard error of salinity	Practical Salinity Units (PSU)
Salinity_max_per_burst	maximum salinity from burst measurements	Practical Salinity Units (PSU)
Temperature	temperature of seawater	degrees Celsius
Temperature_stdev	standard deviation temperature measurements	degrees Celsius
Temperature_stderr	standard error of temperature	degrees Celsius
Pressure	pressure of seawater	decibars (db)
Pressure_stdev	pressure standard deviation	decibars (db)
Pressure_stderr	standard error of pressure	decibars (db)
Oxygen	dissolved oxygen in seawater	milligrams per liter (mg/L)
Oxygen_stdev	standard deviation of dissolved oxygen	milligrams per liter (mg/L)
Oxygen_stderr	standard error of dissolved oxygen	milligrams per liter (mg/L)
Oxygen_sat	oxygen saturation of seawater	percent (%)
Oxygen_sat_stdev	oxygen saturation of seawater standard deviation	percent (%)
Oxygen_sat_stderr	oxygen saturation of seawater R value	percent (%)
Chlorophyll	chlorophyll-a concentrations in seawater	micrograms per liter (ug/L)
Chlorophyll_stdev	standard deviation of chlorophyll-a concentrations in seawater	micrograms per liter (ug/L)
Chlorophyll_stderr	standard error of chlorophyll-a concentrations in seawater	micrograms per liter (ug/L)

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Instruments

Dataset-specific Instrument Name	Conductivity sensor (OEM 7-pole conductivity cell)
Generic Instrument Name	Conductivity Meter
Dataset-specific Description	Sea and Sun Technology CTD 48Mc is a multiparameter probe: 1.Temperature Sensor SST PT100: The temperature sensor is a Pt100 platinum resistor 2. Conductivity sensor (OEM 7-pole conductivity cell): The conductivity sensors consists of 7 electrodes in a cylindrical arrangement. The central electrode is used to impress an alternating current into the water volume. Two pairs of sensing electrodes to the right and left of the central electrode measure the voltage drop across them. The constant potential on the outer electrodes limits the electrical field to the inside of the cylinder and prevents any influence from boundary conditions outside the cell. The conductivity electronic holds the voltage drop across the sensing electrodes on a constant level, while the current is proportional to the actual conductivity value. 3. Fluorometer (Turner Cyclops): The Turner Designs' CYCLOPS-7 Submersible Fluorometer is a single channel detector that can be used for many different applications. It is intended for integration into multi-parameter systems from which it will receive power and deliver a voltage output that is proportional to the concentration of the fluorophore, particle, or compound of interest.
Generic Instrument Description	Conductivity Meter - An electrical conductivity meter (EC meter) measures the electrical conductivity in a solution. Commonly used in hydroponics, aquaculture and freshwater systems to monitor the amount of nutrients, salts or impurities in the water.

Dataset-specific Instrument Name	Sea and Sun Technology CTD 48Mc
Generic Instrument Name	CTD - fixed
Dataset-specific Description	Sensors were deployed within the benthic reef system at the listed sites. Calibrations were done on the fluorescence and conductivity sensors using reference materials prior to deployment. The sensors were configured using log at 10 minute intervals with five 5 second burst samples. Sea and Sun Technology CTD 48Mc is a multiparameter probe: 1.Temperature Sensor SST PT100: The temperature sensor is a Pt100 platinum resistor 2. Conductivity sensor (OEM 7-pole conductivity cell): The conductivity sensors consists of 7 electrodes in a cylindrical arrangement. The central electrode is used to impress an alternating current into the water volume. Two pairs of sensing electrodes to the right and left of the central electrode measure the voltage drop across them. The constant potential on the outer electrodes limits the electrical field to the inside of the cylinder and prevents any influence from boundary conditions outside the cell. The conductivity electronic holds the voltage drop across the sensing electrodes on a constant level, while the current is proportional to the actual conductivity value. 3. Fluorometer (Turner Cyclops): The Turner Designs' CYCLOPS-7 Submersible Fluorometer is a single channel detector that can be used for many different applications. It is intended for integration into multi-parameter systems from which it will receive power and deliver a voltage output that is proportional to the concentration of the fluorophore, particle, or compound of interest.
Generic Instrument Description	A reusable instrument that always simultaneously measures conductivity and temperature (for salinity) and pressure (for depth). This term applies to CTDs that are fixed and do not measure by profiling through the water column. For profiling CTDs, see https://www.bco-dmo.org/instrument/417.

