# Hourly means for DMS flux, transfer velocity, and associated variables from NOAA Ship Ronald H. Browncruise 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/3311
**Version**: 16 March 2010
**Version Date**: 2010-03-16

**Project**
» Southern Ocean Gas Exchange Experiment (SO_GasEx)

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



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|---|---|---|
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## Dataset Description

These data are hourly mean data for DMS flux, transfer velocity,
and associated variables. Most associated variables are derived
from the Univ. Conn.10 min meteorological data product (Sept 2009 version).
Seawater DMS data are from S. Archer, Plymouth Marine Labs, Jan 2010 release.

Notes:
1) DMS flux and transfer velocity measurements have been filtered to remove hours of atmospheric stability when z/L > 0.05.

2) Additional periods of anamalously low flux during the first tracer patch and the high wind event on transit to Uruguay are not presented in this release. We are currently examining this data to better understand the reason for the low results. For access to these measurements contact the investigators.

Contact: Barry Huebert, University of Hawaii Oceanography, huebert@hawaii.edu

### Methods & Sampling

**See:** SO-GasEx cruise report, Section 5.1.3 ppgs 11-12

**Operation description:**
Continuous measurement of atmospheric DMS concentration at 20 Hz, sampled from the 18m level of the bow jackstaff.

*Sampling times and locations:*
Continuous, except for periods when ship speed and heading is changing frequently, typically during the tracer injection.

*Overall sampling strategy:*
Air is sampled into a 3/8" ID teflon tube at a flow rate of 110-120 Standard Liters Per Minute (SLPM) and brought to a lab van located on the O2 deck, forward of the bridge. The inlet tip is located near a sonic anemometer to facilitate eddy correlation analysis of the data.

*Analytical method:*
A continuous internal standard gas (isotopically labeled: d-3 dimethylsulfide in nitrogen) is injected into the sample flow at the inlet tip. In the lab van, the sample flow is subsampled at 3-4 SLPM into an atmospheric pressure ionization mass spectrometer (APIMS), where the ambient to standard DMS isotopomer ratio is measured at 20 Hz. We calculate the ambient DMS concentration from the isotopomer ratio, sample flow rate and known concentration of standard in the sample air.

*Instrument details:*
Atmospheric Pressure Ionization Mass Spectrometer: designed and built at Univ. of Hawaii, based on the APIMS developed in Alan Bandy's lab at Drexel University (Bandy et al, JGR 107, D24, p.4743, 2002).

**Operation Log - During Cruise**

| Affected data | Comments |
|---|---|
| 3/1/2008 2300 GMT | Commence atmospheric DMS flux measurements. |
| 3/3/2008 1640 GMT | End atmospheric DMS sampling. |
| 3/3/2008 1826 GMT | Commence seawater DMS measurements. |
| 3/6/2008 1800 GMT | End seawater DMS trials. |
| 3/7/2008 0045 GMT | Commence atmospheric DMS flux measurements. |
| 3/7/2008 2130 GMT | Suspend DMS measurements during injection and buoy deployment. |
| 3/8/2008 2134 GMT | Resume atmospheric DMS flux measurements. |
| 3/19/2008 1300 GMT | Stop DMS flux system during downwind survey legs. |
| 3/19/2008 1500 GMT | Restart DMS flux system on upwind survey legs. |
| 3/19/2008 2000 GMT | Stop DMS flux system. |
| 3/20/2008 1300 GMT | Restart DMS flux system during CTD. |
| 3/20/2008 1957 GMT | Stop DMS flux system during tracer injection. |
| 3/21/2008 1600 GMT | Restart DMS flux system. |
| 3/22/2008 1240-1300 GMT | Stop DMS flux system briefly to adjust source flow. |
| 3/23/2008 1055-1100 GMT | Stop DMS flux system briefly to remove inlet filter. |
| 3/24/2008 0004-0027 GMT | Stop DMS flux system briefly due to ship exhaust. |
| 3/25/2008 2020 GMT | Stop DMS flux system: sensitivity gone. |
| 3/26/2008 0200 GMT | Restart DMS flux system after cleaning mass spec inlet aperture. |
| 3/26/2008 1500-1600 GMT | Missing data, files not written. |
| 4/4/2008 1600 GMT | END atmospheric DMS sampling. |
| 4/4/2008 1800 GMT | Begin 2nd trial, seawater DMS sampling. |

**Data Processing Description**

**See:** SO-GasEx cruise report, Section 5.1.3 ppgs 11-12

**BCO-DMO Processing Notes**
- Generated from original file SO-GasEX_UH_DMS_Flux_Hourly_Ver2.txt

**BCO-DMO Edits**
- parameter names modified to conform to BCO-DMO convention
- 'NaN' changed to 'nd'

- date/time separated into two fields (date, time)
- date reformatted as YYYYMMDD
- time reformatted as HHMM (all secondss were 00)

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## Data Files

| File |
| --- |
| **DMSFlux.csv** (Comma Separated Values (.csv), 106.14 KB)<br>MD5:7e267d58aad8501c9d674233ff59d8e7<br>Primary data file for dataset ID 3311 |

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## Parameters

| Parameter | Description | Units |
|---|---|---|
| date | Date variable GMT start of hour for flux measurement | YYYYMMDD |
| time | Time variable GMT start of hour for flux measurement | HHMM |
| lon | GPS longitude | decimal degrees |
| lat | GPS latitude | decimal degrees |
| SOG | GPS speed over ground in knots | knots |
| Gyro | Ship gyro heading in degrees | degrees |
| FluxDuration | Duration of flux measurement seconds | seconds |
| DMS | Atmospheric mean DMS concentration measured in parts per trillion by volume (pptv) | pptv |
| DMSflux | Corrected DMS flux in uMoles m^-2 day^-1 at ambient conditions | uMoles m^-2 day^-1 |
| DMSflux_error | Flux error (uMoles m^-2 day^-1) computed following Blomquist et al. Atm.Meas.Tech; 3; 1-20; 2010 | uMoles m^-2 day^-1 |
| kDMS | DMS transfer velocity for ambient conditions in cm/hr (not Sc corrected) | cm/hr |
| kDMS_error | Transfer velocity error in cm/hr | cm/hr |
| U10N | 10 m neutral wind speed in m/s from COARE 3.0 bulk flux model | m/sec |
| Ustar_COARE | Friction velocity in m/s from COARE 3.0 | m/sec |
| Rwspd | Relative wind speed in m/s | m/sec |
| Sc_DMS | DMS Schmidt number at ambient sea surface temperature and salinity | dimensionless |
| swDMS | Sea water DMS concentration in nM (or uMoles m-3) | nM |
| Rwdir | Relative wind direction zero degrees on bow starboard positive | degrees |
| Tair | Air temperature deg C | degrees Celcius |
| SST | Sea surface temperature deg C | degrees Celcius |
| Sal | Salinity in parts per thousand | ppth |
| Longwave | Longwave radiation | w m^-2 |
| Shortwave | Shortwave radiation | w m^-2 |
| z_L | Dimensionless stability parameter z=18m L from COARE 3.0. | dimensionless |

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## Instruments

| | |
|---|---|
| **Dataset-specific Instrument Name** | Atmospheric Pressure Ionization Mass Spectrometer |
| **Generic Instrument Name** | Atmospheric Pressure Ionization Mass Spectrometer |
| **Generic Instrument Description** | The Atmospheric Pressure Ionization Mass Spectrometer measures dimethylsulfide (DMS) in ambient air and in sea water. This instrument is used to measure DMS fluxes directly in the marine boundary layer. |

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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

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

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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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