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

Website: https://www.bco-dmo.org/dataset/870352
Data Type: experimental, Other Field Results
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 total alkalinity (TA) time-series measured by three identically designed SAMI-alks (Submersible Autonomous Moored Instrument for Alkalinity). Data was recorded at 1-hour intervals. 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).

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Coverage

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

Methods & Sampling

This study used three SAMI-alks with measurement frequency at 1-hour intervals. See references for technical details of the instrument (Shangguan et al., 2022).

Data Processing Description

SAMI-alk data was processed by a custom-made 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 AT sensor.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

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Data Files

File
sami_alk_2016.csv (Comma Separated Values (.csv), 9.22 KB) MD5:9526616fa9c8a719c2db14660f4209cd Primary data file for dataset ID 870352

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Related Publications

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

Spaulding, R. S., DeGrandpre, M. D., Beck, J. C., Hart, R. D., Peterson, B., De Carlo, E. H., Drupp, P. S., & Hammar, T. R. (2014). Autonomous in Situ Measurements of Seawater Alkalinity. Environmental Science & Technology, 48(16), 9573–9581. https://doi.org/10.1021/es501615x
Methods

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Related Datasets

IsRelatedTo

Shangguan, Q., DeGrandpre, M., Martz, T. R. (2022) **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.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-03-01 doi:10.26008/1912/bco-dmo.870390.1 [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) **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 doi:10.26008/1912/bco-dmo.870401.1 [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 doi:10.26008/1912/bco-dmo.870368.1 [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 doi:10.26008/1912/bco-dmo.870412.1 [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 doi:10.26008/1912/bco-dmo.870379.1 [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.

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Parameters

Parameter	Description	Units
time	Timestamp with time zone (UTC) in ISO 8601 format YYYY-MM-DDThh:mmZ	unitless
SAMI_alk_00	Total alkalinity from the SAMI-alk sensor<serial number 00>	micromoles per kilogram (umol/kg)
SAMI_alk_01	Total alkalinity from the SAMI-alk sensor<serial number 01>	micromoles per kilogram (umol/kg)
SAMI_alk_02	Total alkalinity from the SAMI-alk sensor<serial number 02>	micromoles per kilogram (umol/kg)

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Instruments

Dataset-specific Instrument Name	SAMI-alk
Generic Instrument Name	Submersible Autonomous Moored Instrument
Dataset-specific Description	AT time-series measured by three identically designed SAMI-alks (Submersible Autonomous Moored Instrument for Alkalinity). Data is recorded at 1-hour interval.
Generic Instrument Description	The Submersible Autonomous Moored Instrument (SAMI) measures and logs levels of dissolved chemicals in sea and fresh water. It is a plastic cylinder about 6 inches wide and 2 feet long that is self-powered and capable of hourly measurements for up to one year. All data collected are logged to an internal memory chip to be downloaded later. SAMI sensors usually are placed a few feet underwater on permanent moorings, while others on floating drifters sample the water wherever the wind and currents carry them. The instruments have been used by researchers around the globe in a variety of studies since 1999. Dr. Mike DeGrandpre, University of Montana, developed the SAMI between 1990 and 1993 during his postdoctoral work at the Woods Hole Oceanographic Institution (Woods Hole, MA, USA). For additional information, see URL: http://www.sunburstsensors.com/ from the manufacturer, Sunburst Sensors, LLC, 1226 West Broadway, Missoula, MT 59802.

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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.

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Funding

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

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