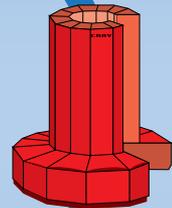


WORLD OCEAN CIRCULATION EXPERIMENT



WOCE DATA GUIDE 1997



WORLD CLIMATE RESEARCH PROGRAMME



WORLD OCEAN CIRCULATION EXPERIMENT DATA AND INFORMATION SYSTEM

The WOCE data management structure is a distributed system which utilises the expertise of scientists in order to attain the highest possible data quality and documentation. Each measurement technique produces a different data “stream”, and the data management system brings them together to form a single data resource for numerous investigators and analysis groups. The system consists of several elements with the flow being from Principal Investigator to DAC to SAC to users and Archive.

Data Assembly Centres (DACs) are managed by scientists, handle assembly and quality control of data sets, and generate data products.

Special Analysis Centres (SACs) perform data analysis and synthesis functions, including the generation of derived data sets.

WOCE Archive is distributed across the centres of the World Data Center System.

The Data Information Unit (DIU) is a central source of information on the status of WOCE, tracking all data collection, processing and archiving activities, and acting as the primary interface between the WOCE data system and all users.

Navigation through the Web

<http://www.cms.udel.edu/woce/>

This document provides a basic outline of the WOCE data system but for detailed information the user should contact the DIU, and for access to data sets contact the DACs and SACs themselves. A suggested route is to start a World Wide Web tour at the DIU where summaries of the field programme and data status are continually updated. Links exist to all components of the WOCE data system, to further data sources which may be of interest, and to a bibliography of WOCE references. If you do not have access to the Internet, contact the DIU (see back cover) for information on other means of accessing data.

Sharing WOCE Data

WOCE has developed a data sharing policy which strikes a balance between the requirements of the experiment as a whole and the intellectual rights of the individuals who contribute to the programme. The trade-off between these different interests has resulted in a policy which expects data to be made publicly available within 2 years of the data set being complete. Investigators are thus allowed a reasonable period to complete their own analysis and publications, while ensuring the global dataset is accumulated and made accessible for wider examination. Data will not be released by the data centres without the consent of the originator. WOCE encourages investigators to share data with others and to authorise general release as soon as possible. If investigators demand exclusive rights to data more than 2 years old then WOCE encourages peer pressure and funding agencies to persuade the originator to give consent.

What is WOCE?

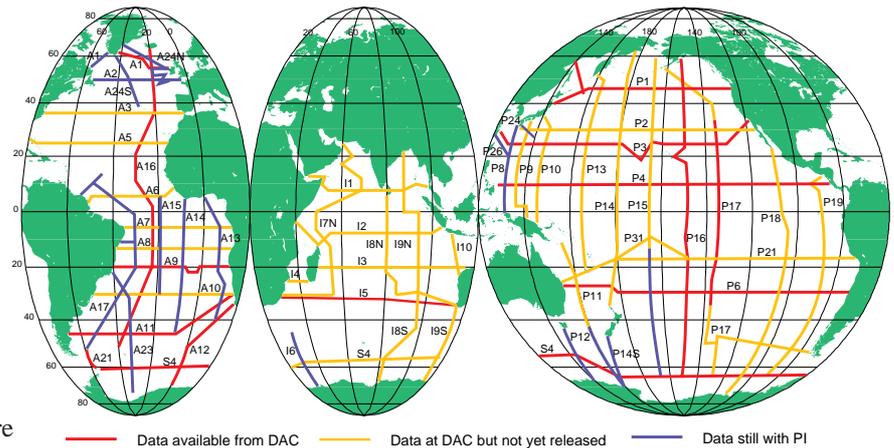
The World Ocean Circulation Experiment is the part of the World Climate Research Programme that will provide much-needed improvements in ocean circulation models for use in climate prediction. The oceans are a key element in the climate system in the way they transport heat and fresh water and exchange these with the atmosphere. The oceans also sequester CO₂ released by the burning of fossil fuels. WOCE has used resources from 25 countries to make unprecedented *in-situ* and satellite observations of the global ocean between 1990 and 1997 and to observe poorly-understood but important physical processes. In parallel, great advances have been made during WOCE in the ability of ocean models to reproduce the known characteristics of the ocean and its circulation. Analysis, Interpretation, Modelling and Synthesis of WOCE data (WOCE AIMS) will continue to 2002 but a prerequisite for its success will be the continuing assembly and quality control of WOCE data. The diverse WOCE data sets will serve as a unique resource for climate researchers and marine scientists for decades to come.

WOCE HYDROGRAPHIC PROGRAMME

One-Time Survey

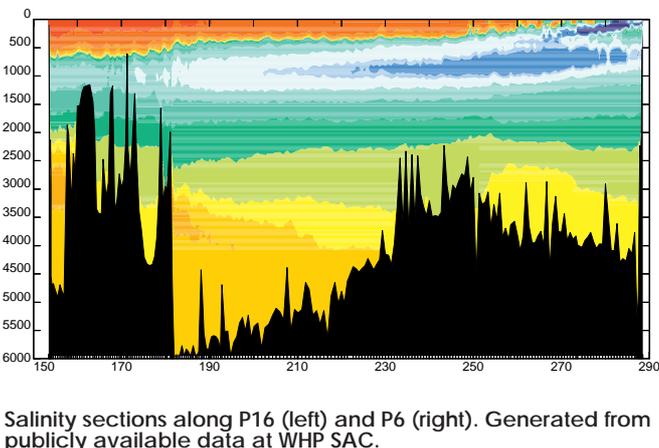
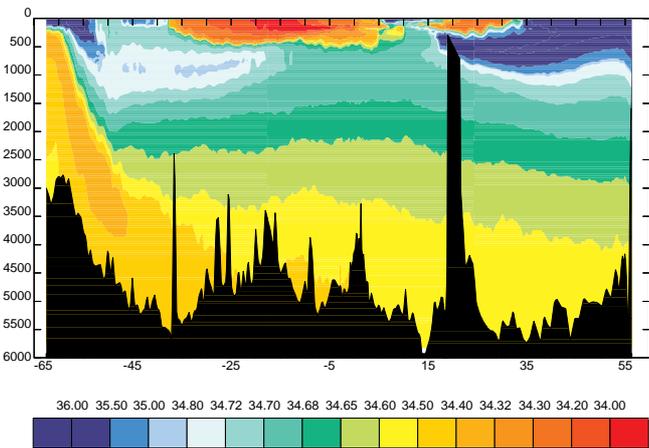
The WOCE Hydrographic Programme (WHP) One-Time Survey encompasses a range of physical and chemical measurements at discrete stations and from continuous sampling. Station data consist of profiles of temperature, salinity, dissolved oxygen and other parameters. Large and small volume bottle samples enable a variety of chemical properties to be analysed, including nutrients, CO₂, CFCs, tritium, helium and other tracers. Most parameters are analysed onboard (ship-based) but some require analysis in laboratories on land (shore-based). The WHP data submission schedule requires that ship-based data are sent to the WHP Office (DAC) 6 months after a cruise, while a further 12 months are allowed for shore-based tracer data. Data are examined by independent Data Quality Experts in order to ensure the quality of the datasets. Ship-based data are

scheduled to be made available for public release up to 2 years after cruise completion. While shore-based data from cruises prior to 1994 should be available now, in fact few have been released by the PIs, and the non-availability of these data is a concern currently being addressed.