Dataset-specific Instrument Name	Turner Designs' CYCLOPS-7 Submersible Fluorometer
Generic Instrument Name	CTD-fluorometer
Dataset-specific Description	Sensors were deployed within the benthic reef system at the listed sites. Calibrations were done on the fluorescence and conductivity sensors using reference materials prior to deployment. The sensors were configured using log at 10 minute intervals with five 5 second burst samples. Sea and Sun Technology CTD 48Mc is a multiparameter probe: 1.Temperature Sensor SST PT100: The temperature sensor is a Pt100 platinum resistor 2. Conductivity sensor (OEM 7-pole conductivity cell): The conductivity sensors consists of 7 electrodes in a cylindrical arrangement. The central electrode is used to impress an alternating current into the water volume. Two pairs of sensing electrodes to the right and left of the central electrode measure the voltage drop across them. The constant potential on the outer electrodes limits the electrical field to the inside of the cylinder and prevents any influence from boundary conditions outside the cell. The conductivity electronic holds the voltage drop across the sensing electrodes on a constant level, while the current is proportional to the actual conductivity value. 3. Fluorometer (Turner Cyclops): The Turner Designs' CYCLOPS-7 Submersible Fluorometer is a single channel detector that can be used for many different applications. It is intended for integration into multi-parameter systems from which it will receive power and deliver a voltage output that is proportional to the concentration of the fluorophore, particle, or compound of interest.
Generic Instrument Description	A CTD-fluorometer is an instrument package designed to measure hydrographic information (pressure, temperature and conductivity) and chlorophyll fluorescence.

Dataset-specific Instrument Name	Temperature Sensor SST PT100
Generic Instrument Name	Pyroscience Pt100 Temperature Probe TSUB21
Dataset-specific Description	Sea and Sun Technology CTD 48Mc is a multiparameter probe: 1.Temperature Sensor SST PT100: The temperature sensor is a Pt100 platinum resistor 2. Conductivity sensor (OEM 7-pole conductivity cell): The conductivity sensors consists of 7 electrodes in a cylindrical arrangement. The central electrode is used to impress an alternating current into the water volume. Two pairs of sensing electrodes to the right and left of the central electrode measure the voltage drop across them. The constant potential on the outer electrodes limits the electrical field to the inside of the cylinder and prevents any influence from boundary conditions outside the cell. The conductivity electronic holds the voltage drop across the sensing electrodes on a constant level, while the current is proportional to the actual conductivity value. 3. Fluorometer (Turner Cyclops): The Turner Designs' CYCLOPS-7 Submersible Fluorometer is a single channel detector that can be used for many different applications. It is intended for integration into multi-parameter systems from which it will receive power and deliver a voltage output that is proportional to the concentration of the fluorophore, particle, or compound of interest.
Generic Instrument Description	The PyroScience TSUB21 sensor is a flexible, Teflon-coated temperature probe that utilizes a Pt100 resistance temperature detector (RTD) element. It can automatically compensate for temperature variations in measurements of other sensors like oxygen and pH sensors.

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Project Information

RAPID: Coral reef stress responses to an urban fire (Reef stress urban fire)

Coverage: Lahaina, Maui, Hawai'i

NSF Award Abstract:
Maui's coral reefs support subsistence, recreational, and commercial fishing, particularly for the large Native Hawaiian population. In August 2023, hurricane winds and low humidity combined with the recent drought to cause an unprecedented fire in Lahaina, an urban coastal town on the island of Maui. The fire quickly burned over 2170 acres and 2200 structures, releasing ash, particulate matter and potentially toxic materials into the adjacent coastal waters. This project provides novel information on the ecological impacts of wildfires to coral reefs to aid in climate change adaptation and emergency response planning. Cultural perspectives and traditional knowledge of Native Hawaiian community members are incorporated throughout the research process. The project directly supports four students, including a Native Hawaiian student, to participate in activities including field work, data collection, analyses and interpretation, and communication of research results.

A wildfire in an urban city located adjacent to a coral reef is unprecedented but may become more common as expanding shoreline development intersects with potentially increased fire risk with climate change. The overall objective of this study is to examine the direct effects of urban wildfires and associated potential stressors - such as reduced water quality, acidification, hypoxia, and heavy metals - on coral reef ecosystem function and the potential for regime shifts favoring benthic algae instead of corals. Using the 2023 Lahaina wildfire as a case study, the project employs a "before-after control-impact" design to compare three west Maui reefs both affected and unaffected by wildfire, with special attention to the anticipated remobilization of organic matter, toxic compounds (e.g., polycyclic aromatic hydrocarbons) and metals following rain events in autumn. Physical and chemical water parameters will constrain the reef-scale carbon cycle and coral metabolism before, during and after runoff events to document the ecological responses to urban fire impacts. This project will support three Early Career Researchers, contribute toward research training for multiple graduate and undergraduate students, and provide valuable information about contaminants and water quality to a community that relies heavily on coral reef resources.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2345201

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