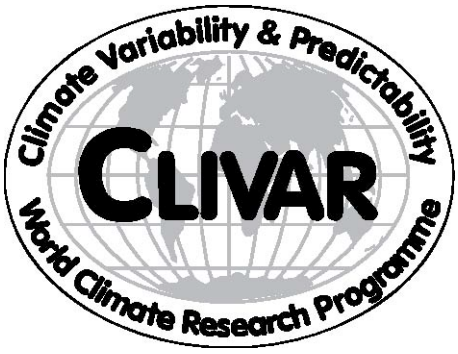
INTERNATIONAL COUNCIL FOR SCIENCE | INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION | WORLD METEOROLOGICAL ORGANIZATION

WORLD CLIMATE RESEARCH PROGRAMME



The CLIVAR Handbook

March 2009

CLIVAR is a component of the World Climate Research Programme (WCRP), which was established by WMO and ICSU, and is carried out in association with IOC and SCOR. The scientific planning and development of CLIVAR is under the guidance of the JSC Scientific Steering Group for CLIVAR assisted by the CLIVAR International Project Office. The Joint Scientific Committee (JSC) is the main body of WMO-ICSU-IOC formulating overall WCRP scientific concepts.

CLIVAR Handbook is compiled from information available at the CLIVAR International Project Office.

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I. CLIVAR Overview

CLIVAR is an international research programme investigating climate variability and predictability on time-scales from months to decades and the response of the climate system to anthropogenic forcing. CLIVAR, as one of the major components of the World Climate Research Programme (WCRP), started in 1995 has a lifetime of 15 years.

The specific objectives of CLIVAR are:

1. To describe and understand the physical processes responsible for climate variability and predictability on seasonal, interannual, decadal, and centennial time-scales, through the collection and analysis of observations and the development and application of models of the coupled climate system, in cooperation with other relevant climate-research and observing programmes.
2. To extend the record of climate variability over the time-scales of interest through the assembly of quality-controlled paleoclimatic and instrumental data sets.
3. To extend the range and accuracy of seasonal to interannual climate prediction through the development of global coupled predictive models.
4. To understand and predict the response of the climate system to increases of radiatively active gases and aerosols and to compare these predictions to the observed climate record in order to detect the anthropogenic modification of the natural climate signal.

II. Programme Structure and Implementation

1. The three streams of CLIVAR

Initially, the CLIVAR programme was organized in three streams:

1. CLIVAR-GOALS: A study of seasonal-to-interannual climate variability and predictability of the global ocean-atmosphere-land system;
2. CLIVAR-DecCen: A study of decadal-to centennial climate variability and predictability, and
3. CLIVAR-ACC: modelling and detection of anthropogenic climate change.

1.1 CLIVAR GOALS

examines the variability and predictability of the Global Ocean Atmosphere Land System on seasonal-to-interannual time-scales, building on the successes of the TOGA programme, by:

1. developing observational capabilities to describe seasonal and interannual climate variability, including continuation of the TOGA observing system;
2. further developing models and predictive skill for SST and other climate variables on seasonal to interannual time scales around the entire global tropics;
3. building understanding and predictive capabilities of the interaction of monsoons with the Indian Ocean, ENSO and land surface processes;
4. understanding climate variability and predictability arising from the interaction between the tropics and extratropics;
5. exploring the predictability of extratropical seasonal to interannual climate variability induced by the interaction of the atmosphere with oceans, land surface processes, and sea-ice processes and developing means to exploit any such predictability.

1.2 CLIVAR DecCen

determines the mechanisms of variability and predictability of climate fluctuations on Decadal-to-Centennial time-scales with a special emphasis on the role of the oceans in the global coupled climate system by:

1. describing and understanding the patterns of global decadal-to-centennial climate variability in the instrumental, paleoclimatic, and model records;
2. extending the records of climatic variability by concerted efforts of data recovery, reanalysis of existing atmospheric, oceanic and paleoclimatic data, finding new paleoclimatic indices, and instituting new oceanographic monitoring sites;

3. developing and implementing appropriate observing, modelling, computing, and data collection and dissemination systems needed to describe, understand, and predict global decadal variability;
4. identifying and studying the oceanic regions and processes, such as water mass transformation regions, strong boundary currents and return path “choke points“, through which the ocean and atmosphere interact to produce decadal-to-centennial climate variability.

1.3 CLIVAR ACC

studies the response of the climate system to Anthropogenic Climate Change by:

1. developing understanding, modelling and predictive capabilities of the response of the climate system to the anthropogenic increases in radiatively active gases and changes in aerosols;
2. identifying the patterns of anthropogenic modification to the mean state and to the variability of the climate system;
3. using the understanding of natural climate variability derived from the other two CLIVAR component programmes as a baseline for detecting the trends and signatures associated with increases in greenhouse gases and the effects of other anthropogenic changes.

2. Unifying Themes and the Principal Research Areas

The Initial CLIVAR Implementation Plan which was published in 1998 provides some elaboration of the objectives and requirements of the three streams of CLIVAR, the Global Ocean Atmosphere Land System (GOALS), Decadal to Centennial Climate Variability (DecCen) and Anthropogenic Climate Change (ACC), all closely linked across geographical regions and with overlapping time scales. It defines 11 mostly regional oriented Principal Research Areas (PRA's) within a global framework of CLIVAR. It also identifies and discusses common (unifying) themes and approaches of global analysis and modelling activities that provide the unifying framework through which CLIVAR will be implemented.

Fig. 1: The structure of the CLIVAR Programme: Unifying Themes and Approaches

These include

- Predictability and prediction
- Global modelling
- Downscaling
- Global sustained observations
- Improved historical data
- Paleoclimate data and modelling
- Reanalysis
- Empirical studies.

The CLIVAR Principal Research Areas (PRA's) have been defined accordingly to the existing streams of CLIVAR.

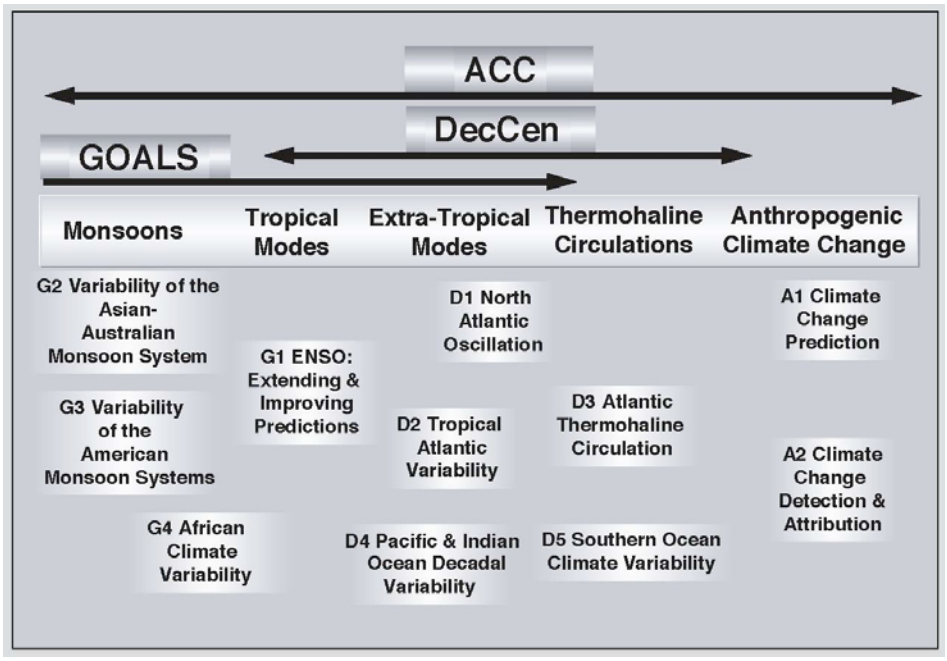


Fig. 2: The CLIVAR Principal Research Areas

GOALS

The four principal research areas that have been identified in the GOALS component of CLIVAR are:

ENSO: Extending and Improving Predictions (G1):

Advancing understanding and observations of climate variability associated with El Niño Southern Oscillation (ENSO) and global teleconnections to improve prediction and applications.

