A pCO2 time series from a SAMI-CO2 instrument during an inter-comparison of autonomous in situ instruments for ocean CO2 measurements under laboratory-controlled conditions at Scripps Institution of Oceanography in 2016

Website: https://www.bco-dmo.org/dataset/870390
Data Type: Other Field Results, experimental
Version: 1
Version Date: 2022-03-01

Project
» A new tool for ocean carbon cycle and ocean acidification studies (Bermuda Biochem Timeseries)

Contributors	Affiliation	Role
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Abstract
This dataset contains a pCO2 time series from a SAMI-CO2 instrument with a frequency of 15 min. These data were part of an inter-comparison of autonomous in situ instruments for ocean CO2 measurements under laboratory-controlled conditions at Scripps Institution of Oceanography in August of 2016. These data were published in Shangguan et al. (2022).

Table of Contents

Coverage

Temporal Extent: 2016-08-16 - 2016-08-27

Acquisition Description

An in situ sensor for pCO2 (Sunburst Sensors, LLC; SAMI-CO2) (DeGrandpre et al., 1995) was deployed at a 15-min measurement frequency.

Processing Description

Sensor data was processed by a custom-written Matlab script. MATLAB scripts convert raw data, which are optical intensities or voltages along with temperature and salinity, into their respective carbonate parameters.

BCO-DMO Data Manager Processing Notes:
* Data from source file "2016 SAMI-CO2.xlsx" Sheet1 were imported into the BCO-DMO data system.

* Parameters (column names) renamed to comply with BCO-DMO naming conventions. See https://www.bco-dmo.org/page/bco-dmo-data-processing-conventions

[table of contents | back to top]

Related Publications

DeGrandpre, M. D., Hammar, T. R., Smith, S. P., & Sayles, F. L. (1995). In situ measurements of seawater pCO2. Limnology and Oceanography, 40(5), 969–975. doi:10.4319/lo.1995.40.5.0969
Methods

Shangguan, Q., Prody, A., Wirth, T. S., Briggs, E. M., Martz, T. R., & DeGrandpre, M. D. (2022). An inter-comparison of autonomous in situ instruments for ocean CO2 measurements under laboratory-controlled conditions. Marine Chemistry, 240, 104085. https://doi.org/10.1016/j.marchem.2022.104085
Results

[table of contents | back to top]

Related Datasets

IsRelatedTo

Shangguan, Q., DeGrandpre, M., Martz, T. R. (2022) **A pCO2 time series from a SuperCO2 benchtop instrument during an inter-comparison of autonomous in situ instruments for ocean CO2 measurements under laboratory-controlled conditions at Scripps Institution of Oceanography in 2016.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-03-01 http://lod.bco-dmo.org/id/dataset/870401 [view at BCO-DMO]
Relationship Description: Data from different sensors in the same inter-comparison study of autonomous in situ instruments for ocean CO2 measurements under laboratory-controlled conditions.

Shangguan, Q., DeGrandpre, M., Martz, T. R. (2022) **Bottle sample TA, pH, and DIC collected during an inter-comparison of autonomous in situ instruments for ocean CO2 measurements under laboratory-controlled conditions at Scripps Institution of Oceanography in 2016.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-03-01 http://lod.bco-dmo.org/id/dataset/870368 [view at BCO-DMO]
Relationship Description: Data from different sensors in the same inter-comparison study of autonomous in situ instruments for ocean CO2 measurements under laboratory-controlled conditions.

Shangguan, Q., DeGrandpre, M., Martz, T. R. (2022) **Temperature and salinity by a MicroCAT CTD during an inter-comparison of autonomous in situ instruments for ocean CO2 measurements under laboratory-controlled conditions at Scripps Institution of Oceanography in 2016.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-03-01 http://lod.bco-dmo.org/id/dataset/870412 [view at BCO-DMO]
Relationship Description: Data from different sensors in the same inter-comparison study of autonomous in situ instruments for ocean CO2 measurements under laboratory-controlled conditions.