Atlantic Ocean A1E GER 1991 A1W CAN 1995 A2 GER 1994 A3 RUS 1993 A5 SP 1992 A6 FR 1993 A7 FR 1993 A8 GER 1994 A9 GER 1991 A10 GER 1993 A11 UK 1993 A12 GER 1992 A13 FR 1995 A14 FR 1995 A15 FR 1994 A16 USA 1988 A17 FR 1994 A20 USA 1997 A21 GER 1990	A22 USA 1997 A23 UK 1995 A24 USA 1997 A25 UK 1997	Southern Ocean S4A GER 1990, 96 S4P RUS 1992 S4I AA 1995 S4I USA 1996	Indian Ocean I1 USA 1995 I2 USA 1995 I3 USA 1995 I4 USA 1995 I5 USA 1987 I5E,W USA 1995 I6 FR 1993-97	Pacific Ocean P1 USA 1985 P1W CAN/RUS 1993 P2 JP 1993,94 P3 USA 1985 P4 USA 1989 P6 USA 1992 P8 JP 1996 P9 JP 1994 P10 USA 1993 P11A AA 1993 P12 AA 1995 P13C JP 1991	I7N,C USA 1995 I7S FR 1997 I8 USA 1995 I9 USA 1995 I10 USA 1995	P13J JP 1993 P13 USA 1992 P14C USA 1992 P14N RUS 1992 P14N USA 1993 P14S USA 1996 P15N CAN 1994 P15S USA 1996 P16 USA 1991 P16A USA 1992 P17C,S USA 1991 P17A USA 1992 P17N,E USA 1993 P18 USA 1994 P19A USA 1992 P19 USA 1993 P21 USA 1994 P24 JP 1995 P26 PRC 1996 P31 USA 1994
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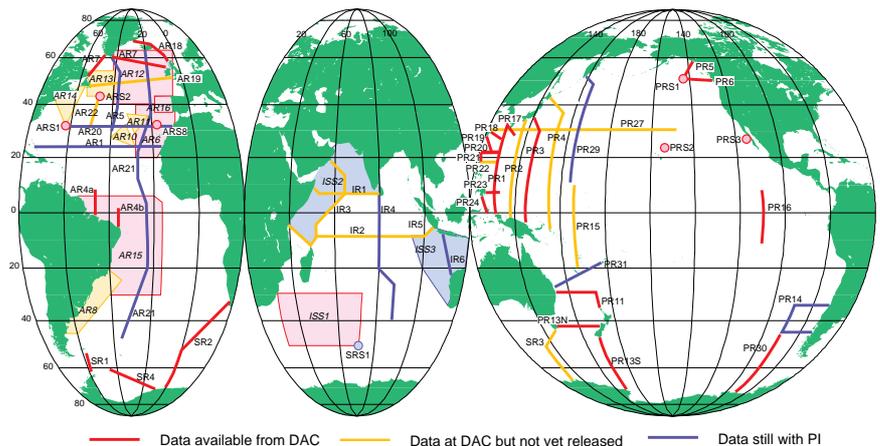
WHP Office and DAC
<http://whpo.ucsd.edu>
 James H. Swift
 Scripps Institution of Oceanography, USA
 Fax: 1-619-534-7383
 e-mail: whpo@ucsd.edu



Salinity sections along P16 (left) and P6 (right). Generated from publicly available data at WHP SAC.

Repeat Hydrography

The repeated sections and time series stations provide information on the temporal variability of the ocean from several occupations in different seasons and years. The data from each occupation are considered separately in the data management system, thus early data from a section may be available before all the planned occupations have occurred. The map shows the sections for which at least some data have been made available or are at the WHP Office (DAC), and those for which all data remain with the Principal Investigators.



WOCE Repeat Sections and Areas (Years, No. of Occupations) and Time Series Stations (Start Date)

Atlantic Ocean

AR1 USA 1998,1
 AR4E GER,FR 1990-96,9
 AR4W GER,FR 1990-95,7
 AR5 CAN 1991-95,2
 AR6 GER,SP 1991-94,2
 AR7E NL,UK,GER 1990-94,6
 AR7W CAN 1990-96,7
 AR8 ARG,BRA 1991-96,10
 AR10 UK,USA,CAN 1992-93,5
 AR11 RUS,UKR,USA 1991-93,12
 AR12 UK,NL 1991-92,4
 AR13 CAN,RUS 1992-95,6
 AR14 CAN 1994,1
 AR15 GER,FR,USA 1990-93,7
 AR16 GER,NOR,SP,POR 1991-4,16
 AR18 NORDIC 1991-95,5
 AR20 CAN,RUS 1991-94,2

AR19 CAN,GER,RUS 1993-95,3
 AR21 USA 1991-93,2
 AR22 CAN 1991-93,2
 AR23 USA 1996,1
 AR24 USA 1996-97,2
 AR25 UK 1997,1

Southern Ocean

SR1 CL,SP,UK,USA 1992-7,10
 SR2 GER,SA 1989-93,3
 SR4 GER 1989-96,5

Pacific Ocean

PR1 JP,PRC 1990-94,4
 PR2 JP 1990-94,8
 PR3 JP,PRC 1990-95,10
 PR4 JP 1992,1
 PR5 CAN 1992-94,5
 PR6 CAN 1990-96,13

PR11 AA,NZ 1989-94,7
 PR12 AA 1983-92,5
 PR13 AA,NZ 1989-94,5
 PR14 CL 1991-95,6
 PR15 FR 1990-92,8
 PR16 USA 1990-95,16
 PR17 JP,PRC 1990-95,19
 PR18 JP,PRC 1991-96,18
 PR19 JP,PRC 1990-96,9
 PR20 ROC 1990-93,7
 PR21 PRC,ROC 1990-95,8
 PR22 PRC 1991,1
 PR23 JP,PRC 1991-95,5
 PR24 JP,PRC 1991-95,4
 PR27 JP 1991-94,6
 PR29 RUS 1992,1
 PR30 UK 1991-92,2
 PR31 AA 1991,1