Variability of the Asian - Australian Monsoon (G2):

Developing better understanding of the mechanisms of interannual and interseasonal variations of the Asian-Australian monsoon and to improve their prediction.

Variability of the American Monsoon Systems (G3):

Developing better understanding of the Pan American monsoon, its interannual variations, and its origin and links to the Pacific and Atlantic.

African Climate Variability (G4):

Initiating studies of the interannual variability and predictability of the African climate and the dependence on SST changes to improve predictions of African climate.

DecCen

The five principal research areas identified for the DecCen component of CLIVAR are:

The North Atlantic Oscillation (D1):
Improving the description and understanding of decadal ocean and atmosphere variability in the North Atlantic region involving the North Atlantic Oscillation.

Tropical Atlantic Variability (D2):
Improving the description and understanding of the patterns of decadal variability originating in the tropical Atlantic.

Atlantic Thermohaline Circulation (D3):
Improving the description and understanding of decadal to centennial variability and the possibilities of rapid climate change associated with the Atlantic thermohaline circulation.

Pacific and Indian Ocean Decadal Variability (D4):
Improving the description and understanding of the decadal variability and its predictability in the Pacific and Indian Ocean basins, and its relationship with ENSO and teleconnections.

Southern Ocean Climate Variability (D5):
Improving the description and understanding of the variability of the Antarctic Circumpolar Current, ocean overturning and water mass transformations in the Southern Oceans.

ACC
The two principal research areas identified for the ACC component of CLIVAR are:

Climate Change Prediction (A1):
Improving prediction through the use of coupled climate models of the likely climate change in response to scenarios of effects of future human activities.

Climate Change Detection and Attribution (A2):
Detecting and attributing anthropogenic climate change in the presence of the natural variability of the climate system.

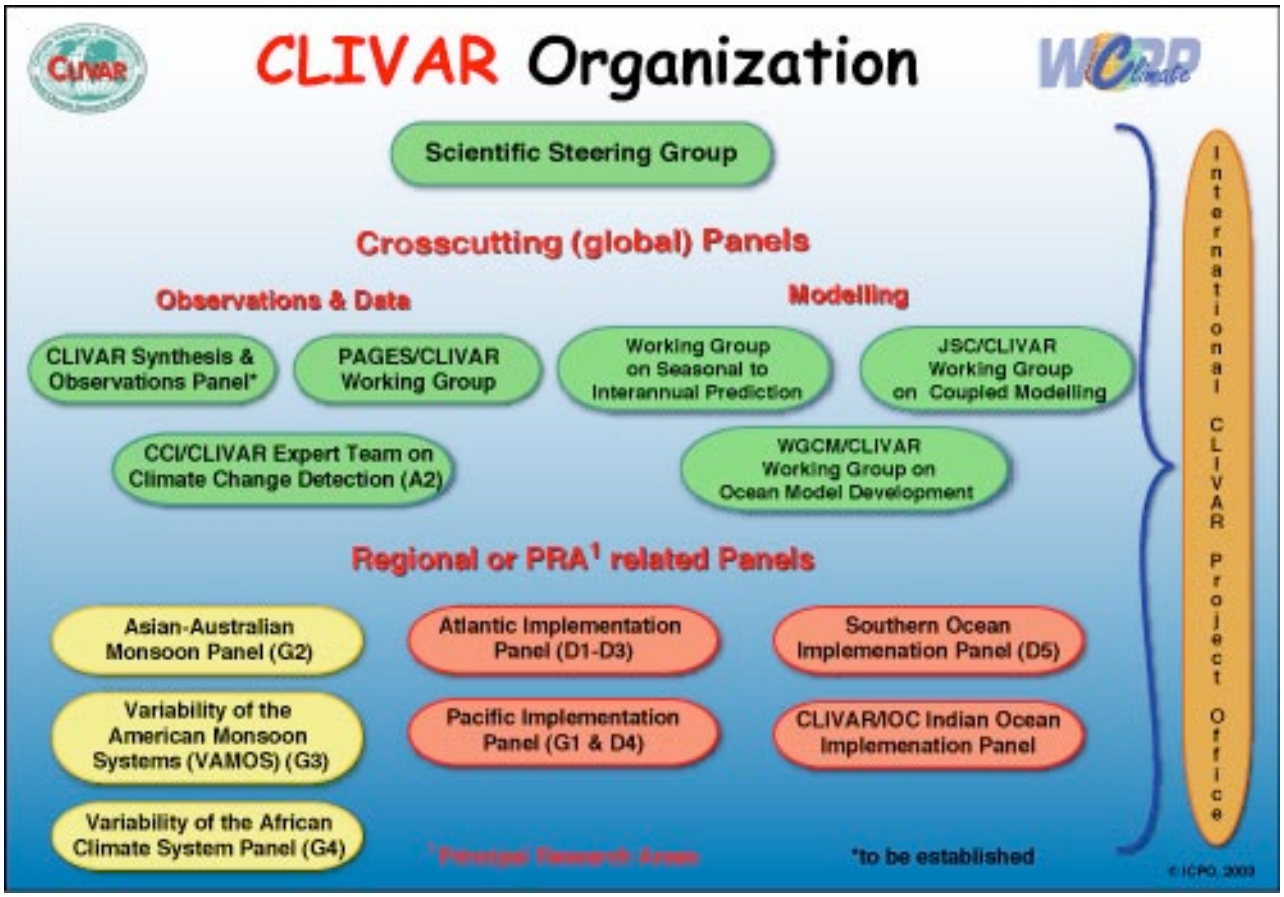
3. Basin-wide Extended Studies

Since some of the PRA's have a considerable amount of overlap, it turned out to be more practical and synergetic for the implementation of the programme to group some of the Principal Reaseach Areas to ocean basin oriented projects. Thus the three Atlantic PRA's D1-D3 will define a comprehensive Programme within the Atlantic sector whereas G1 and D4 will be combined to a Pacific Basin-wide Extented Study (PBECS).

