Radiosonde profiles of atmospheric temperature, humidity, wind speed and direction from R/V Tangaroa cruise VDT0410 in the South East of New Zealand, S.W. Bounty Trough in 2004 (SAGE project)

Website: https://www.bco-dmo.org/dataset/3337
Version: 06April2010
Version Date: 2010-04-06

Project
» Surface-Ocean Lower-Atmosphere Studies Air-Sea Gas Exchange (Experiment) (SAGE)

Programs
» Iron Synthesis (FeSynth)
» United States Surface Ocean Lower Atmosphere Study (U.S. SOLAS)

Contributors	Affiliation	Role
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Dataset Description

Radiosonde profiles of atmospheric temperature, humidity, wind speed and direction

Radiosondes
Profiles of atmospheric temperature, humidity, wind speed and direction were measured using Vaisala RS80-GPS radiosondes carried aloft by helium balloons. A list of radiosonde launches is given as the data file list. The data are transmitted from the sonde to a shipboard receiver and these are stored at 2-s intervals by computer. This sampling gives good height resolution in the atmospheric boundary layer, which is under the direct influence of the fluxes through the sea surface. The radiosondes were generally launched to coincide with the overpasses of the NASA Aqua earth observation satellite, as the atmospheric profiles derived from the radiosondes can be used to validate satellite retrievals of atmospheric temperature and humidity distributions.

Methods & Sampling

Refer to SAGE Voyage Report

Radiosondes

Profiles of atmospheric temperature, humidity, wind speed and direction were measured using Vaisala RS80-GPS radiosondes carried aloft by helium balloons. A list of radiosonde launches is given as the data file list. The data are transmitted from the sonde to a shipboard receiver and these are stored at 2-s intervals by computer. This sampling gives good height resolution in the atmospheric boundary layer, which is under the direct influence of the fluxes through the sea surface. The radiosondes were generally launched to coincide with the overpasses of the NASA Aqua earth observation satellite, as the atmospheric profiles derived from the radiosondes can be used to validate satellite retrievals of atmospheric temperature and humidity distributions.

Data Processing Description

BCO-DMO Processing Notes
Generated from original data and documentations files:
040401a.rs thru 040414a.rs (10 files)
rs_table.pdf

BCO-DMO Edits
MetaData (rs_table.pdf):
- Headers removed (data already in rs_table.pdf)
- File rs_table.pdf exported as text file
- date reformatted to YYYYMMDD
- time reformatted to HHMMSS
- parameter names modified to conform to BCO-DMO convention
Data (.rs files):
- parameter names modified to conform to BCO-DMO convention
- '//', '///' and '////' fields changed to nd

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Data Files

File
Radiosonde.csv (Comma Separated Values (.csv), 3.53 MB)   MD5:aabbae2d6206e7283fe6ded62944508e   Primary data file for dataset ID 3337

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Parameters

Parameter	Description	Units
Filename	Radiosonde data filename	text
date_UTC	Date of Launch (UTC)	YYYYMMDD
time_UTC	Time of Launch (UTC)	HHMM
lat	Launch latitude (South is negative)	decimal degrees

lon	Launch longitude (West is negative)	decimal degrees
Hmax	Max Height	km
Pmin	Minimum Pressure	hPa
N	Number of samples	integer
Id	Radiosonde Code Number	text
Time_Min	Elapsed time since launch (minutes plus seconds field)	minutes
Time_Sec	Elapsed time since launch (minutes plus seconds field)	seconds
Height	Height	meters
Pressure	Pressure	hPa
Temperature	Temperature	degrees Celsius
RH	Relative Humidity	percentage
Dewp	Dew Point	degrees Celsius
PotTem	Potential Temperature	degrees Kelvin
VapP	vapour pressure	hPa
MixR	(tbd)	g/kg
Dir	Wind Direction	degrees
Speed	Wind Speed	meter/second

Instruments

Dataset-specific Instrument Name	Radiosonde
Generic Instrument Name	Radiosonde Vaisala RS80-GPS
Dataset-specific Description	Radiosondes Profiles of atmospheric temperature, humidity, wind speed and direction were measured using Vaisala RS80-GPS radiosondes carried aloft by helium balloons. A list of radiosonde launches is given as the data file list. The data are transmitted from the sonde to a shipboard receiver and these are stored at 2-s intervals by computer. This sampling gives good height resolution in the atmospheric boundary layer, which is under the direct influence of the fluxes through the sea surface. The radiosondes were generally launched to coincide with the overpasses of the NASA Aqua earth observation satellite, as the atmospheric profiles derived from the radiosondes can be used to validate satellite retrievals of atmospheric temperature and humidity distributions.
Generic Instrument Description	Vaisala RS80-GPS radiosondes carried aloft by helium balloons measure atmospheric temperature, humidity, wind speed and direction. The GPS receiver of the GPS-radiosonde measures a shift in Doppler frequencies using a codeless detection and measurement technique. The measured Doppler shifts are a combination of satellite and radiosonde motion and contain the pertinent information for wind speed and direction computation. Doppler frequency measurements of up to 8 satellites are sent to the ground equipment using a low bandwidth (1200 baud) digital link. New independent GPS Doppler measurements from the GPS-sonde are provided every 0.5 seconds for up to 8 channels with 24-bit resolution. The ground equipment computes the wind speed and direction using the differential GPS concept. For more information see www.hobeco.net/pdf/RS80_GPS.pdf.