Indian Ocean

IR1W GER,USA 1993-95,3
 IR2 AA 1994,1
 IR3 GER,USA 1995,3
 IR4 GER,AA,USA 1991-95,4
 IR6 AA,FR 1989-95,3
 ISS1 FR,SA,UK,USA 1991-95,9
 ISS2 GER,USA 1993-95,5
 ISS3 AA 1996,1

Time Series Stations

ARS1 USA 1954
 ARS2 CAN 1946
 ARS8 SP 1992
 PRS1 CAN 1959
 PRS2 USA 1988
 PRS3 USA 1993
 SRS1 FR 1991

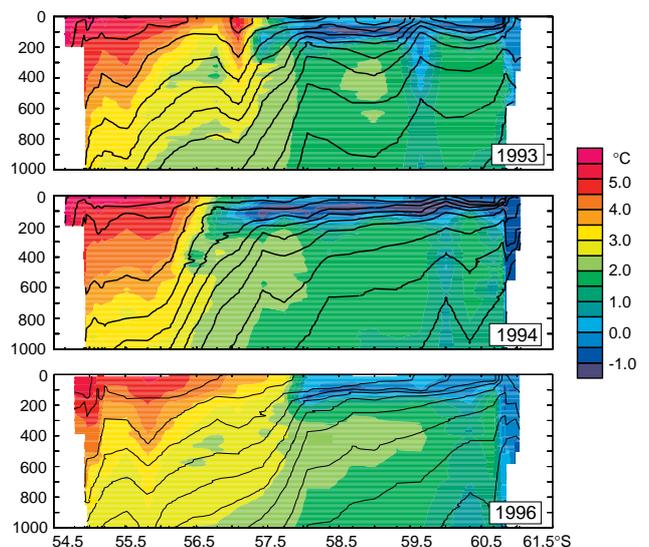
WHP Special Analysis Centre

The WHP Special Analysis Centre (SAC) is the final stage in the hydrographic data management process; it provides a globally consistent data set and generates dynamical products for use in models and other analyses. Specialised visualisation programs and historical (pre-WOCE) hydrographic data are also available from the SAC.

WHP Special Analysis Centre

<http://www.dkrz.de/~u241046/>

Kai Jancke, Bundesamt für Seeschifffahrt und Hydrographie (BSH), Germany
 Fax: 49-40-3190-5000
 e-mail: Kai.Jancke@m5.hamburg.bsh.d400.de



Repeated occupations of SR1; potential temperature (colours) and neutral density (lines). Source: S. Cunningham, SOC, UK.

Bathymetry

High quality along-track bathymetry data from WOCE cruises are assembled at the National Geophysical Data Centre, an international facility for marine geological and geophysical data management. Data are available immediately they are received by the DAC, and can be accessed via the Internet or by CD-ROM.

Bathymetry DAC

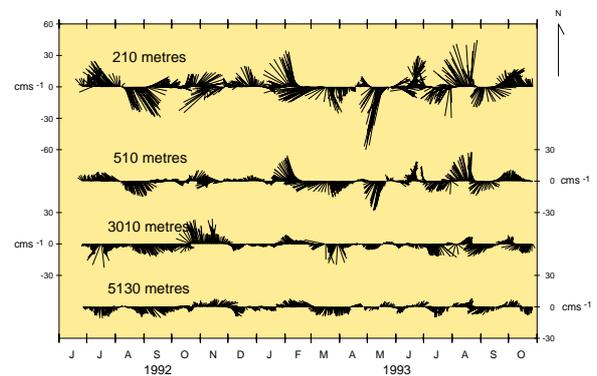
<http://www.ngdc.noaa.gov/mgg/mggd.html>

Robin Warnken
NOAA/NGDC, Boulder, USA
Fax: 1-303-497-6513
e-mail: rrw@mail.ngdc.noaa.gov

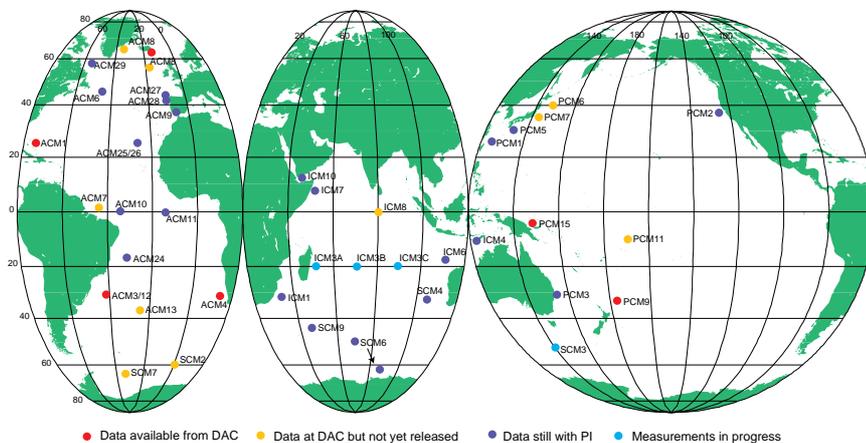
DIRECT CURRENT MEASUREMENTS

Current Meter Moorings

High quality and uniformly processed pre-WOCE and WOCE current meter records are available from the Current Meter DAC and can be downloaded from the online database over the Internet. Data are supplied to the DAC by the PIs, but are not released to the public domain until at least 2 years after recovery and permission has been given by the PI. Edited and original records from WOCE experiments are available along with data reports and flow statistics. Users can search the online database by a variety of criteria such as geographical location or experiment name.



Velocity at the most westerly mooring of ACM4. Source: Current Meter DAC WWW site.



