Oxygen from underway system from 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/3139
Version: 26 July 2010
Version Date: 2009-06-19

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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Dataset Description

SO-GasEx Final Discrete Oxygen Data from underway system analyzed by Winkler Titration

Methods & Sampling

Operation description:
Discrete analysis of dissolved oxygen on ship's underway seawater line.

Sampling times and locations:
Sampled all CTD casts where Niskin bottles were tripped and two pumped casts.
One deep cast to 4600m, three mid-depth casts to 1500m, other casts usually to 500m or 100m.
See CTD cast logs and bottle files for specific times, locations, and flask numbers for each cast.

Overall sampling strategy:
Normally collected one sample from each unique depth.
If multiple Niskins were tripped at a given depth, hydrography sampled only one of these.
Duplicate samples collected on two Niskins per cast, usually near the O2 minimum and just under the mixed layer.
A mixture of triplicates and duplicates were collected from the underway seawater line.

Sample collection:
Roberta Hamme collected most of the oxygen samples.
However, on casts where noble gas samples or a profile of O2/N2/Ar samples were collected, Sarah Purkey collected the discrete oxygen samples.
No difference in precision was detected between the two samplers, as measured by the standard deviation of duplicate samples.

Data Processing Description

Analytical method:
Winkler titration method using Langdon amperometric detection of the endpoint.
Samples preserved with 1 mL each of MnCl2 and NaI-NaOH solutions.
Shaken twice and stored in dark with tap water around caps to form seal.
Precipitate dissolved with 1mL H2SO4 solution and titrated with thiosulfate solution.
Endpoint is detected via electrode current that is related to concentration of I3-.
Normally run within 24 hours, but some samples from underway system sat for 2-3 days.
3-5 KIO3 standards run at beginning of each day running samples.
Blanks run in distilled water used for calculations.
Seawater blanks required 2-2.5 uL more titrant than distilled water blanks.

Calculations:
Final dataset calculated using distilled water blanks in keeping with official WOCE methodology.
High quality seawater blanks were determined on this cruise.
Data is likely of higher accuracy when calculated with seawater blanks.
To convert distilled blank numbers to seawater blank numbers, simply subtract 0.530 umol/kg (micromol/kg).
Saturations calculated relative to Garcia and Gordon (1992,1993) with no correction for atmospheric pressure variations.

BCO-DMO Processing Notes
- Generated from original file Winkler_SOGasEx_Underway.csv

BCO-DMO Edits
- date reformatted to YYYYMMDD
- Time reformatted to HHMM
- lon/lat padded to 3 decimal places
- Column headers/parameter names edited to conform to BCO-DMO convention (blanks replaced with underscores or eliminated)
- blank fields changed to 'nd'
- decimal places padded as appropriate for consistency

Comments from original text file - Winkler_SOGasEx_Underway.csv
Final Discrete Oxygen Data from underway system analyzed by Winkler Titration. SOGasEx cruise. Feb 29-April 11, 2008 aboard R/V Ron Brown.
This data is calculated with a distilled water blank. To obtain values calculated with a seawater blank, subtract 0.530 umol/kg.
Flag = 2 means good; Flag = 3 means questionable (unexplained high std dev); Flag = 4 means bad (see metadata file for explanation).

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Data Files

File	
O2_Underway.csv	(Comma Separated Values (.csv), 6.71 KB) MD5:3f32277362389eaa86381183b3b53837
Primary data file for dataset ID 3139	

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Parameters

Parameter	Description	Units
time	Time UTC	HHMM
date	Date UTC	YYYYMMDD
lat	latitude, negative denotes South	decimal degrees
lon	longitude, negative denotes West	decimal degrees
event	Unique event number	YDAHHMM
Flag	Data quality flag Flag = 2 means good; Flag = 4 means bad	integer
Draw_T	Draw Temperature	degrees Celsius
O2_conc	O2 concentration	micro moles/kilogram
O2_sat	Percentage of O2 saturation	dimensionless
Std_dev	Standard of deviation	micro moles/kilogram
Sampling_Location	Description of sampling location on the vessel	text
Ships_T	Ship's Temperature (seawater??)	degrees Celsius
pCO2_Salinity	pCO2 salinity	dimensionless
corrected_Salinity	Corrected Salinity	dimensionless

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Instruments

Dataset-specific Instrument Name	Langdon Oyxgen Titrator
Generic Instrument Name	Oyxgen Titrator -Langdon
Generic Instrument Description	A Langdon Oyxgen Titrator is an amperometric oxygen titration system developed to measure dissolved oxygen in seawater. The device uses a conventional polarographic electrode in connection with chronoamperometry to overcome many of the problems limiting the performance of oxygen electrodes. Reproducibility is typically better than +/- 0.8 micromolar and essentially drift-free for several weeks. A microcomputer controls all phases of the measuring process: pulse generation, data acquisition, reduction, and storage. Software is used to correct sensor output for temperature dependence and an activity coefficient, a function of temperature and salinity, is computed to correct for salinity. (Langdon, 1984. Deep Sea Research Part A. Oceanographic Research Papers, Volume 31, Issue 11, pp. 1357-1367; Culberson and Huang, 1987. Automated amperometric oxygen titration. Deep Sea Res. 34:875-880).

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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.

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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.

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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.

Oceanographers and atmospheric scientists are working together to improve understanding of the fate, transport, and feedbacks of climate relevant compounds.

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

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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

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