4. Milestones of the Programme

1990	Programme proposed at the 2nd World Climate Conference
1993	The Joint Scientific Committee of WCRP established CLIVAR
1995	CLIVAR Science Plan published, International CLIVAR Project Office (ICPO) opened in Hamburg
1997	Overview brochure as part of the Initial CLIVAR Implementation Plan published
1998	Initial CLIVAR Implementation Plan published, ICPO moves to Southampton,
	International CLIVAR Conference in Paris
1999/2000	Nations start to implement CLIVAR, first national CLIVAR projects funded
2004	1st International CLIVAR Science Conference in Baltimore

1. Introduction



The schematic diagram above summarizes the current structure of CLIVAR

The Scientific Steering Group (SSG) has oversight over the implementation of CLIVAR and reports to the Joint Scientific Committee (JSC) of the World Climate Research Programme (WCRP).

For efficient implementation, coordination and management of the CLIVAR programme, several panel and working groups have been established. Some of them are organised jointly with other WCRP component programmes or in close collaboration of IGBP, GOOS/GCOS or IPCC activities.

The CLIVAR SSG continuously reviews the organizational structure of the programme with the aim of eliminating the distinction between the component programmes and combining them into a single CLIVAR programme that has common modelling, observing and analysis projects.

The International CLIVAR Project Office is responsible for the co-ordination of the scientific as well as for the administrative aspects of the CLIVAR programme under the oversight of the CLIVAR Scientific Steering Group (SSG).

The full details of the organizational structure can be found in this publication.

2. CLIVAR Working Groups and Panels

2.1 Cross-cutting or Global Panels

CLIVAR Scientific Steering Group (SSG)

Terms of Reference:

1. To formulate the CLIVAR research programme on climate variability and predictability, based on coupled ocean-atmosphere models, guided by the analysis of observations including paleoclimatic reconstructions, as required to understand the phenomena and predict climate variations.
2. To organise an observing programme that would fulfil the data requirements of CLIVAR, taking into account the development of the operational Global Climate and Global Ocean Observing Systems and possible contributions from national research projects.
3. To provide scientific guidance for the implementation of CLIVAR, using advice of experts and expert groups as necessary.
4. To ensure the exchange and analysis of CLIVAR data and the dissemination of scientific results.
5. To establish scientific liaison with relevant organizations and existing programmes, as appropriate.
6. To advise the Joint Scientific Committee of the World Climate Research Programme of progress achieved in the implementation of CLIVAR and scientific advances in the understanding of climate variability and predictability.

Members

J. Hurrell (co-chair) (09)	NCAR, U.S.A.
T. Palmer (co-chair) (07)	ECMWF, Reading, United Kingdom
M. Visbeck (co-chair) (10)	IFM-GEOMAR, Kiel, Germany
W Dong (10)	National Climate Centre, Beijing, China
L. Goddard (10)	Earth Institute at Columbia, U.S.A.
B N Goswami (10)	Indian Institute for Science, Bangalore, India
C R Mechoso (10)	University of California, Los Angeles, U.S.A.
T. Tokioka (07)	Frontier Research System for Global Change, Kanagawa, Japan

Ex-Officio Members

One chair/co-chair from each CLIVAR Panel and Working Group (with other co-chairs as alternates)
Dr Thomas P Ackerman Chair - GEWEX, Univ. of Washington, USA

The group e-mail address for the CLIVAR SSG is: clivar-ssg@clivar.org

The ICPO contact for the CLIVAR SSG is Dr. Howard Cattle.

Working Group on Seasonal to Interannual Prediction (WGSIP)

Terms of Reference:

1. To develop a programme of numerical experimentation for seasonal-to-interannual variability and predictability, paying special attention to assessing and improving predictions;
2. To develop appropriate data assimilation, model initialization and forecasting procedures for seasonal-to-interannual predictions, considering such factors as observing system evaluation, use of ensemble and probabilistic methods and statistical and empirical enhancements, and measures of forecast skill;
3. To advise the CLIVAR SSG on the status of seasonal to interannual forecasting and on the adequacy of the CLIVAR observing system, and to liaise with JSC/CLIVAR Working Group on Coupled Modelling and the JSC/CAS Working Group on Numerical Experimentation.

Members

B. Kirtman (co-chair) (09)	COLA, Calverton, USA
T. Stockdale (co-chair) (08)	ECMWF, Reading, UK
O. Alves (09)	BMRC, Melbourne, Australia
G. Boer (09)	CCCma, Victoria, Canada
M. Deque (09)	METEO, Toulouse, France
D. DeWitt (09)	IRI, Palisades, U.S.A.
R. Koster (09)	NASA/GSFC, Greenbelt, USA
W. Landman (09)	South African Weather Service, South Africa
A. Morse (08)	University of Liverpool, United Kingdom
P. Nobre (08)	INPE/CPTEC, Cachoeira Paulista, Brazil
H. Lu Pan (09)	NCEP, Camp Springs, U.S.A.
T. Ose (09)	Meteorological Research Institute, Tsukuba, Japan
C. Saulo (12)	CIMA, Universidad de Buenos Aires, Argentina
A Scaife (09)	The Hadley Centre, Exeter, United Kingdom

The group e-mail address for this panel is: clivar-wgsip@clivar.org

The ICPO contact for the CLIVAR WGSIP is Dr Anna Pirani

JSC/CLIVAR Working Group on Coupled Modelling (WGCM)

The Working Group on Coupled Modelling is a joint group of the Joint Scientific Committee for the WCRP and CLIVAR.

Terms of Reference:

1. Review and foster the development of coupled climate models, including organisation of model intercomparisons and utilisation of available instrumental records and paleo-climatic data for model validation and diagnosis of shortcomings;
2. Promote co-ordinated experimentation with coupled models aiming to understand natural climate variability on decadal to centennial time scales and its predictability, and to predict the response of the climate system to changes in natural and anthropogenic forcing;
3. Promote the development of appropriate data assimilation procedures for coupled models and consider questions related to initialisation;
4. Undertake other modelling activities in support of CLIVAR and the WCRP, as requested by the CLIVAR Scientific Steering Group and the JSC;
5. Advise the CLIVAR Scientific Steering Group and the WCRP Joint Scientific Committee on progress in the development and use of global coupled models, and review and coordinate modelling activities as appropriate within CLIVAR and in the WCRP as a whole;
6. Maintain close co-operation with the JSC/CAS Working Group on Numerical Experimentation in establishing an integrated approach to climate modelling in the WCRP;
7. Liaise as appropriate with IPCC and the Global Analysis, Interpretation and Modelling (GAIM) element of IGBP.