Current Meter DAC

<http://kepler.oce.orst.edu/>

Dale Pillsbury
Oregon State University, USA
Fax: 1-503-737-2064
e-mail: pillsbury@oce.orst.edu

Atlantic Ocean

ACM1 USA 1990-97
ACM3/12 USA,GER 1991-93
ACM4 USA 1992-93
ACM6 CAN 1993-95
ACM7 GER 1989-94
ACM8 UK,GER 1986-97
ACM9 SP,USA 1994-96
ACM10 USA 1992-94
ACM11 FR 1992-94
ACM13 GER 1992-94
ACM24 USA 1993-95

ACM25/26 USA 1991-93
ACM27 SP 1993-94
ACM28 PORT 1993-94
ACM29 CAN 1978-94

Indian Ocean

ICM1 UK 1995-96
ICM3A USA 1995-97
ICM3B USA 1995-97
ICM3C USA 1995-97
ICM4 FR 1989-93
ICM6 AA 1994-96

ICM7 GER 1995-96
ICM8 GER 1991-94
ICM10 USA 1995-96

Pacific Ocean

PCM1 ROC,USA 1994-96
PCM2 USA 1992-94
PCM3 AA 1991-94
PCM5 JP 1993-95
PCM6 USA 1993-95
PCM7 USA 1992-94

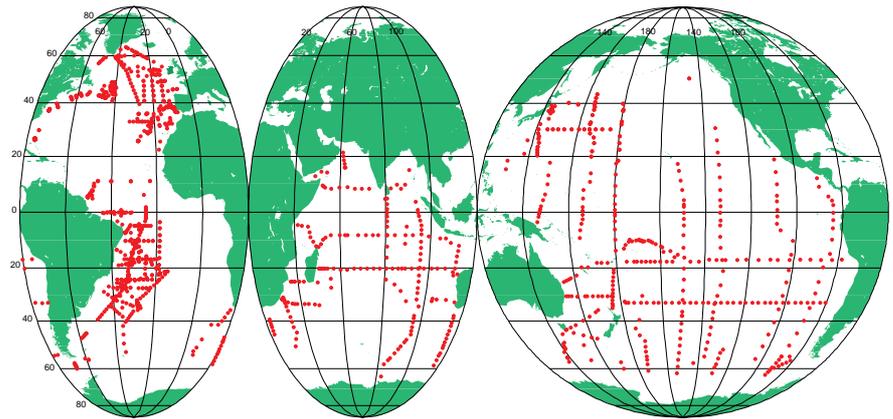
PCM9 NZ,USA 1991-92
PCM11 USA 1992-94
PCM15 USA 1992-93

Southern Ocean

SCM2 GER 1992-95
SCM3 AA,USA 1991-97
SCM4 AA 1995-96
SCM6 UK 1993-94
SCM7 GER 1989-95
SCM9 UK 1993-95

Subsurface Floats

A variety of acoustically- or satellite-tracked, neutrally buoyant subsurface floats have been released during WOCE. The Subsurface Float DAC is assembling these (and historical data) to form a consolidated float data set for incorporation into ocean models and climatologies. Data received by the DAC are checked, archived and made available (with PI permission) through the DAC Web site. More data are available by direct contact and joint investigations with the PIs.



Release locations of WOCE subsurface floats

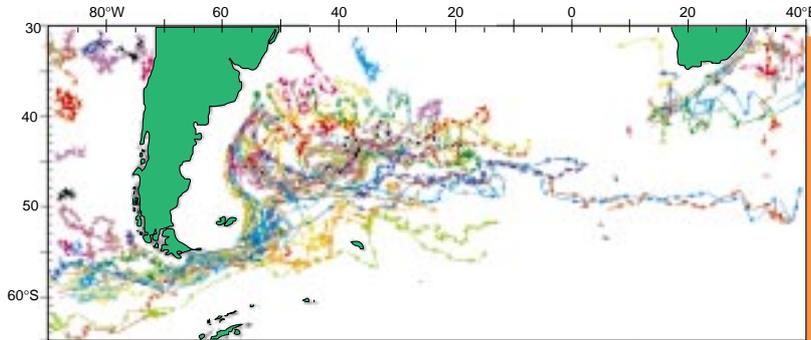
Subsurface Float Deployments (Years, No. of Floats)

Atlantic Ocean	GER 1994 16	JP 1989-95 36
<i>North (15-60°N)</i>	USA 1989-94,1997-98 277	USA 1991-93 89
CAN 1994,1996 14	<i>South (45-15°S)</i>	<i>South (45°S-20°N)</i>
FR 1992-93,1996-98 133	FR 1994,1997 55	GER 1996-98 19
GER 1991-94,1996-97 83	GER 1992,1994,1997 131	USA 1991-96 240
UK 1996 7	USA 1992-97 150	Indian Ocean
USA 1989-97 521	Pacific Ocean	USA 1995 136
PORT 1997-98 24	<i>North (20-55°N)</i>	Southern Ocean
<i>Tropical (15°N-15°S)</i>	CAN 1996 2	USA 1990-96 136
FR 1994,1997 44		

Subsurface Float DAC

<http://wfdac.whoi.edu/>

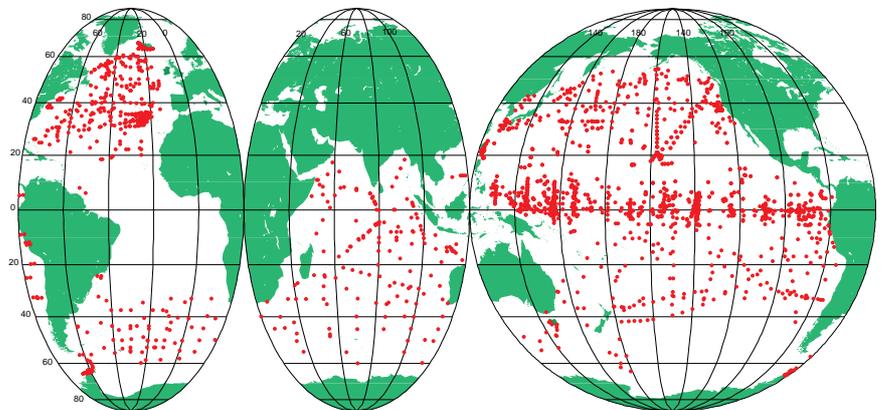
Philip L. Richardson
 Woods Hole Oceanographic
 Institution, USA
 Fax: 1-508-457-2181
 e-mail: prichardson@whoi.edu



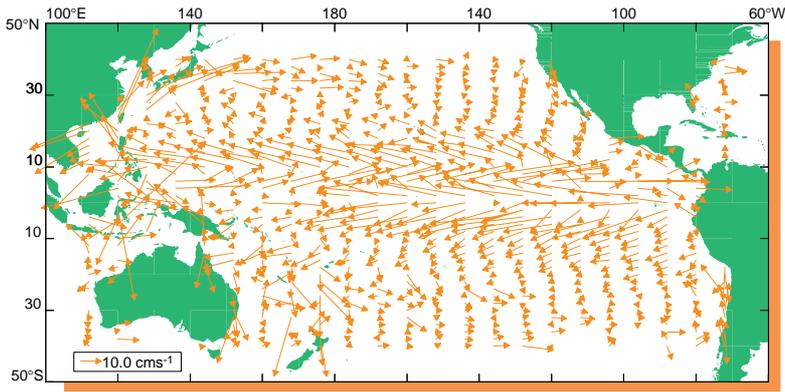
ALACE (Autonomous Lagrangian Circulation Explorer) float tracks at 1000 m in the South Atlantic from 1990 to 1996. Source: Float DAC WWW site (R. Davis, SIO).