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Deployments

VDT0410

Website	https://www.bco-dmo.org/deployment/57828
Platform	R/V Tangaroa
Report	http://bcodata.whoi.edu/Fe_Synthesis/SAGE/SAGE_Voyage_Report.pdf
Start Date	2004-03-17
End Date	2004-04-15
Description	Surface-Ocean Lower-Atmosphere Studies Air-Sea Gas Experiment Phytoplankton blooms, either natural or stimulated, provide effective natural laboratories in which to study the pronounced biogeochemical fluxes and gradients associated with their evolution and decline. These phytoplankton-mediated signals are mainly expressed in the ocean, but also result in enhanced fluxes of carbon dioxide (CO_2), dimethylsulfide (DMS) and other biogenic gases across the air-sea interface. The Southern Ocean is a net sink region for atmospheric CO_2, yet uncertainties remain in the strength of this sink because few measurements of the efficiency of ocean-atmosphere gas exchange have been made under turbulent windy open-ocean conditions. During SAGE, in a similar fashion to SOIREE in 1999, we proposed to stimulate a phytoplankton bloom through addition of iron fertiliser to iron-limited Sub-Antarctic waters. The fertilisation was marked with the addition of two inert dissolved gas tracers, sulfur hexafluoride (SF6) and Helium-3 (3He), creating a lagrangian patch/dual-tracer study with the tracer SF6 providing a control volume, vertical and lateral diffusion rates and estimates of air-sea gas exchange in association with 3He. The enhanced gas fluxes associated with the bloom should provide optimal conditions for measuring the rate of gas exchange and the key physical processes governing the exchange. These processes include near-surface turbulence (typically generated by breaking waves), temperature microstructure, stratification, wave field, wave breaking and wind speed. In conjunction with these patch scale and surface physics measurements, the micrometeorologic al relaxed eddy accumulation technique (REA) was deployed to make direct atmospheric measurements of gas fluxes. A combination of gas concentration measurement and REA flux potentially allows the efficiency of gas exchange to be calculated at the local scale. These local scale measurements can be compared with exchange rates derived from the dual tracer technique for the larger labelled patch. Experimental goals Determine drivers and controls of ocean-atmosphere gas exchange quantifying: - biological production and utilisation of climatic relevant gases in particular CO_2 and DMS) - in the surface ocean - physical control of exchange across the interfaces of the surface mixed layer - production of aerosols resulting from interaction of biological and physical processes Objectives: This experiment combined seven main research objectives considering: 1. quantification of gas transfer fluxes and velocities for a variety of gases 2. physical processes affecting gas transfer 3. ecosystem interactions controlling dissolved DMS concentration and CO_2 removal 4. the impact of iron availability upon phytoplankton productivity and its influence upon dissolved - gas concentration 5. the impact of photochemistry in the surface ocean on dissolved gas concentration and air-sea exchange 6. the fate of DMS in the atmosphere and aerosol condensation nuclei production from chemical - transformation in the atmospheric boundary-layer. 7. Role of aggregation in the timing and magnitude of export processes Additional objectives were the: 1. servicing of NIWA biophysical moorings: 41°11.28'S 178°28.62'E Northern Biophysical Mooring - (NBM) and approximately 46°38.202'S 178°33.486'E Southern Biophysical Mooring (SBM) 2. final release of 2 Carioca Buoys at SBM SAGE Cruise Track from SST data

Project Information

Surface-Ocean Lower-Atmosphere Studies Air-Sea Gas Exchange (Experiment) (SAGE)

Website: http://www.niwascience.co.nz/rc/atmos/sage/

Coverage: South-East of New Zealand in the vicinity of the S.W. Bounty Trough; Sub-Antarctic waters near 46.5°S 172.5°E

While not officially funded as a U.S. SOLAS project, SAGE included
significant U.S. participation and it's science themes were consistent
with those of the International SOLAS program.

[from http://www.us-solas.org:8080/Plone/projects/the-us-solas-in-the-sage-study (26 may 2008)]
SAGE was a mesoscale Fe addition experiment run after the seasonal autumnal
bloom of the sub-Antarctic showed a small biological response to Fe addition.
The SF6/3He dual-tracer experiment extended the range of gas exchange measurement
into stronger wind regimes typical of the Southern Ocean.

A goal of the SAGE project was to increase understanding of air-water Gas Exchange,
Mixed Layer structure, skin/surface properties, biogenic gases and atmospheric fluxes.
Core measurements included Carbon, N2/O2, noble gas, DMS(P), SO2, N2O, CO, CDOM CN
and aerosol chemistry.