Members:

G. Meehl (co-chair)(11)	NCAR, Boulder, USA
S. Bony (co-chair)(11)	LMD/IPSL, France
P. Bracannot (11)	Lab. de Modelisation d. Climat et de l'Environnement, Gif sur Yvette, France
V. Eyring (12)	DLR, Institut fuer Physik der Atmosphaere, Wessling, Germany
M. Giorgetta (11)	Max Planck Institute for Meteorology, Germany
F. Giorgi (10)	ICTP, Italy
A. Hirst (11)	CSIRO, Aspendale, Australia
D. Karoly (10)	University of Oklahoma, USA
M. Kimoto (10)	University of Tokyo, Japan
C. Le Quéré (10)	Max Planck Institut fur Biogeochemie, Germany
N. Nakicenovic (10)	IIASA, Austria
B. Wang (12)	LASG, Chinese Academy of Sciences, Beijing, China

Ex-Officio member

S Griffies (co-chair WGOMD)	NOAA/GFDL, Princeton, USA
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G. Flato (WCRP JSC)	Canadian Centre for Climate Modelling and Analysis, Canada

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The contact for the JSC/CLIVAR WGCM is Dr Ghassem Asrar, JSC for WCRP
The ICPO contact for the WGCM is Dr. Anna Pirani

CLIVAR /WGCM Working Group on Ocean Model Development (WGOMD)

Terms of Reference:

1. To stimulate the development of ocean models for research in climate and related fields, with a focus on decadal and longer timescales at mid-and high-latitudes.
2. To encourage investigations of the effects of model formulation on the results of ocean models, making use of sensitivity studies and intercomparisons.
3. To promote interaction amongst the ocean modelling community and between this and other communities through workshops and other activities.
4. To stimulate the validation of ocean models when used in stand alone mode and as part of a coupled ocean-atmosphere model, using oceanographic data and other methods, and to advise on the observational requirements of such studies.
5. To publicise developments in ocean models amongst the climate modelling community.
6. To collaborate with other activities in areas of overlapping responsibility.
7. To advise on ocean modelling and related issues and to report on its activities to the JSC/CLIVAR WGCM and CLIVAR Scientific Steering Group.

Members

S. Griffies (co-Chair) (08)	Geophysical Fluid Dynamics Lab., NOAA, Princeton, USA
H. Banks (09) (co-Chair)	Hadley Centre, Exeter, UK
G. Danabasoglu (09)	NCAR, Boulder, USA
H. Drange (09)	University of Bergen, Bergen, Norway
M. England (08)	University of New South Wales, Sydney, Australia
R. Greatbatch (09)	Dalhousie University, Nova Scotia, Canada
G. Madec (09)	LODYC, France
H. Tsujino (09)	Japan Meteorological Agency, Tsukuba, Japapn

Ex Officio Officer

R Gerdes (CliC)	Alfred Wegener Institut für Polar-unjd Meeresforschung, Bremerhaven, Germany
C. Böning	Leibniz Institut für Meereswissenschaften, Kiel, Germany
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A.M. Treguier	Laboratoire de Physique de Océans, IFREMER, France

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The ICPO contact for the CLIVAR/WGCM WGOMD is Dr. Anna Pirani.

CLIVAR Global Synthesis and Observation Panel (GSOP)

The CLIVAR Global Synthesis and Observations panel is established to:

1. Develop, promote and seek to implement strategies for a synthesis of global ocean, atmosphere and coupled climate information through analysis and reanalysis efforts and through the use of other techniques where appropriate. Initial emphasis will be on global ocean synthesis efforts, building on previous experiences and developments.
2 Be responsible for the definition and fulfilment of CLIVAR's global needs for sustained observations (in collaboration with relevant WMO and IOC bodies, including GCOS, GTOS, GOOS, AOPC and OOPC, and JCOMM), and for the development of a strategy for their evolution/optimization based on new science and reanalysis insights, and fostering the use of resulting data sets in global synthesis efforts.
3. Promote activities to develop the surface flux data sets required by CLIVAR in liaison with the WGNE, global atmospheric reanalysis efforts and the WCRP Working Group on Surface Fluxes.
4. Provide an overview of and directions to CLIVAR data management and information activities in collaboration with other WCRP projects and in liaison with CLIVAR-relevant data centres and DACS and the ICPO.
5. Liaise and collaborate with CLIVAR Panels and Working Groups in identifying the requirements for and coordinating the development of an observing system for CLIVAR.

The Panel reportds to the CLIVAR SSG.

Members (established 2004)

B. Sloyan (co-Chair) (09)	CSIRO, Marine Research, Hobart, Australia
D Stammer (co-chair) (09)	Institut für Meereskunde, Hamburg, Germany
D Behringer (08)	NOAA, Camp Springs, USA
M Fukasawa (08)	JAMSTEC, Kanagawa, Japan
K. Haines (09)	ESSC, University of Reading, United Kingdom
S Josey (08)	National Oceanography Centre, Southampton UK
M McPhaden (08)	NOAA/PMEL, Seattle, U.S.A.
S. Pouliquen (09)	CERSTAT, IFREMER, France
D. Roemmich (09)	Scripps Institution of Oceanography, La Jolla, USA
U. Send (08)	Scripps, La Jolla, U.S.A.
T. Tanhua (09)	Leibniz Institute of Marine Sciences, Kiel, Germany
A Weaver (08)	CERFACS, Toulouse, France
S. Wijffels (08)	CSIRO, Hobart, Tasmania, Australia
J. Willis (09)	NASA/JPL California Institute of Technology, USA

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The ICPO contact for GSOP is Dr Kate Stansfield

PAGES/CLIVAR Working Group

Terms of Reference:

The PAGES / CLIVAR Working Group will:

1. formulate and promote, in collaboration with PAGES and CLIVAR, a programme of paleoclimatic reconstruction providing long-term records of quantitative paleoclimatic data with seasonal to interannual resolution in areas which are of direct relevance to IGBP and WCRP (i.e., monsoon and ENSO regions, the North Atlantic, and areas of the globe with possible hydrologic predictability).
2. formulate and promote, in collaboration with PAGES and CLIVAR, a programme for collecting, analyzing and integrating paleoclimatic data in order to reveal evidence of patterns of variability within the climate system over seasonal to century time scales.
3. formulate and promote the use of paleoclimatic data in evaluating predictive physical climate models, as well as the use of inverse models, to understand the variability present in the paleoclimatic and paleoceanographic record, and to cooperate with other modelling activities of relevance to PAGES and CLIVAR.

Members

G. Schmidt (co-chair) (09)	NASA/Goddard Institute for Space Studies, New York, U.S.A.
V. Masson-Delmotte (co-chair)	Lab. de Modelisation d. Climat et de l'Environnement, Gif-sur-Yvette, France
J. Beer (09)	EAWAG, Dubendorf, Switzerland
K Briffa (09)	University of East Anglia, Norwich, United Kingdom
P. Clark (08)	Oregon State University, Corvallis, U.S.A.
E. Cortijo (08)	Laboratoire des Sciences du Climat et l'Environnement, Gif-sur-Yvette, France
J. Hurrell (08)	NCAR, Boulder, U.S.A.
E Jansen (08)	University of Bergen, Bergen, Norway
M. Mann (09)	University of Virginia, Charlottesville, U.S.A.
A. Schmittner (08)	Oregon State University, Corvallis, U.S.A.
P. Valdes (08)	University of Bristol, Bristol, United Kingdom
A Weaver (09)	University of Victoria, Victoria, Canada
W. Zhou (08)	Institute of Earth Environment, Chinese Academy of Sciences, Xi'an, China

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The ICPO contact for the PAGES/CLIVAR Working Group is Dr. Anna Pirani
The PAGES contact for the PAGES/CLICAR Working Group is Dr T Kiefer

2.2 Regional or PRA-oriented panels and Working Groups

CLIVAR Asian-Australian Monsoon Panel (AAMP)

Terms of Reference:

The Panel will, in co-operation with CLIVAR WGSIP and other CLIVAR Panels:

1. evolve a strategy to assess climate variability and predictability of the coupled ocean-atmosphere-land system in the Asian-Australia-Africa monsoon region.
2. design and implement a programme to investigate the mechanisms of ENSO-monsoon interactions.
3. determine a monitoring strategy for the Indian Ocean, Western Pacific and surrounding marginal seas and land regions necessary for investigating the structure and variability of the monsoon.
4. co-ordinate and promote interactions among meteorologists, oceanographers and hydrologists from interested nations.
5. develop an implementation plan for monsoon research in the region, that recognizes the need for a well co-ordinated and optimised set of process studies.
6. work in co-operation with other existing and planned regional and multinational programmes directed at improving our understanding of the monsoon system, which include investigations on regional weather forecasting, seasonal climate prediction and impacts on human activities.