Surface Drifting Buoys

Drifting buoys provide surface velocity measurements for validation of models and ground truth sea surface temperature data to initialize the ocean component of climate prediction models. Some buoys also measure atmospheric pressure. The Drifter DAC assembles and provides uniform quality data from WOCE drifting buoys and WOCE quality buoys released under other programmes. Data files and products such as track plots, mean velocity and temperature fields are available within a month of collection (no proprietary period).



Release locations of WOCE-quality surface drifting buoys (since 1990).



Surface Drifter DAC

Scientific Quality Control and Products

<http://www.aoml.noaa.gov/phod/dac/dac.html>

Mark Swenson
NOAA/AOML, USA
Fax: 1-305-361-4582
e-mail: swenson@aoml.noaa.gov

Pacific annual mean 15 m velocity estimates (1991 to August 1996). Generated from publicly available data.

Surface Drifter DAC

Distribution and Archival

http://www.meds.dfo.ca/Meds/e_inv.html

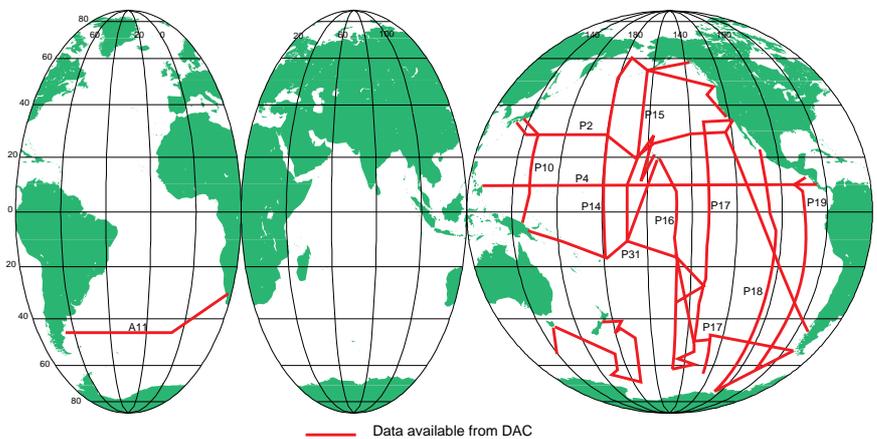
André Bolduc
MEDS, Canada
Fax: 1-613-990-5510
e-mail: bolduc@am.meds.dfo.ca

Drifting Buoy Deployments (Years, No. of Buoys)

Atlantic Ocean	FR 1995-96 16	USA 1990-96 1353
BRAZIL 1993-96 69	GER 1995 12	RUS,USA 1991-94 70
FR 1992-96 52	INDIA 1993-96 70	NZ 1993-95 21
GER 1990-96 273	JP 1990-96 49	
ICE 1992-96 72	USA 1995-96 196	
NATO 1991-96 107		
NL 1990-95 31	Pacific Ocean	Southern Ocean
PORT 1993 30	AA 1991-95 70	ARG 1994-95 8
UK 1992,1994-95 8	CAN 1990-96 136	AA 1991-96 33
USA 1991-96 442	FR 1990-95 100	FR 1995 3
Indian Ocean	JP 1990-96 168	GER 1991-92 40
AA 1993-94 20	KOREA 1991-96 39	USA 1993-96 184
	ROC,USA 1991-96 207	SA 1994-96 64
		OTHERS 1996 56

Acoustic Doppler Current Profilers

Shipboard acoustic Doppler current profilers (ADCPs) when used in conjunction with reliable heading and navigation data can determine absolute currents in the upper ocean. Many WOCE hydrography cruises include the collection and processing of underway ADCP data, and the DAC assembles, reviews, documents, archives and distributes these data. The DAC is a joint effort between the Japan Oceanographic Data Centre (JODC) and University of Hawaii (UH). Data are available in two forms, the densely sampled set or an ASCII standard subset. The map shows the location of WOCE data currently held by the DAC; many other data sets still reside with the PIs and will eventually be submitted. For information of these other



datasets, including the names and contact addresses of the PIs, see the DIU inventory at:

http://www.cms.udel/woce/dacs/adcp_param.html

ADCP DAC

<http://www.jodc.jhd.go.jp/inf/data/current/shipboard-adcp.html>

Shohei Wakamatsu
Japan Oceanographic Data Centre
Fax: 81-3-3545-2885
e-mail: mail@jodc.jhd.go.jp

ADCP Co-DAC

<http://www.soest.hawaii.edu/caldwell/index.html>

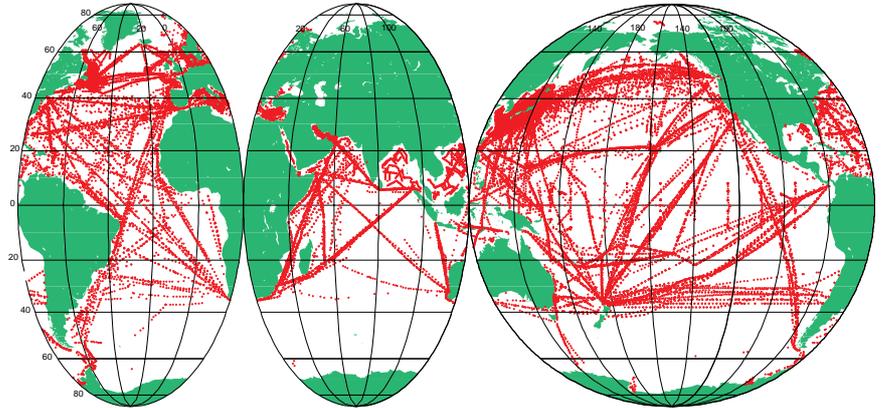
Patrick Caldwell
University of Hawaii, USA
Fax: 1-808-956-2352
e-mail: caldwell@soest.hawaii.edu

