SAMI-CO2 data from MAPCO2 buoy deployed on NOAA Ship Ronald H. Brown cruise RB-08-02 in the Southwest Atlantic sector of the Southern Ocean near South Georgia Island in 2008 (SO_GasEx project)

Website: https://www.bco-dmo.org/dataset/3289
Version: 06 Jan 2010
Version Date: 2010-01-06

Project
» Southern Ocean Gas Exchange Experiment (SO_GasEx)

Programs
» Ocean Carbon and Biogeochemistry (OCB)
» United States Surface Ocean Lower Atmosphere Study (U.S. SOLAS)

Contributors	Affiliation	Role
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Table of Contents

Dataset Description

SO-GasEx MAPCO2 Buoy - SAMI-CO2 data
CO2, pH, O2, and temperature data sets collected by SAMI-CO2
and SAMI-pH sensors on the MAPCO2 buoy at 6 depths.

Methods & Sampling

For MAPCO2 Buoy Information See: SO-GasEx cruise report, Section 5.5.1 pgs 30-33

Parameter names, definitions and units:
pCO2 - Partial pressure of CO2 in seawater, units in µatm.
O2 - Dissolved oxygen, units in µmol kg-1.

Sampling and Analytical Methodology:
Data were collected by SAMI-CO2 sensors equipped with Aanderaa model 4175 oxygen optodes mounted at 5, 19, 34.5, 50, 75, 105 m depth. All sensors were calibrated in the lab prior to deployment. Blank solutions, used to detect drift in the CO2 measurements, were run every 3.5 days. The SAMI-CO2 sensor has an accuracy 1 ±1 µatm, the optodes have an accuracy of 5% (15 µmol kg-1 at an in situ O2 concentration of 300 µmol kg-1).

CO2 and O2 data were collected every half hour, and CO2 data were found to have good agreement with

shipboard data after a 4 µatm was applied, and O2 data agreed well with discrete Winkler titrations (typically within 1 µmol kg-1). pH data was collected every hour, and interpolated to half hour intervals. The SAMI-pH sensor has an accuracy of 0.001 ± 0.0007 pH units.

The buoy was initially deployed on March 8, 2008 in a SF6/3He tracer patch, and was recovered on March 12, 2008 after it was observed to be riding too low in the water. The buoy was reconfigured, and redeployed on March 13, 2008. After the first deployment of the MapCO2 buoy the 105 m SAMI was moved up to 96 m. The ship was forced to leave the study area after the second buoy deployment due to a severe storm, and when it returned the tracer patch was dispersed. The buoy was recovered, a new tracer patch was put in place, and the buoy was deployed a third time on March 22, 2008. On March 26, 2008 the tracer patch split and the buoy, along with a small tracer patch, moved away from the main tracer patch, and was recovered on March 31, 2008.

Data Processing:
CO2 data were corrected for blank solutions, and missing data points due to the running of the blanks were replaced via linear interpolation. For quality control all data were compared to shipboard measurements when they were available (i.e. the ship was in the indicator patch).

Related files and references:
DeGrandpre, M.D., T.R. Hammar, S.P. Smith, and F.L. Sayles. 1995. In situ measurements of seawater pCO2. Limnol. Oceanogr. 40: 969-975.
http://www.aadi.no/Aanderaa/Document%20Library/1/Data%20Sheets/Oxygen%20Optodes_3.pdf

Data Processing Description

For MAPCO2 Buoy Information See: SO-GasEx cruise report, Section 5.5.1 pgs 30-33

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BCO-DMO Processing Notes
- Generated from original file CO2_O2_T_data.xls

BCO-DMO Edits
- DeploymentId added to each data record as Deployment_1, etc.
- single date/time field converted to separate fields and formatted to BCO-DMO convention
- 'NaN's and any blank fields changed to 'nd' (no data)
- data parameter names reformatted to BCO-DMO convention and depth added to each

[table of contents | back to top]

Data Files

File
MAPCO2_SAMI.csv (Comma Separated Values (.csv), 115.36 KB) MD5:04cda4a75447fff41c82b79945955341 Primary data file for dataset ID 3289

[table of contents | back to top]