Members

H. Hendon (co-chair)(09)	BMRC, Melbourne, Australia
K. Sperber (co-chair)(12)	Lawrence Livermore National Laboratory, Livermore, U.S.A.
I.S. Kang (09)	Seoul National University, Seoul, Korea
A Kitoh (12)	Meteoroligical Research Institute, Japan
H. Meinke (10)	Dept. of Primary Industries and Fisheries, Queensland, Australia
M. Rajeevan (09)	LRF/NCC, India Meteorological Dept., Pune, India
B Qiu (10)	University of Hawaii, USA
A Turner (12)	University of Reading, United Kingdom
G Vecchi (10)	NOAA/ Geophysical Fluid Dynamics Laboratory, Princeton, USA
B. Wang (10)	University of Hawaii, Honolulu, U.S.A.
X Zeng (12)	University of Arizona, USA
T Zhou (12)	State Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Dynamics, China
Ex-Officio	
G Meyers	CSIRO, Hobart, Australia (IOP Chair)

The group e-mail address for this panel is: clivar-monsoon@clivar.org

The ICPO contact for the CLIVAR Asian Australian Monsoon Panel is Dr. Carlos Ereño

CLIVAR/GOOS Indian Ocean Panel (IOP)

The need for high-quality ocean observations is shared by research (CLIVAR) and ocean applications and services (GOOS) and there is a shared conviction that, together, the ocean community should endeavour to establish the basis for a comprehensive ocean observation network and oversee the staged implementation of a sustainable ocean observing system for the Indian Ocean. It is therefore agreed that a Panel will be established and supported by CLIVAR and GOOS (through Indian Ocean GOOS and the Perth Office of the IOC) with the following:

Terms of Reference.

1. Provide scientific and technical oversight for a sustained ocean observing system for the Indian Ocean and Indonesian Throughflow in order to provide ocean observations needed for climate variability research and to underpin operational ocean applications and services relevant to the region, particularly with regard to ocean-state estimation and climate prediction.
2. Develop, coordinate and implement a plan for a sustained ocean observing system for the Indian Ocean to (a) meet the common requirement of CLIVAR research themes and regional initiatives, particularly those identified by AAMP and VACS and the CLIVAR modelling panels, (b) satisfy the common requirements of GOOS and its modules, and (c) coordinate implementation activities in collaboration with relevant regional and global bodies and IOGOOS and JCOMM in particular.
3. Liaise with relevant research Panels of CLIVAR and implementation Panels of GOOS and JCOMM and provide a focal point for coordination of ocean observing networks in the region.
4. Report to the CLIVAR SSG through its AAMP and to GOOS through the IOC Perth Office.

Members

W Yu (co-chair)(12)	First Institute of Oceanography, Qingdao CHINA
Y Masumoto (co-chair) (09)	FORSGC, JAMSTEC, Tokyo, JAPAN
M Feng (12)	CSIRO Floreat Western AUSTRALIA
R Hood (12)	Horn Point Lab. Uni. Meryland USA
T Lee (09)	NASA Jet Propulsion Laboratory, Pasadena USA
J McCreary (AAMP)	University of Hawaii, Honolulu, USA
M McPhaden (10)	NOAA, PMEL, Seattle, USA
G Meyers(10)	CSIRO, Hobart, AUSTRALIA
V S N Murthy (09)	National Institute of Oceanography, Goa INDIA
W. de Ruijter 09)	University of Utrecht, NL
D Sengupta (12)	Indian Institute of Science, Bangalore INDIA
F Syamsudin (09)	BPPT, Jakarta INDONESIA
G Vecchi (09)	NOAA-GFDL, Princeton USA
J Vialard (09)	LOCEAN, Paris FRANCE
L Yu (10)	Woods Hole Oceanographic Institution, Woods Hole, USA

The group email for this panel is clivar-iop@clivar.org
The ICPO contact is Dr Roberta Boscolo

Atlantic Implementation Panel

Terms of Reference:

1. To recommend and oversee the implementation of observations in the Atlantic Ocean sector and of research on Atlantic climate variability and predictability, in order to meet the objectives outlined in CLIVARs Science and Initial Implementation Plans, particularly with respect to the Principal Research Areas D1 (NAO), D2 (TAV), D3 (THC), and anthropogenic climate change.
2. To collaborate with JSC/CLIVAR WGCM, WGOMD, and WGSIP in order to contribute to the design of appropriate numerical experiments and to jointly define and implement the requirements for data sets needed to validate and initialize models.
3. To liaise with relevant CLIVARs panels, in particular the Arctic Climate Panel, the Southern Ocean Panel, and the VAMOS and VACS panels to ensure that best use is made of resources from regional research programs.
4. To liaise with GSOP, OOPC, PIRATA, ARGO, and the IOC-CO2 panel to ensure that CLIVAR benefits from and contributes to GEOSS.
5. To liaise with relevant interdisciplinary SCOR-IGBP groups such as PAGES, GLOBEC, IMBER, and SOLAS and with regional Atlantic marine ecosystem research programs such as BCLME and GCLME to ensure that CLIVAR benefits from and provides input to these programs.
6. To respond to needs from stakeholders and facilitate the transfer of knowledge from science to operations and applications with respect to Atlantic climate variability and predictability issues.
7. To report to the CLIVAR SSG.

Members:

Ruth Curry (co-Chair)(09)	Woods Hole Oceanography Institution, USA
Laurent Terray (co-Chair)(10)	CERFACS, Toulouse FRANCE
Molly Baringer (12)	NOAA/AOML/PHOD Miami USA
Peter Brandt (09)	IfM-GEOMAR, University of Kiel GERMANY
Suzana Camargo (12)	LDEO Columbia University USA
Ping Chang (12)	Texas A&M University College Station USA
Stuart Cunningham (09)	NOCS, Southampton UK
Yochanan Kushnir (09)	LDEO, Columbia University USA
Mauricio Mata (12)	FURG Rio Grande BRAZIL
Paulo Nobre (09)	CPTEC/INPE, São Paulo BRAZIL
Svein Oesterhus (09)	University of Bergen NORWAY
Chirs Reason (09)	University of Cape Town SOUTH AFRICA
Doug Smith (12)	Hadley Centre, MetOffice UK
Anne-Marie Treguier (12)	LPO IFREMER Plouzane FRANCE

Ex-Officio members:

A. Koertzinger (Carbon Rep.)	IfM-GEOMAR, University of Kiel, Germany

The group e-mail address for this panel is: clivar-atlantic@clivar.org

The ICPO contact for the CLIVAR Atlantic Implementation Panel is Dr. Roberta Boscolo.