UPPER OCEAN AND SEA SURFACE OBSERVATIONS

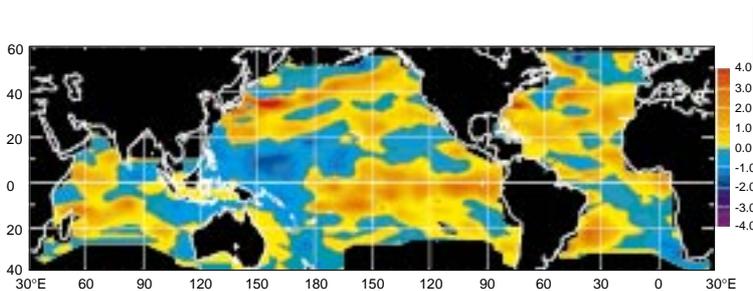
Upper Ocean Thermal Data

A global network of commercial ships takes voluntary upper ocean thermal measurements using Expendable Bathythermographs (XBTs) which are launched every few hours while the ship is steaming. XBTs are also deployed by fishing and research vessels, and together these observations form a global data set of temperature (and sometime salinity) profiles in the top 750 m. Some data are transmitted from the vessels to data centres by satellites in real time (less than 30 days) and made available to users with no restriction. Higher resolution profiles are submitted to the DACs and made available to users 1 year or more after collection. Other instrumentation such as moored buoys, thermistor chains

on drifting buoys, profiling floats and CTDs provide additional profiles.



Locations of upper ocean thermal profiles collected during 1996.



Heat Storage anomalies for 0-400 m in Nov-Dec 1994. Anomalies are referenced to the mean annual cycle computed for 1980-89. Units are Watts/sec-m². Source: UOT DAC Pacific Science Centre WWW site.

UOT DAC

<http://www.nodc.noaa.gov/GTSPP/gtspp-home.html>

Douglas Hamilton
National Oceanographic Data Centre
Silver Spring, USA
Fax: 1-301-713-3301/3302
e-mail: dhamilton@nodc.noaa.gov

UOT DAC Participating Centres

Use the DIU to link to these centres

<http://www.cms.udel.edu/woce/dacs.html>

Assembly and Distribution

NODC, Washington, USA
Marine Environmental Data Services, Canada
Global Subsurface Data Centre, Brest, France

Scientific Quality Control

Atlantic: NOAA/AOML, Miami, USA
Pacific: Scripps Institution of Oceanography, USA
Indian: CSIRO, Hobart, Australia

Some XBT sections are occupied quarterly at a higher rate of spatial sampling. These High Density sections can determine the mean, seasonal cycle, and eddy statistics of temperature and geostrophic shear and transport fields, and obtain some measure of interannual variability. Unlike the majority of XBT data, High Density sections are maintained by PIs who submit a subset of the data in real-time, but have a 2-year proprietary period for the full dataset.

The Upper Ocean Thermal DAC consists of several centres which together provide a globally consistent data set as part of the Global Temperature-Salinity Pilot Project (GTSP). There are two levels of quality control available to users; batch consistency checks performed by national data centres (US NODC and MEDS, Canada), and scientific quality control on a profile-by-profile basis performed by 3 regional centres. The data can be accessed from US NODC which acts as the GTSP distribution facility.

Sea Surface Salinity

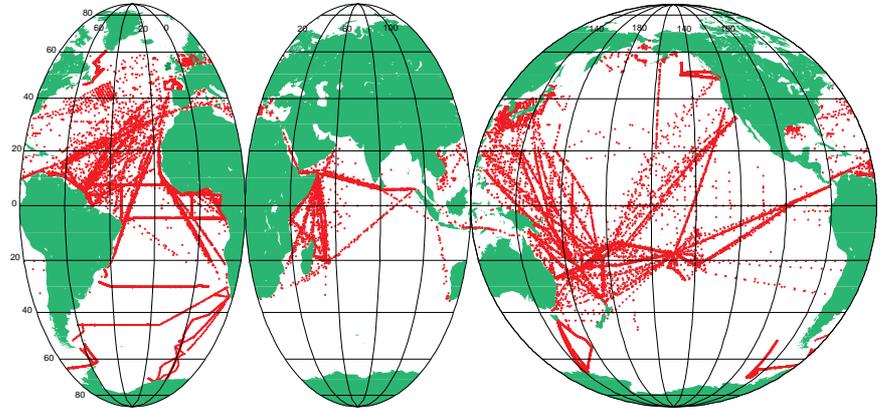
Underway sea surface salinity data are collected on WHP cruises and voluntary observing ships using thermo-salinographs and buckets. Processed and calibrated data are assembled and made available by the DAC. Most of the

DAC holdings at present are from the ORSTOM network of voluntary observing ships; many data sets from WHP cruises still reside with the PIs.

Sea Surface Salinity DAC

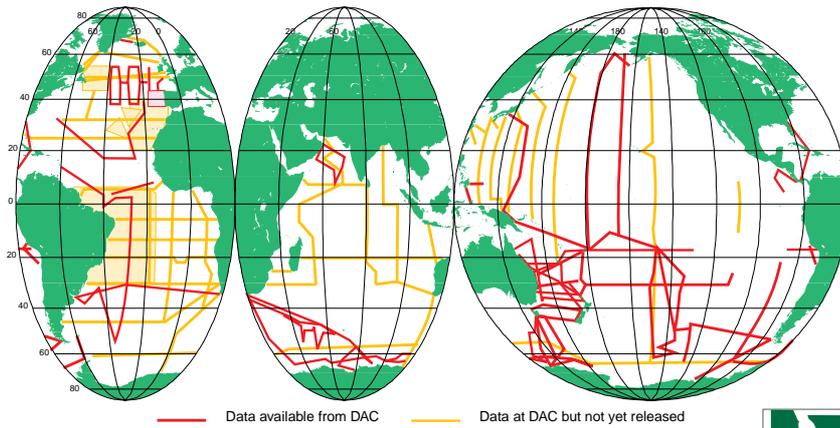
http://www.ifremer.fr/orstom/sss/sss_dac/sss_dac.html

Alain Dessier
IFREMER, France
Fax: 33-98-22-45-14
e-mail: dessier@orstom.fr



Locations of surface salinity data held by the DAC.

Surface Meteorological Data and Surface Fluxes



— Data available from DAC — Data at DAC but not yet released

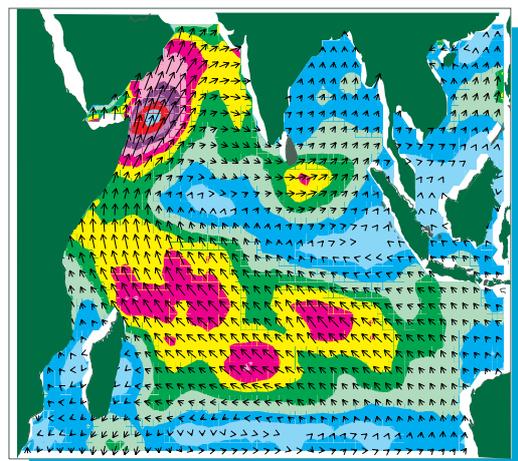
Surface meteorological data are collected on many WOCE cruises, and range from high quality near-continuous recording systems, to ship bridge observations. These data are collected, checked, archived and distributed by the Surface Meteorological DAC. The map shows the data assembled so far, but data from many other WHP cruises still reside with the PIs.