One cruise was conducted aboard the Research Vessel Tangaroa and instrumentation
included CARIOCA pCO2 Buoys, Shipboard Gill R3A Anemometer mast, SAMI pCO2 sensors,
SkinDeep vertical profiler, MAERI, SCAMP/TRAMP temperature microstructure profiler,
sparbuoy, ADCP, S-band radar, FRRF, flow cytometer, primary production, nutrients,
Fe, Meteorology and radiosondes.

from "DSR intro.doc"; by Mike Harvey described as in preparation for Deep Sea Research II
The SOLAS air-sea gas exchange experiment (SAGE) was a combined gas-transfer process
study and iron fertilisation experiment conducted in sub-Antarctic waters of the
south-west Bounty Trough (46.5°S 172.5°E) to the south-east of New Zealand between
mid-March and mid-April 2004.

The experiment was designed as a lagrangian study of air-sea gas exchange processes
of CO2, DMS and other biogenic gases associated with an iron-induced phytoplankton
bloom. In conjunction with the iron fertilisation a dual tracer SF6/3He release
served quantify both patch evolution and air-sea tracer exchange at the 10's of km's
scale. Within this patch local/micrometeorological (100's m scale) gas exchange
process studies quantified physical variables such as near-surface turbulence,
temperature microstructure at the interface, wave properties and wind speed to enable
development of improved gas exchange models for the frequently windy Southern Ocean.

After 15 days and four iron additions totalling 1.1 tonne Fe2+ there was a doubling
in both column chlorophyll-a and primary productivity; a very modest response compared
with other mesoscale iron enrichment. An investigation of factors limiting bloom
development considered co-limitation by light, other nutrients, phyto-plankton seed-stocks
and grazing regulation.

Related files

SAGE precruise Science Plan
SAGE precruise Voyage Plan
SAGE Voyage Report
SAGE Release Times
SAGE Surface Physics Metadata Report

SAGE Cruise Track from SST data (.jpg image)
Note:
SAGEtime/Experiment time zero (0.0000) is: 25 March 2004, 19:00 Local Time (NZST) *(from SAGE*

Voyage Report, Voyage Timetable, Pages 5-6)

Program Information

Iron Synthesis (FeSynth)

Coverage: Global

The two main objectives of the Iron Synthesis program (SCOR Working Group proposal, 2005), are:
1. Data compilation: assembling a common open-access database of the *in situ* iron experiments, beginning with the first period (1993-2002; Ironex-1, Ironex-2, SOIREE, EisenEx, SEEDS-1; SOFeX, SERIES) where primary articles have already been published, to be followed by the 2004 experiments where primary articles are now in progress (EIFEX, SEEDS-2; SAGE, FeeP); similarly for the natural fertilizations S.O.JGOFS (1992), CROZEX (2004/2005) and KEOPS (2005).

2. Modeling and data synthesis of specific aspects of two or more such experiments for various topics such as physical mixing, phytoplankton productivity, overall ecosystem functioning, iron chemistry, CO_2 budgeting, nutrient uptake ratios, DMS(P) processes, and combinations of these variables and processes.

SCOR Working Group proposal, 2005. "The Legacy of *in situ* Iron Enrichments: Data Compilation and Modeling".
http://www.scor-int.org/Working_Groups/wg131.htm

See also: SCOR Proceedings Vol. 42 Concepcion, Chile October 2006, pgs: 13-16 2.3.3 Working Group on The Legacy of *in situ* Iron Enrichments: Data Compilation and Modeling.

The first objective of the Iron Synthesis program involves a data recovery effort aimed at assembling a common, open-access database of data and metadata from a series of *in-situ* ocean iron fertilization experiments conducted between 1993 and 2005. Initially, funding for this effort is being provided by the Scientific Committee on Oceanic Research (SCOR) and the U.S. National Science Foundation (NSF).

Through the combined efforts of the principal investigators of the individual projects and the staff of Biological and Chemical Oceanography Data Management Office (BCO-DMO), data currently available primarily through individuals, disparate reports and data agencies, and in multiple formats, are being collected and prepared for addition to the BCO-DMO database from which they will be freely available to the community.

As data are contributed to the BCO-DMO office, they are organized into four overlapping categories:
1. Level 1, basic metadata
(e.g., description of project/study, general location, PI(s), participants);
2. Level 2, detailed metadata and basic shipboard data and routine ship's operations
(e.g., CTDs, underway measurements, sampling event logs);
3. Level 3, detailed metadata and data from specialized observations
(e.g., discrete observations, experimental results, rate measurements) and
4. Level 4, remaining datasets
(e.g., highest level of detailed data available from each study).

Collaboration with BCO-DMO staff began in March of 2008 and initial efforts have been directed toward basic project descriptions, levels 1 and 2 metadata and basic data, with detailed and more detailed data files being incorporated as they become available and are processed.

Related file

Program Documentation

The Iron Synthesis Program is funded jointly by the Scientific Committee on Oceanic Research (SCOR) and the U.S. National Science Foundation (NSF).

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 CO_2, 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
New Zealand International Science and Technology Fund (ISAT)	unknown SAGE ISAT
New Zealand Foundation for Research, Science and Technology (FRST)	C01X0204
New Zealand Foundation for Research, Science and Technology (FRST)	C01X0223
National Science Foundation (NSF)	unknown SAGE NSF

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