Pacific Implementation Panel

Terms of Reference:

1. To oversee and facilitate the implementation of CLIVAR in the Pacific sector in order to meet the objectives outlined in the Science and Initial Implementation Plans particularly with respect to:
   - Expanding and Improving ENSO predictions
   - Variability and predictability of the Asian-Australian Monsoon system
   - Indo-Pacific Decadal Variability

   And also on Pacific impacts on:
   - Variability and predictability of the American Monsoon system
   - Southern Ocean Climate variability
   - Climate change prediction/detection and attribution
2. To develop broad-scale atmospheric sampling plans and processes studies to complement the oceanic observations planned for the Pacific and as an integral component of the strategy to improve atmospheric and coupled models. To work with agencies and nations to sustain broad-scale atmospheric sampling in the Pacific.
3. To coordinate the activities of the Pacific nations, facilitating cooperative efforts and coordinating work within the boundaries of the various nations as well as outside those boundaries. To provide a forum for exchange and discussion of national plans in the Pacific.
4. To organize and conduct workshops that will entrain oceanographers, atmospheric scientists, and other investigators from the Pacific nations, that will lead to formulation of plans for broad-scale sampling and for sampling locations of high interest (such as boundary currents), and will coordinate not only the field activities but also the modelling, empirical, and paleo studies in the Pacific.
5. To collaborate with WCRP WG on Coupled Modelling, the CLIVAR WG on Seasonal-Interannual Prediction and the WG on Ocean Model Development in order to design appropriate numerical experiments. To be aware of the requirements of these groups for data sets needed to validate models.
6. To liaise with the Ocean Observation Panel for Climate (OOPC), with the Joint Commission for Oceanography and Marine Meteorology (JCOMM), with the Atmospheric Observations Panel for Climate (AOPC), and other relevant groups to ensure that CLIVAR benefits from and contributes to observations in GOOS and GCOS
7. To advise the CLIVAR SSG of progress and obstacles towards successful implementation of CLIVAR in the Pacific.

Members:

A. Timmerman (Chair) (08)	IPRC, Univ. Hawaii, Honolulu, U.S.A.
W. Cai (data liaison) (09)	CSIRO, Div. of Atmospheric Research, Aspendale, Australia
A. Clement (09)	RSMAS, Univ. Miami, Miami, U.S.A.
W. Crawford (09)	IOS, Sydney, Canada
A. Ganachaud (09)	Legos.IRD, Noumea, New Caledonia
M. Jochum (12)	Ncar, Boulder, USA
M. Lengaigne (12)	LOCEAN, Paris, France
R. Martinez (09)	CIIFEN, Guayquil, Ecuador
D. Neelin (09)	Univ. California, U.S.A.
S. Power (09)	BMRC, Melbourne, Australia
B. Qiu (09)	Univ. Hawaii, Honolulu, U.S.A.
T. Suga (09)	Tohoku University, Japan
Dong-Xiao Wang (09)	Key Lab. Of Tropical Marine Environmental Dynamics, China
R. Feely (Carbon Rep.)	NOAA.PMEL, Seattle, U.S.A.

(09)

Ex-officio members

M. McPhaden	NOAA/PMEL, Seattle, USA

The group email address for this panel is: clivar-pacific@clivar.org
ICPO contact for the Pacific Implementation Panel is Dr Roberta Boscolo

Southern Ocean Implementation Panel

Terms of Reference:

1. To design a strategy to assess climate variability and predictability of the coupled ocean-atmosphere-ice system in the Southern Ocean region.
2. To develop and refine an implementation plan for the Southern Ocean region which defines the process studies, sustained observations, and model experiments needed to meet the objectives of CLIVAR and CliC.
3. To work in concert with relevant CLIVAR panels (e.g. regional panels, numerical experimentation groups), ACSYS/CliC Panels (DMIP, OPP, NEG) and other groups (e.g. Ocean Observation Panel for Climate, Argo Science Team) to integrate Southern Ocean observations with those in neighbouring regions to ensure the objectives of CLIVAR/CliC are met and resources are used efficiently.
4. To enhance interaction between the meteorology, oceanography, cryosphere biogeochemistry and paleoclimate communities with an interest in the climate variability of the Southern Ocean region.
5. To serve as a forum for the discussion and communication of scientific advances in the understanding of climate variability and change in the Southern Ocean region.
6. To work with the CLIVAR and CliC data systems on issues related to distribution and archiving of Southern Ocean observations.
7. To advise the CLIVAR and ACSYS/CliC SSGs on progress achieved towards implementation.

Members:

M. England (09)	University of New South Wales, Australia
K. Speer (co-chair) (09)	Florida State University, Tallahassee, USA
Y. Fukumachi (09)	Hokkaido University, Sapporo, Japan
H. Goosse (09)	Université catholique de Louvain, Louvain-la-Neuve, Belgium
B. Gruber (09)	University of California, Los Angeles, U.S.A.
C. Haas (09)	Alfred-Wegener Institute, Bremerhaven, Germany
D. Martinson (09)	Lamont Doherty Earth Observatory, Palisades, USA
A. Naveira Garabato (09)	National Oceanography Centre, Southampton, UK
S. Rintoul (09)	CSIRO, Hobart, Tasmania, Australia
S. Speich (09)	University of Bretagne Occidentale, Brest, France
D. Thompson (09)	Colorado State University, Fort Collins, U.S.A..
M. van den Broeke (09)	Utrecht University, Utrecht, Netherlands

Ex Officio Member:

E. Fahrbach	Alfred-Wegener Institute, Bremerhaven, Germany
A. Orsi	Texas A&M University, College Station, U.S.A.

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The ICPO contact for the CLIVAR Southern Ocean Programme is Dr Kate Stansfield
The ICPO South America contact is Dr Carlos Ereño

Variability of the American Monsoon Systems (VAMOS) Panel

Terms of Reference:

1. To be responsible to the CLIVAR SSG for the formation of a detailed scientific plan and conceptual design of an international project to investigate the variability and predictability of the American monsoon system (VAMOS) in the context of global climate variability and predictability.
2. To develop an implementation plan for a VAMOS project for consideration by the CLIVAR SSG.
3. To coordinate and promote interactions amongst meteorologists, oceanographers and hydrologists from interested nations to work on VAMOS problems.
4. To oversee the implementation of a VAMOS project.
5. To advise the CLIVAR numerical experimentation groups on modelling investigations which need to be carried out to meet VAMOS objectives.
6. To work closely and coordinate with other national, regional and international projects and organizations interested in this area of research, e.g. the Inter-American Institute, the International Research Institute for Seasonal to Interannual Prediction, PACS, GEWEX and START.

