SAMI-CO2, SAMI-pH, temperature and dissolved oxygen from multiple moorings near Media Luna Reef, Puerto Rico from 2007-2008 (DOGEE-II project, NH10_ShelfBreak_MLR project)

Website: https://www.bco-dmo.org/dataset/632551
Version: 12 January 2012
Version Date: 2016-01-12

Project
» Collaborative Research: Near-Surface controls of Air-Sea CO2 Exchange: A Contribution to the UK-SOLAS "Deep Ocean Gas Exchange Experiment" (DOGEE-II)
» Collaborative Research: Autonomous pH and Alkalinity Sensors: in situ Testing and Carbon Cycle Research (NH10_ShelfBreak_MLR)

Program
» UK Surface Ocean - Lower Atmosphere Study (UK SOLAS)

Contributors	Affiliation	Role
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Dataset Description

SAMI-CO2, SAMI-pH, temperature and dissolved O2 data from Media Luna Reef, Puerto Rico

Media Luna Reef, NOAA CREWS buoy

Locations:
Reef Head: 17.9381N, 67.0403W, depth of 4m
Reef Tail (#2):17.9386N, 67.0519W, depth of 5m
Reef Tail (#3): 17.9353N, 67.0483W, depth of 4m

Methods & Sampling

The SAMIs sampled on a 30 minute interval. The SAMI-CO2 ran a non-absorbing blank measurement every 3.5 days. Oxygen was measured with a calibrated Aanderaa 4175 optode attached to a SAMI.

Related files and references:
Gray, S. E. C., M. D. DeGrandpre, C. Langdon, *and* J. E. Corredor *(2012), Short-term and seasonal pH, pCO_2 and saturation state variability in a coral-reef ecosystem, Global Biogeochem. Cycles, 26, GB3012.*

Data Processing Description

Data Processing:
See DeGrandpre et al. (1995)

BCO-DMO Processing Notes
- Generated from the following list of original .xlsx files contributed by Cory Beatty
Media Luna Reef_Fall_SAMI-CO2 & pH & O2.xlsx
Media Luna Reef_Summer_SAMI-CO2 & pH.xlsx
Media Luna Reef_Winter_SAMI-CO2 & pH & O2.xlsx
- Parameter names edited to conform to BCO-DMO naming convention found at Choosing Parameter Name
- Params added to some datasets for compatibility
- If not reported, aded params assigned "NaN" values
- Date reformatted to YYYYMMDD
- Time reformatted to HHMMSS

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Data Files

File
MediaLunaReef.csv (Comma Separated Values (.csv), 1.30 MB) MD5:874a1a0ca729e148e976e2332dbeb3e3 Primary data file for dataset ID 632551

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Parameters

Parameter	Description	Units
Site	Site	text
Deployment	Deployment Id	text
Latitude	Latitude of Deployment (South is negative)	decimal degrees
Longitude	Longitude of Deployment (West is negative)	decimal degrees
Excel_Date	Excel Date	xxxxx.xxxx
Year_Day	Jan 1 = YD1	xxx.xxxx
Date	Date (UTC)	YYYYMMDD
Time	Time (UTC)	HHMMSS
Temp_head	Temperature at the reef head	oC
pH_head	pH at the reef head	pH Units
pCO2_head	Partial Pressure of Carbon Dioxide at the reef head	uatm
O2_head	Dissolved O2 at the reef head	percent saturation
Temp_tail	Temperature at the reef tail	oC
pH_tail	pH at the reef tail	pH Units
pCO2_tail	Partial Pressure of Carbon Dioxide at the reef tail	uatm
O2_tail	Dissolved O2 at the reef tail	percent saturation

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Instruments

Dataset-specific Instrument Name	Aanderaa 4175 optode
Generic Instrument Name	Aanderaa Oxygen Optodes
Dataset-specific Description	Oxygen was measured with a calibrated Aanderaa 4175 optode attached to a SAMI.
Generic Instrument Description	Aanderaa Oxygen Optodes are instrument for monitoring oxygen in the environment. For instrument information see the Aanderaa Oxygen Optodes Product Brochure.

Dataset-specific Instrument Name	SAMI-CO2 pCO2
Generic Instrument Name	pCO2 Sensor
Dataset-specific Description	SAMI-CO2 pCO2 and Temperature mooring time series data collected on the Buzzards Bay mooring
Generic Instrument Description	A sensor that measures the partial pressure of CO2 in water (pCO2)

Dataset-specific Instrument Name	SAMI-CO2 pCO2
Generic Instrument Name	Submersible Autonomous Moored Instrument
Dataset-specific Description	SAMI-CO2 pCO2 and Temperature mooring time series data collected on the Buzzards Bay mooring
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.

Dataset-specific Instrument Name	SAMI-CO2 pCO2 and Temperature
Generic Instrument Name	Water Temperature Sensor
Dataset-specific Description	SAMI-CO2 pCO2 and Temperature mooring time series data collected on the Buzzards Bay mooring
Generic Instrument Description	General term for an instrument that measures the temperature of the water with which it is in contact (thermometer).