Shangguan, Q., DeGrandpre, M., Martz, T. R. (2022) **Total alkalinity from SAMI-alks during an inter-comparison of autonomous in situ instruments for ocean CO2 measurements under laboratory-controlled conditions at Scripps Institution of Oceanography in 2016.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-03-01 http://lod.bco-dmo.org/id/dataset/870352 [view at BCO-DMO]
Relationship Description: Data from different sensors in the same inter-comparison study of autonomous in situ instruments for ocean CO2 measurements under laboratory-controlled conditions.

Shangguan, Q., DeGrandpre, M., Martz, T. R. (2022) **pH time-series from SAMI-pH and SeapHOx instruments during an inter-comparison of autonomous in situ instruments for ocean CO2 measurements under laboratory-controlled conditions at Scripps Institution of Oceanography in 2016.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-03-01 http://lod.bco-dmo.org/id/dataset/870379 [view at BCO-DMO]
Relationship Description: Data from different sensors in the same inter-comparison study of autonomous in situ instruments for ocean CO2 measurements under laboratory-controlled conditions.

[table of contents | back to top]

Parameters

Parameter	Description	Units
time	Timestamp with time zone (UTC) in ISO 8601 format YYYY-MM-DDThh:mmZ	unitless
SAMI_CO2	O2 partial pressure from the SAMI-CO2 sensor	microatmospheres (uatm)

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	SAMI-CO2
Generic Instrument Name	pCO2 Sensor
Dataset-specific Description	An in situ sensor for pCO2 (Sunburst Sensors, LLC; SAMI-CO2) (DeGrandpre et al., 1995) was deployed at a 15-min measurement frequency. SAMI=Submersible Autonomous Moored Instrument
Generic Instrument Description	A sensor that measures the partial pressure of CO2 in water (pCO2)

[table of contents | back to top]

Project Information

A new tool for ocean carbon cycle and ocean acidification studies (Bermuda Biochem Timeseries)

Coverage: Bermuda

NSF abstract:
The ocean inorganic carbon system is of great interest to marine scientists, and indeed all people, because it contains important information about ocean productivity, the sources and sinks of anthropogenic carbon dioxide, and ocean acidification. Total alkalinity is one of the critical inorganic carbon parameters and has been widely measured through ship and laboratory-based methodologies. At this time, there are no commercially-available in situ sensors for total alkalinity. In this project, researchers at the University of Montana will further develop and test a new autonomous system, known as the SAMI-alk, for measuring total alkalinity. This new system will expand understanding of total alkalinity and the inorganic carbon cycle by making near continuous measurements in locations not frequented by ships. The development of this instrument will have important broader implications for the oceanographic community and ocean acidification research by providing a novel instrument for ocean research. This project will also provide training opportunities to graduate and undergraduate students, and will continue to support public outreach on ocean acidification through a university-affiliated museum.

Studies focused on the marine carbon cycle and ocean acidification pose a number of measurement challenges. While pH is the ocean acidification "smoking gun" and partial pressure of CO2 is critical for gas

exchange calculations, the full inorganic carbon system must be quantified for most inorganic carbon studies. Using autonomous sensors to accurately and precisely quantify all of the inorganic carbon species has been a long-standing objective for marine biogeochemists, but full characterization of the inorganic carbon system has, until recently, been limited to ship and laboratory-based measurements. Total alkalinity is one such parameter as its research has been limited by the lack of instrument capable of making in situ measurements. This research will address this problem and advance inorganic carbon studies through the further development of an autonomous, in situ system to measure seawater total alkalinity, known as the submersible autonomous moored instrument for total alkalinity (SAMI-alk). Preliminary testing of the instrument showed great promise, and through this project, researchers will conduct lab experiments to improve its performance. Two new prototype instruments will be tested in laboratory and field evaluations.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1459255

[table of contents | back to top]