Members:

E. Berbery (co-Chair) (09)	University of Maryland, U.S.A.
J. Marengo (co-chair) (09)	CPTEC/INPE, Brazil
J-P. Boulanger (08)	LODYC, Paris, France
A. Busalacchi (08)	Earth System Science Interdisciplinary Center, U. Maryland, College Park, USA
T. Cavazos (09)	CICCESE, Ensendal, Mexico
D. Enfield (09)	NOAA/AOML, Miami, U.S.A.
L. Farfan (08)	CICESE, Ensenada, Mexico
R. Garreaud (09)	University of Chile, Santiago, Chile
D. Gochis (09)	NCAR, Boulder, U.S.A.
L. Goddard (08)	IRI, Columbia University, Palisades U.S.A.
D. Gutzler (08)	U. New Mexico, Albuquerque, USA
C.R. Mechoso (08)	UCLA, Los Angeles, U.S.A.
C. Saulo (09)	University of Buenos Aires, Argentina

The group e-mail address for this panel is: clivar-vamos@clivar.org

The ICPO contact for the CLIVAR VAMOS Panel is Dr. Carlos Ereño

CLIVAR Variability of the African Climate System (VACS) Panel

Terms of Reference

1. Develop and refine a VACS implementation plan, based on the work of the CAWG and CATT, to diagnose the variability and predictability of African climate and its relationship to the global climate system. This plan should take into account the objectives listed below.
2. Prepare requirements for limited-period and sustained observations in support of the CLIVAR Programme in and around the African continent; establish links with, and present the requirements to, the other major climate-observing programs (e.g. GCOS, WWW, GOOS, etc.).
3. Promote and coordinate efforts for evaluations and improvements of model simulations (e.g., AMIP, CMIP, IPCC, etc.) for the African region.
4. Promote development of African climate databases and foster access thereto for research purposes in cooperation with projects such as CLICOM, DARE, INFOCLIMA, etc.
5. Promote the involvement of African scientists within VACS and the use of VACS products in capacity building activities.
6. Develop cooperative investigations with other CLIVAR groups and national, regional or international research programs and organizations interested in this area of research.
7. Develop links with programs and organizations interested in the application of VACS research (e.g. CLIPS, and START) and, as far as feasible, integrate requirements of these programs and organizations into VACS.
8. Execute the VACS implementation plan and measure the success of the plan against stated objectives.
9. Report to the CLIVAR SSG as required on progress and problems in developing and implementing the VACS plan.

Members

C. Reason (co-chair) (09)	University of Cape Town, South Africa
R. Washington (co-chair) (09)	School of Geography and the Environment, U. Oxford, Oxford, UK
R. Anyah (09)	Rutgers University, Nedw Brunswick, U.S.A.
A. Giannini (08)	IRI, Palisades, U.S.A.
M. Harrison (09)	UK Met Office, Exeter, UK
A. Kamga (09)	ACMAD, Niamey, Niger
L. Ogallo (06)	Drought Monitoring Center, Nairobi, Kenya
D. Olago (07)	University of Nairobi, Nairobi, Kenya
N. Raholijao (09)	Meteorological Services of Madagascar, Antananarivo, Madagascar
F. Semazzi (09)	North Carolina State University, Raleigh, USA
W. Thiaw (08)	NOAA Science Center, Camp Springs, U.S.A.

Ex-officio members:

C. Thorncroft (AMMA Liaison) University of Albany, USA
A. Morse (WGSIP Liaison) University of Liverpool, UK
Representative of the Drought Monitoring Center - Harare Zimbabwe)
Representative of the Agromet Center (Niamey – Niger)

The group e-mail address for this panel is: clivar-africa@clivar.org

The ICPO contact for the CLIVAR VACS Panel is Dr.Kate Stansfield

CCl/CLIVAR Expert Team on Climate Change Detection and Indices

Terms of Reference:

1. To provide international coordination and help organize collaboration on climate change detection and indices relevant to climate change detection;
2. To further develop and publicize indices and indicators of climate variability and change from the surface and sub-surface ocean to the stratosphere;
3. To encourage the comparison of modeled data and observations perhaps via the development of indices appropriate for both sources of information;
4. To coordinate these and other relevant activities the ET chooses to engage in (such as perhaps observing system experiments that help determine where observations are needed for climate change detection) with other appropriate agencies such as GCOS, CBS, CIMO, CAgM, CHy, IPCC, START etc. as well with the joint WCRP JSC/CLIVAR Working Group on Coupled Modelling, the WCRP Observations and Assimilation Panel and regional associations;
5. To explore, document and make recommendations for addressing the needs for capacity building in each region, pertinent to this topic;
6. To submit reports in accordance with timetables established by the OPAG chair and/or Management Group.

Members:

A. Klein-Tank (co-chair) (CCl)	KNMI, The Netherlands
F. Zweirs (co-chair) (CLIVAR)	Univ. of Victoria, Canada
B. Garanganga (JCOMM)	Drought Monitoring Centre, Gaborone, Botswana
G. Hegerl (CLIVAR)	Duke University, North Carolina, USA
P. Jones (CLIVAR)	University of East Anglia, United Kingdom
D. Karoly (CLIVAR)	University of Oklahoma, USA
E. Kent (JCOMM)	National Oceanography Centre, Southampton, United Kingdom
D. Parker	Hadley Centre, United Kingdom
V. Swail (JCOMM)	Environment Canada, Ontario, Canada
B. Trewin (CCl)	Bureau of Meteorology, Melbourne, Australia
S. Woodruff (JCOMM)	NOAA, Boulder, USA
X. Zhang (CCl)	Meteorological Service of Canada, Canada

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The ICPO contact for the CCl/CLIVAR/JCOMM ETCCDI is Dr. Antonio Caltabiano

2.3 Other related groups and activities

Tropical Moored Buoy Implementation Panel (TIP)

The Tropical Moored Buoy Implementation Panel (TIP) is responsible for development, co-ordination, and implementation of moored buoy programmes in the tropical ocean regions as part of an integrated approach to observing the climate system to address the research needs of CLIVAR and the operational strategies of GOOS and GCOS.
The TIP will serve the needs of GOOS and GCOS in its role as an Action Group of the Data Buoy Cooperation Panel (DBCP) and as an integral component of the Data Buoy Observations Team within the Observations Programme Area of the Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM). The TIP will also co-ordinate tropical moored buoy programme implementation on behalf of the CLIVAR Global Synthesis and Observation Panel (GSOP) and, in particular, provide oversight and co-ordination for experimental pilot arrays.
Membership will be open to all participants in the Tropical moored buoy programme. To ensure proper co-ordination with CLIVAR research initiatives, two experts are selected by CLIVAR.