Associated with the DAC is the WOCE SAC for surface fluxes. The SAC produces regularly gridded fields of ocean surface forcing fields (*e.g.* winds, temperatures, humidity, turbulent fluxes of momentum, moisture, and heat) suitable for use by ocean models and intensive diagnostic studies.

Surface Meteorological DAC and Surface Flux SAC

<http://www.coaps.fsu.edu/WOCE>

David M. Legler and James J. O'Brien
Florida State University, USA
Fax: 1-904-644-4841
e-mail: legler@coaps.fsu.edu



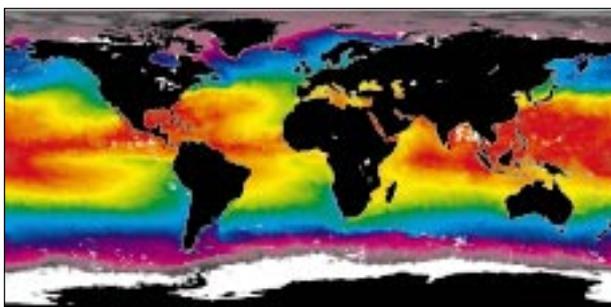
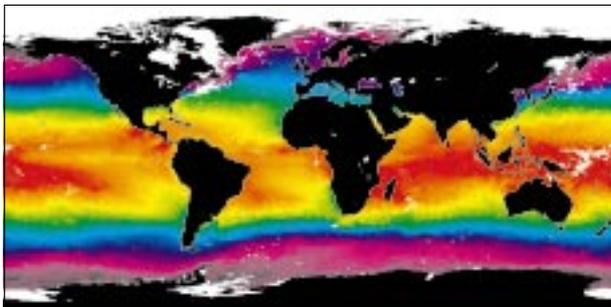
0 20 40 60 80 100 120 140 160 180 200 m^2s^{-2}

Surface Flux SAC Product: Pseudo-stress vectors for August 1996.

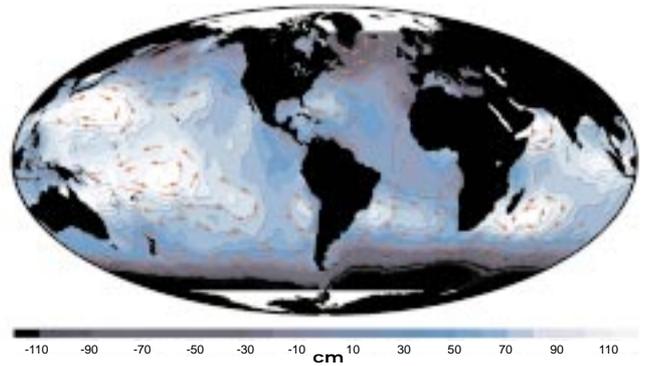
SATELLITE OBSERVATIONS

At the very heart of WOCE are the global measurements made by satellites. The primary interest for WOCE lies with satellite altimetry and its associated geophysical variables of sea level variability and wave height. There are 3 altimeters operating today, the French and USA satellite TOPEX/POSEIDON (since August 1992), and the European Space Agency satellites ERS-1 (since late 1991) and ERS-2 (since April 1995). In addition the US GEOSAT mission operated just prior to the WOCE field programme. Also of interest are wind speed from scatterometers (the NASA scatterometer NSCAT, and ERS-1 and ERS-2), sea surface temperature (the USA AVHRR or Advance Very High Resolution Radiometer) and water vapour content (TOPEX/POSEIDON and the US Special Sensor Microwave Imager or SSMI).

Satellite data are managed by a variety of agencies and data centres, so there are no WOCE satellite DACs. However data and products are available to users through the Internet. TOPEX/POSEIDON data are in the public domain and not restricted, and while ERS-1 and ERS-2 data are available only to specified investigators, products from them are not restricted and are distributed on CD-ROM or Exabyte tape. The Internet sites listed opposite offer a variety of high-level products including corrected and quality-controlled data and anomaly fields. They also contain high-quality images and discussion of the instrumentation and products available.



NOAA-AVHRR Pathfinder Sea Surface Temperature in February 1993 (top) and August 1993 (bottom). Source: PODAAC WWW site.



Sea surface dynamic topography as observed by TOPEX/POSEIDON. Source: AVISO WWW site (Space Oceanography Division, CLS, Toulouse, France).

Satellite Data and Product Centres

<http://www.cms.udel.edu/woce/dacs.html>

Altimetry, sea level, waveheight, scatterometry, sea surface temperature, tide models

<http://podaac-www.jpl.nasa.gov/>

Physical Oceanography Distributed Active Archive Center (PODAAC)

Jet Propulsion Laboratory, USA

Fax: 1-818-393-2718

e-mail: podaac@podaac.jpl.nasa.gov

Altimetry, sea level, waveheight

<http://alti.cnes.fr>

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Altimetry, sea level, waveheight, scatterometry, sea surface temperature

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ERS-1 and ERS-2 products and programme description

<http://www.esrin.esa.it/>

European Space Agency

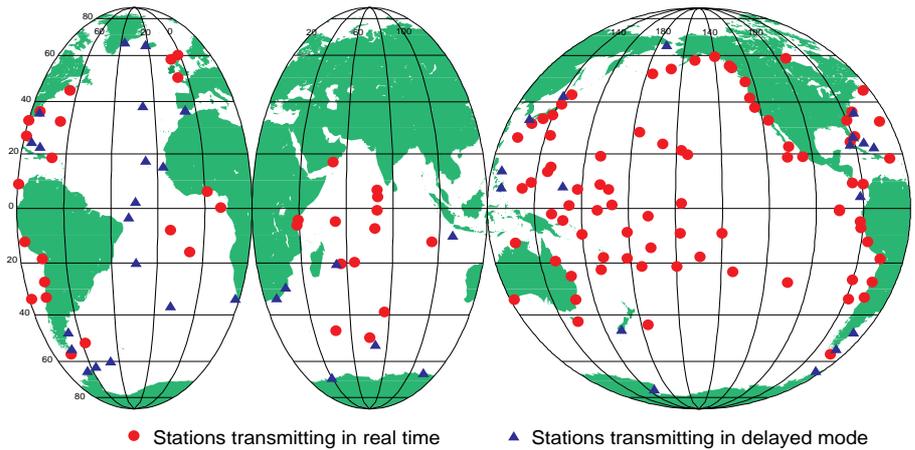
Frascati, Italy

Fax: 39-6-94180-652

e-mail: eohelp@mail.esrin.esa.it

IN SITU SEA LEVEL DATA

WOCE tide gauges make hourly or more frequent observations to provide *in situ* data to support altimetry, and to estimate geostrophic currents across straits. Many stations transmit data by satellite in real time (delay of 1–3 months) and these are assembled and distributed by the Fast Delivery DAC. The Delayed Mode Sea Level DAC assembles, quality controls, distributes and archives all available sea level data (18–24 months).