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Deployments

MediaLunaReef_Fall_SAMI-CO2_pH_O2

Website	https://www.bco-dmo.org/deployment/632568
Platform	NDBCLPRP4 - Media Luna Reef
Start Date	2008-09-16
End Date	2008-11-21

MediaLunaReef_Summer_SAMI-CO2_pH

Website	https://www.bco-dmo.org/deployment/632574
Platform	NDBCLPRP4 - Media Luna Reef
Start Date	2007-06-19
End Date	2007-08-21

MediaLunaReef_Winter_SAMI-CO2_pH_O2

Website	https://www.bco-dmo.org/deployment/632571
Platform	NDBCLPRP4 - Media Luna Reef
Start Date	2008-01-07
End Date	2008-03-14

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Project Information

Collaborative Research: Near-Surface controls of Air-Sea CO2 Exchange: A Contribution to the UK-SOLAS "Deep Ocean Gas Exchange Experiment" (DOGEE-II)

Coverage: North East Atlantic Ocean (limit 40W), Atlantic west of Iberian Peninsula and Ireland

The problem of quantifying the rate of gas flux across the air-water interface is one of the central questions of oceanography and is critical in the context of greenhouse gases and ocean-atmosphere budgets. The large uncertainty surrounding the flux of carbon dioxide (CO2) between the atmosphere and ocean prevent us from determining the partitioning of the sink of anthropogenic CO2 between the ocean and the terrestrial biosphere. This uncertainty also limits the ability to realistically model future atmospheric CO2 levels. The International SOLAS (Surface Ocean - Lower Atmosphere Study) science plan and implementation strategy highlights the need for an improved understanding of gas exchange. One of the stated goal of the SOLAS program to develop quantitative understanding of processes responsible for air-sea exchange of mass, momentum and energy to permit accurate calculation of regional and global gas and aerosol fluxes. This requires establishing the dependence of these interfacial transfer mechanisms on physical, biological and chemical factors within the atmospheric and oceanic boundary layers.

The investigator in this project will participate in the recently funded UK-SOLAS "Deep Ocean Gas Exchange Experiment", DOGEE. As part of this field experiment, two deliberate dual tracer patches will be released in close proximity to each other in the North Atlantic. One will be "labeled" with a surfactant in order to mimic the role of surface organic slicks in modifying gas transfer. The funded UK ship-based efforts will be enhanced with high resolution Lagrangian measurements of the air-sea interface. Specifically two Air-Sea Interaction Spar (ASIS) buoys, one in each patch, will be deployed to measure direct fluxes along with controlling surface physical processes (wind speed, wind stress, stability, surface waves, upper ocean turbulence and mixing, and key parameters governing mixed layer CO2 dynamics). In addition, a newly developed Air-Sea Interaction Profiler will be deployed to provide thermal and shear measurements in the very near surface. With these measurements, gas transfer process related specifically to surfactant effects, and to high wind processes will be better understood.

Broader impacts: The current lack of an adequate parameterization of air-sea gas transfer rates contributes directly to our inability to predict with certainty future concentrations of CO2 and other climate relevant compounds in the atmosphere. This project will improve the accuracy of the global ocean carbon dioxide flux estimates and increase our understanding of the causes of its variability. Another broader impact is that this proposal establishes an international collaboration between research institutes in the US (RSMAS/U. Montana/ODU) and the UK. The proposed measurements employ state-of-the-art instrumentation, which will enhance the DOGEE experiment. The opportunity to participate in this experiment, and access to the data for subsequent analysis will provide for a unique dataset with which to increase our understanding of the role of air-sea CO2 exchange in influencing climate. The project will involve students as undergraduate and post-graduate research assistants. The University of Miami is a Hispanic Serving Institution and thereby fosters the participation of under-represented groups in science and engineering. The data will be made available through several data bases via WWW. The project will contribute to the active outreach activities coordinated through the RSMAS Dean's Office.

This project is a contribution to the international SOLAS program.

PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH

Note: *When clicking on a Digital Object Identifier (DOI) number, you will be taken to an external site maintained by the publisher. Some full text articles may not yet be available without a charge during the embargo (administrative interval).*

Some links on this page may take you to non-federal websites. Their policies may differ from this site.