Parameters

Parameter	Description	Units
DeploymentId	MAPCO2 Buoy Deployment Id	text
date	Date (UTC)	YYYYMMDD
time	Time (UTC)	HHMM
lon	buoy longitude position in decimal degrees (West is negative)	decimal degrees
lat	buoy latitude position in decimal degrees (South is negative)	decimal degrees
Temp_5m	Temperature from sensors mounted at 5meters depth	degrees celsius
pCO2_5m	Partial pressure of CO2 in seawater from sensors mounted at 5meters depth	microatm
O2_5m	Dissolved oxygen from sensors mounted at 5meters depth	micromol/kg
Temp_34point5m	Temperature from sensors mounted at 34.5meters depth	degrees celsius
pCO2_34point5m	Partial pressure of CO2 in seawater from sensors mounted at 34.5meters depth	microatm
O2_34point5m	Dissolved oxygen from sensors mounted at 34.5meters depth	micromol/kg
Temp_50m	Temperature from sensors mounted at 50meters depth	degrees celsius
pCO2_50m	Partial pressure of CO2 in seawater from sensors mounted at 50meters depth	microatm
O2_50m	Dissolved oxygen from sensors mounted at 50meters depth	micromol/kg
Temp_75m	Temperature from sensors mounted at 75meters depth	degrees celsius
pCO2_75m	Partial pressure of CO2 in seawater from sensors mounted at 75meters depth	microatm
O2_75m	Dissolved oxygen from sensors mounted at 75meters depth	micromol/kg
Temp_105m_96m	Temperature from sensors mounted at 105meters or 96meters depths	degrees celsius
pCO2_105m_96m	Partial pressure of CO2 in seawater from sensors mounted at 105meters or 96meters depths	microatm
O2_105m_96m	Dissolved oxygen from sensors mounted at 105meters or 96meters depths	micromol/kg
Temp_1m	Temperature at 1meter depth	degrees celsius
pH_1m	pH at 1meter depth	pH (sea water scale)

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Aanderaa Oxygen Optodes
Generic Instrument Name	Aanderaa Oxygen Optodes
Dataset-specific Description	Model 4175
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	MAPCO2 Drifting Buoy
Generic Instrument Name	MAPCO2 Drifting Buoy
Dataset-specific Description	For SO-GasEx MAPCO2 Buoy Configuration See: SO-GasEx MAPCO2 Metadata Report
Generic Instrument Description	The Moored Autonomous pCO2 (MAPCO2) surface drifting buoy designed by NOAA/PMEL is a low profile, high payload buoy. It was used in the SO GasEx project as a drogued drifter instrumented with a variety of autonomous instruments capable of making a coordinated set of physical, geochemical, and biological measurements at high temporal resolutions. These measurements provide a key component in the study of processes controlling air-sea CO2 exchange.

Dataset-specific Instrument Name	Submersible Autonomous Moored Instrument
Generic Instrument Name	Submersible Autonomous Moored Instrument
Dataset-specific Description	Sampling and Analytical Methodology: Data were collected by SAMI-CO2 sensors equipped with Aanderaa model 4175 oxygen optodes mounted at 5, 19, 34.5, 50, 75, 105 m depth. All sensors were calibrated in the lab prior to deployment. Blank solutions, used to detect drift in the CO2 measurements, were run every 3.5 days. The SAMI-CO2 sensor has an accuracy 1 ±1 µatm, the optodes have an accuracy of 5% (15 µmol kg-1 at an in situ O2 concentration of 300 µmol kg-1). CO2 and O2 data were collected every half hour, and CO2 data were found to have good agreement with shipboard data after a 4 µatm was applied, and O2 data agreed well with discrete Winkler titrations (typically within 1 µmol kg-1). pH data was collected every hour, and interpolated to half hour intervals. The SAMI-pH sensor has an accuracy of 0.001 ± 0.0007 pH units.
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.

[table of contents | back to top]

Deployments

RB-08-02

Website	https://www.bco-dmo.org/deployment/57846
Platform	NOAA Ship Ronald H. Brown
Report	http://bcodata.whoi.edu/SO-GasEx/SO_GasEx_Cruise_Report.pdf
Start Date	2008-02-29
End Date	2008-04-12
Description	The Southern Ocean GasEx experiment was conducted aboard the NOAA ship Ronald H. Brown with 31 scientists representing 22 institutions, companies and government labs. The cruise departed Punta Arenas, Chile on 29 February, 2008 and transited approximately 5 days to the nominal study region at 50°S, 40°W in the Atlantic sector of the Southern Ocean. The scientific work concentrated on quantifying gas transfer velocities using deliberately injected tracers, measuring CO2 and DMS fluxes directly in the marine air boundary layer, and elucidating the physical, chemical, and biological processes controlling air-sea fluxes with measurements in the upper-ocean and marine air. The oceanic studies used a Lagrangian approach to study the evolution of chemical and biological properties over the course of the experiment using shipboard and autonomous drifting instruments. The first tracer patch was created and studied for approximately 6 days before the ship was diverted from the study site, 350 miles to the south, to wait near South Georgia Island for calmer seas. After more than 4 days away, we returned to the study area and managed to find some remnants of the tracer patch. After collecting one final set of water column samples and recovering the two drifting buoys deployed with the patch, we relocated to the northwest, closer to the area where the first patch was started. A second tracer patch was created and studied for approximately 15 days before we had to break off the experiment and transit to Montevideo, Uruguay for the completion of the cruise.