Sea Level DAC

Fast Delivery Centre

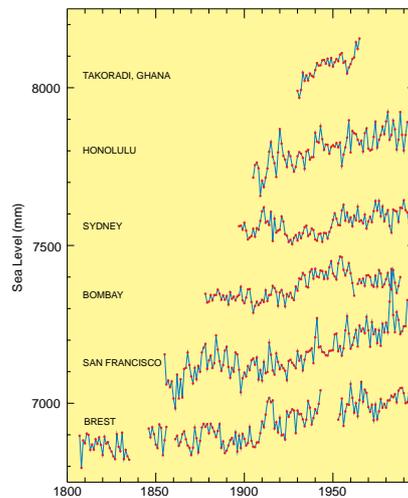
<http://www.soest.hawaii.edu/kilonsky/uhsdc.html>

Mark Merrifield
 University of Hawaii, USA
 Fax: 1-808-956-4104
 e-mail: markm@soest.hawaii.edu

Delayed Mode Delivery Centre

<http://www.nbi.ac.uk/bodc/woce/dmsldac.html>

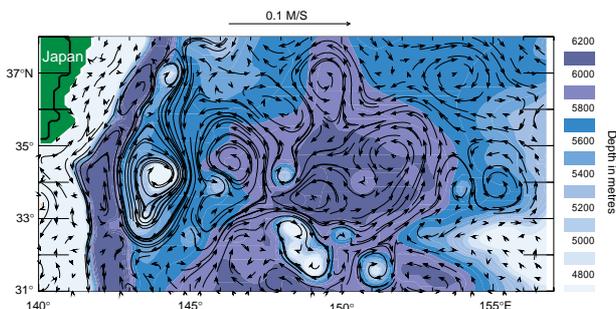
Lesley Rickards
 Proudman Oceanographic Laboratory, UK
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Long sea level records from each continent. Each record is offset vertically. Trends for the 20th century are of order 0.5 mm/year at each site. Source: P. Woodworth, PSMSL, UK.

OCEAN MODELLING

During WOCE there has been extraordinary development in the capability of numerical models to simulate the ocean's dynamical structure and properties. Both basin-wide and global models show impressive realism, using



Model results illustrating the dynamics of the topographic impact in the Kuroshio Extension region just east of Japan. Mean abyssal currents overlaying the bottom topography. Source: H. Hurlburt, NRL, Stennis Space Center, USA.

20–60 vertical levels and horizontal resolutions as fine as $\frac{1}{2}$ of a degree. Global eddy resolving models and coupled ocean-atmosphere (climate) models require the most powerful computers and so are run at only a few centres. New model developments (isopycnal, topography following and finite element) have diversified modelling opportunities. Assimilating WOCE observations into ocean models is a burgeoning field. Where observed winds, or satellite altimeter data or XBT measurements are introduced, models are quite successful in predicting aspects of observed ocean behaviour.

It is not possible to identify the activity of all ocean modelling groups at perhaps 100 sites around the world, but the largest have WWW sites which describe their research and also offer model output. Start your search at:

<http://www.soc.soton.ac.uk/OTHERS/woceipo/modelling.html>

THE WOCE DATA ARCHIVE

WOCE Archive

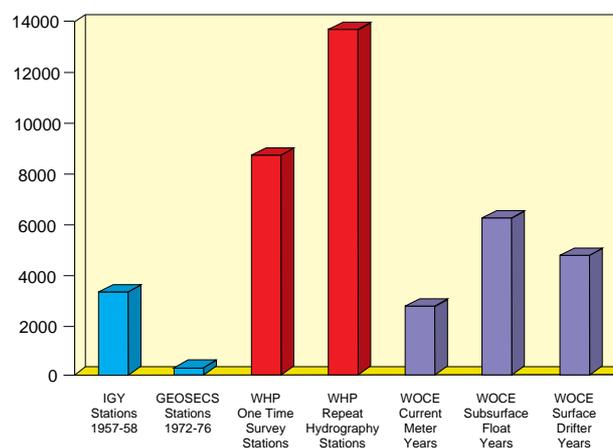
<http://www.nodc.noaa.gov/>

Douglas Hamilton
National Oceanographic Data Center
Silver Spring, USA
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The secure final archive of the WOCE data set is to be carried out by the World Data Centre, specifically WDC-A (Oceanography) at the National Oceanographic Data Center in the USA. WDC-A is committed to archiving and preserving the (non-satellite) WOCE data set in its entirety. In addition, all DACs and SACs are committed to producing CD-ROMs of their complete holdings to be distributed in association with WDC-A. A searchable data retrieval system will be developed at WDC-A for the WOCE data set. The Archive will provide continuity into the future when the WOCE DACs and SACs are no longer active.

WOCE: THE LARGEST GLOBAL OCEAN EXPERIMENT SO FAR

The various components of WOCE combine to form the biggest and most comprehensive oceanographic experiment undertaken to date. Satellite measurements, *in situ* observations and the development of models are all contributing to this first truly global ocean experiment. The chart shows how the number of WOCE oceanographic stations far exceeds previous experiments, and illustrates the high number of “data years” of direct current measurements being accumulated. In addition there are some 60,000 XBT profiles collected per year, and extensive sets of ADCP and surface salinity data. The global satellite data sets provide a level of coverage previously unobtainable. The accurate and quasisynoptic WOCE data set will be the definitive baseline of the “state of the ocean” against which future changes will be measured. The success of WOCE has relied on a new level of international co-operation which is set to continue in future climate-related projects and global ocean observational programmes.



Number of hydrographic stations and data-years of measurements taken by WOCE, and previous oceanographic expeditions.

WOCE International Project Office

<http://www.soc.soton.ac.uk/OTHERS/woceipo/ipo.html>

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WOCE Data Information Unit

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