Brooks, I.M. et al. (M.D. DeGrandpre 12th of 54 authors in alphabetical order). "Physical exchanges at the air-sea interface: UK-SOLAS field measurements," *Bulletin of the American Meteoroligical Society*, v.90, 2009, p. 629. doi:10.1175/2008BAMS2578.1

Byrne, R.H., DeGrandpre, M.D., Short, R.T., Martz, T.R., Merlivat, L., McNeil, C., Sayles, F.L., Bell, R. and P. Fietzek. "Sensors and systems for observation of marine CO2 system variables," *roceedings of OceanObsâ?? 09: Sustained Ocean Observations and Information for Society (Vol. 2)*, v.2, 2010. doi:doi:10.5270/OceanObs09.cwp.13

Turk, D. Malacic, V., DeGrandpre, M.D. and W. R. McGillis. "Carbon dioxide variability and air-sea fluxes in the northern Adriatic Sea," *Journal of Geophysical Research*, v.115, 2010. doi:doi:10.1029/2009JC006034

Edson, JB; Degrandpre, MD; Frew, N; McGillis, WR. "Investigations of Air-Sea Gas Exchange in the CoOP Coastal Air-Sea Chemical Exchange Project," *OCEANOGRAPHY*, v.21, 2008, p. 34. View record at Web of Science

Collaborative Research: Autonomous pH and Alkalinity Sensors: in situ Testing and Carbon Cycle Research (NH10_ShelfBreak_MLR)

Coverage: Coastal ocean waters off the U.S. central west coast, and a shallow coral ecosystem in Puerto Rico

The earth's carbon cycle has been dramatically altered by global human industrialization. The movement of carbon from ancient fossil deposits to the atmosphere and into marine and terrestrial biospheres has many consequences, few of which are currently fully understood or predictable. Much of the needed understanding of the carbon cycle may come from better observational methods that can characterize large spans of time or space. One group of observational methods, autonomous sensors, can provide high temporal resolution data within air, earth or water systems. In this research, PIs from the University of Montana, Oregon State University and University of Miami will develop and use autonomous sensors to advance our understanding of carbon cycling within the earth's biosphere. With prior support, they have developed sensors for the partial pressure of CO2 (pCO2), pH and total alkalinity that can be used to quantify the amount of dissolved inorganic carbon through thermodynamic relationships. The more recently developed, currently laboratory-based sensors (pH and alkalinity) will be further refined for subsequent deployment, along with the more mature pCO2 sensor, in two contrasting marine environments; the coastal ocean waters off the U.S. central west coast, and a shallow coral ecosystem in Puerto Rico. Field studies will begin with a short, in situ test off Oregon State University's pier in Newport, Oregon followed by deployment on the Oregon shelf to study the processes that control air-sea carbon dioxide fluxes during periods of coastal upwelling. Concurrently, the same sensors will be deployed in La Parguera Marine Reserve, Puerto Rico, a Coral Reef Early Warning System (CREWS) site operated by NOAA to focus on the relationship of calcium carbonate saturation states to calcification rates in a

coral reef ecosystem.

The project will have a number of broad impacts including the technological development of rigorously tested sensors that will have a wide range of applications in marine and freshwater research. Students will be trained in the area of chemical sensor development who will subsequently become the next generation of leaders in this important research area. Outreach activities related to the grant will create awareness for contemporary carbon cycle issues such as greenhouse gas warming and ocean acidification.

PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH
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Hamme, R.C., Webley, P.W., Crawford, W.R., Whitney, F.A., DeGrandpre, M.D., Emerson, S.R., Eriksen, C.C., Giesbrecht, K.E., Gower, J.F.R., Kavanaugh, M.T., PeÃ±a, M.A., Sabine, C.L., Batten, S.D., Coogan, L.A., Grundle, D.S., and D. Lockwood. "Volcanic ash fuels anomalous plankton bloom in subarctic Northeast Pacific," *Geophysical Research Letters*, v.37, 2010, p. L19604. doi:10.1029/2010GL044629

Byrne, R.H., DeGrandpre, M.D., Short, R.T., Martz, T.R., Merlivat, L., McNeil, C., Sayles, F.L., Bell, R. and P. Fietzek. "Sensors and systems for observation of marine CO2 system variables," *Proceedings for Ocean Obs â??09*, 2010.

BOOKS/ONE TIME PROCEEDING
Cullison, S.E.. "MARINE APPLICATIONS OF AN
AUTONOMOUS INDICATOR-BASED pH
SENSOR", 10/01/2009-09/30/2010, 2010, "The University of Montana".

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Program Information

UK Surface Ocean - Lower Atmosphere Study (UK SOLAS)

Website: http://www.bodc.ac.uk/projects/uk/uksolas/

Coverage: Global

The UK Surface Ocean - Lower Atmosphere Study (UK SOLAS) was devised to examine the interaction between the atmosphere and ocean. The focus was on chemical exchanges that affect marine productivity and climate. UK SOLAS was the UK's contribution to the international SOLAS programme. UK SOLAS data are managed by the UK SOLAS Data Centre (SDC), co-ordinated by the British Oceanographic Data Centre (BODC) in collaboration with the British Atmospheric Data Centre (BADC). Follow the links below, or on the side menu bar to find out more

UK SOLAS Final Report (.pdf)

International SOLAS Web site

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0628569
NSF Division of Ocean Sciences (NSF OCE)	OCE-0623294

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