[table of contents | back to top]

Project Information

Southern Ocean Gas Exchange Experiment (SO_GasEx)

Website: http://so-gasex.org/

Coverage: Southwest Atlantic sector of the Southern Ocean (nominally at 50°S, 40°W, near South Georgia Island)

The Southern Ocean Gas Exchange Experiment (SO-GasEx; also known as GasEx III) took place in the Southwest Atlantic sector of the Southern Ocean (nominally at 50°S, 40°W, near South Georgia Island) in austral fall of 2008 (February 29-April 12, 2008) on the NOAA ship *Ronald H. Brown*. SO-GasEX is funded by NOAA, NSF and NASA.

The research objectives for Southern Ocean GasEx are to answer the following questions:

- What are the gas transfer velocities at high winds?
- What is the effect of fetch on the gas transfer?
- How do other non-direct wind effects influence gas transfer?
- How do changing pCO2 and DMS levels affect the air-sea CO2 and DMS flux, respectively in the same locale?
- Are there better predictors of gas exchange in the Southern Ocean other than wind?
- What is the near surface horizontal and vertical variability in turbulence, pCO2, and other relevant biochemical and physical parameters?
- How do biological processes influence pCO2 and gas exchange?
- Do the different disparate estimates of fluxes agree, and if not why?
- With the results from Southern Ocean GasEx, can we reconcile the current discrepancy between model based CO2 flux estimates and observation based estimates?

Related files

SO-GasEx cruise report
SO-GasEx Science Plan
SO-GasEx Implementation Plan

The SO-GasEx cruise report and Science and Implementation plans, may also be available at the SO-GasEx science Web page.

[table of contents | back to top]

Program Information

Ocean Carbon and Biogeochemistry (OCB)

Website: http://us-ocb.org/

Coverage: Global

The Ocean Carbon and Biogeochemistry (OCB) program focuses on the ocean's role as a component of the global Earth system, bringing together research in geochemistry, ocean physics, and ecology that inform on and advance our understanding of ocean biogeochemistry. The overall program goals are to promote, plan, and coordinate collaborative, multidisciplinary research opportunities within the U.S. research community and with international partners. Important OCB-related activities currently include: the Ocean Carbon and Climate Change (OCCC) and the North American Carbon Program (NACP); U.S. contributions to IMBER, SOLAS, CARBOOCEAN; and numerous U.S. single-investigator and medium-size research projects funded by U.S. federal agencies including NASA, NOAA, and NSF.

The scientific mission of OCB is to study the evolving role of the ocean in the global carbon cycle, in the face of environmental variability and change through studies of marine biogeochemical cycles and associated ecosystems.

The overarching OCB science themes include improved understanding and prediction of: 1) oceanic uptake and release of atmospheric CO2 and other greenhouse gases and 2) environmental sensitivities of biogeochemical cycles, marine ecosystems, and interactions between the two.

The OCB Research Priorities (updated January 2012) include: ocean acidification; terrestrial/coastal carbon fluxes and exchanges; climate sensitivities of and change in ecosystem structure and associated impacts on biogeochemical cycles; mesopelagic ecological and biogeochemical interactions; benthic-pelagic feedbacks on biogeochemical cycles; ocean carbon uptake and storage; and expanding low-oxygen conditions in the coastal and open oceans.

United States Surface Ocean Lower Atmosphere Study (U.S. SOLAS)

Website: http://www.us-solas.org/

Coverage: Global

The Surface Ocean Lower Atmosphere Study (SOLAS) program is designed to enable researchers from different disciplines to interact and investigate the multitude of processes and interactions between the coupled ocean and atmosphere.

Oceanographers and atmospheric scientists are working together to improve understanding of the fate, transport, and feedbacks of climate relevant compounds, and also weather and hazards that are affected by processes at the surface ocean.

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Physical, chemical, and biological research near the ocean-atmosphere interface must be performed in synergy to extend our current knowledge to adequately understand and forecast changes on short and long time frames and over local and global spatial scales.

The findings obtained from SOLAS are used to improve knowledge at process scale that will lead to better quantification of fluxes of climate relevant compounds such as CO2, sulfur and nitrogen compounds, hydrocarbons and halocarbons, as well as dust, energy and momentum. This activity facilitates a fundamental understanding to assist the societal needs for climate change, environmental health, weather prediction, and national security.

The US SOLAS program is a component of the International SOLAS program where collaborations are forged with investigators around the world to examine SOLAS issues ubiquitous to the world's oceans and atmosphere.

Â» International SOLAS Web site

Science Implementation Strategy Reports

US-SOLAS (4 MB PDF file)
Other SOLAS reports are available for download from the US SOLAS Web site

[table of contents | back to top]

Funding

Funding Source	Award
National Oceanic and Atmospheric Administration (NOAA)	unknown SO_GasEx NOAA
National Aeronautics & Space Administration (NASA)	unknown SO_GasEx NASA
National Science Foundation (NSF)	unknown SO_GasEx NSF

[table of contents | back to top]