Terms of Reference

- To promote an integrated approach to moored buoy observations of the climate system in the tropics, through development of common calibration standards, sampling, and reporting procedures, and through co-ordination with other CLIVAR, GOOS, and GCOS panels involved with observing system maintenance and development.
- To assist in the preparation of annual operating plans for the TAO/TRITON array, PIRATA array, and related moored buoy arrays in the tropical oceans.
- To promote and co-ordinate the exchange of technical and logistic information between institutions participating in the maintenance of these arrays.
- To encourage the rapid dissemination of moored buoy data in real time via the Global Telecommunications System and other mechanisms of the Data Management Programme Area of JCOMM; and to encourage user feedback on the timeliness, accuracy, and utility of the data,
- To advise CLIVAR and GOOS/GCOS (via the JCOMM Observation Programme Area) on the technical feasibility of expansions and enhancements to existing programmes, or the implementation of new moored buoy programmes in the tropics and adjoining areas.
- To facilitate capacity building at institutions seeking involvement in the deployment and maintenance of moored buoy arrays in support of CLIVAR, GOOS, and GCOS, in coordination with the Education, Training and Capacity Programme Area of JCOMM.
- To ensure that organizations actively involved in the use of moored buoy data are informed of the workings of the panel and to encourage, as appropriate, their participation in the panel deliberations.
- To report annually to CLIVAR GSOP, the GOOS/GCOS/WCRP Ocean Observations Panel for Climate (OOPC), to the Data Buoy Co-operation Panel, and to JCOMM through the Data Buoy Observations Team.

Currently the chairman of this group is M. McPhaden (NOAA/PMEL, Seattle, USA). The CLIVAR designees are: J. Picaut, IRD, Toulouse, France; J. Lorenzetti, INPE, Brazil; M. Jury, U. Zululand, Kwadlangezwa, South Africa; and Y. Kuroda, JAMSTEC, Yokosuka, Japan.

http://www.pmel.noaa.gov/tao/proj_over/tip/newpanel.html

IV. CLIVAR National Committees and Contacts

The International CLIVAR Project Office has established national contacts with agencies, scientific institutes, and individual scientists in the following nations:
Argentina, Australia, Austria, Brazil, Canada, Chile, China, Ethiopia, Egypt, France, Germany, Ireland, Japan, Korea, Malaysia, Mauritius, Myanmar, New Zealand, Russian Federation, Sweden, Singapore, Spain, South Africa, Switzerland, Seychelles, Thailand, The Netherlands, United Kingdom, and USA.
All these countries have named one or more official national contacts for CLIVAR. The distribution of CLIVAR related information, however, is not limited to these contacts. Presently, more than 3500 scientists, agencies and institutes in 153 countries are on the CLIVAR mailing list. Note, that for many countries the information was collected for the CLIVAR Conference in December 1998.

Argentina

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Australian CLIVAR Panel

Background
The CLIVAR Sub-Committee was set up by the Australian Academy of Science to coordinate Australian planning for and participation in the international CLIVAR programme, which is the component of the WCRP focusing on the variability and predictability of climate. The programme has three components: CLIVAR GOALS covers seasonal to interannual variations of the global ocean-atmosphere-land surface system, CLIVAR DecCen covers the decadal to century variability of the climate system with a particular emphasis on the oceans, and CLIVAR ACC covers anthropogenic climate change issues. There are strong links between all components of the programme, and the national contribution will need to include all components.

The **terms of reference** of the Sub-Committee are:

1. To prepare, for the National Committee for Climate and Global Change (NCCGC) in consultation with the national research community, a science and implementation plan for the Australian contribution to the international CLIVAR programme;
2. To coordinate the implementation of the approved science and implementation plan for the Australian contribution to CLIVAR;
3. To promote the participation of the broad national research community in the Australian contribution to CLIVAR,
4. To liaise with the International CLIVAR Project Office and the CLIVAR Scientific Steering Group on science and implementation issues of the national CLIVAR programme;
5. To liaise with the national Expert Sub-Groups on GCOS and GOOS, as required to ensure a coordinated approach to observational programmes associated with CLIVAR in Australia; and
6. To report to the NCCGC on matters relating to CLIVAR.

Members:
M. Manton (chair)Bureau of Meteorology Research Centre, Melbourne
I. Allison Antarctic Cooperative Res. Centre, Univ. of Tasmania, Hobart
J. Church CSIRO, Division of Marine Research, Hobart
R. Francey CSIRO, Division of Atmospheric Research, Aspendale
S. Godfrey CSIRO, Division of Marine Research, Hobart
A. Hirst CSIRO, Division of Atmospheric Research, Aspendale
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Canada
The following is a list of the 23 members of the Canadian CLIVAR Research Network:

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Chinese CLIVAR Panel
The panel is a sub-committee of the Chinese Committee for the World Climate Research Programme charged with:

1. promoting and coordinating the implementation of the CLIVAR Science Plan in China
2. liaising with the CLIVAR Scientific Steering Group, The CLIVAR Panels and Working Groups and with the International CLIVAR Project Office.

Members:
Li Chongyin (Chair) Institute of Atmospheric Physics, CAS, Beijing
Chao Jiping (Vice chair) State Oceanic Administration (SOA), Beijing
Wang Shaowu (Vice chair) Beijing University, Beijing
Zhang Guocai (Vice chair) China Meteorological Administration, (CMA), Beijing
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Spain
The functions of the Spanish CLIVAR National Committee (CNCLIVAR)
The first and essential functions of the Spanish CNCLIVAR are:
1. To identify the scientists and national groups who could be potential participants in CLIVAR
2. To establish the links among this Committee and other national and international programmes related to the matters covered by CLIVAR
3. To establish links and interactions among available infrastructures in order to its better and more efficient use by the national community
4. To ease access to the national data banks
5. To detect the CLIVAR data needs that can be served with the current databases
6. To promote priority to the observation needs by which Spain eventually will contribute to CLIVAR

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United States

U.S. CLIVAR Interagency Group
The National Aeronautics and Space Agency (NASA), National Oceanic and Atmospheric Administration (NOAA), The National Science Foundation (NSF,) and The Department of Energy (DoE) have formed an inter-agency coordinating group for CLIVAR as part of the U.S. Climate Change Science Program (CCSP). While individual agencies have unique missions, the CLIVAR goals are shared by the inter-agency group as scientifically timely and important.
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J. Fein National Science Foundation, Arlington, USA
E. Itsweire National Science Foundation, Arlington, USA
M. Ji NOAA/OGP, Silver Spring, USA
M. Johnson NOAA/OGP, Silver Spring, USA
A. Bamzai Department of Energy, Germantown, USA
D. Anderson NASA Headquarters, Washington, USA
E. Lindstrom NASA Headquarters, Washington, USA
J. Huang NOAA/OGP, Silver Spring, USA
J. Todd NOAA/OGP, Silver Spring, USA

U.S. CLIVAR Committee
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Meghan Cronin, NOAA PMEL
Ben Kirtman, COLA
Alex Hall, UCLA
Sonya Legg, Princeton
Marty Hoerling (Chair), NOAA – CDC
Kathie Kelly, University of Washington
Jay McCreary, IPRC
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The PSMI panel's mission is to research underlying uncertainties in models and physics and to improve the delivery of climate science.
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WCRP/GCOS/GOOS Ocean Observations Panel for Climate (OOPC)
D E Harrison NOAA/PMEL, Seattle, USA

WCRP/GCOS Atmospheric Observation Panel for Climate (AOPC)

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a. [1] 1. Sea-ice/Ocean Modelling (SIOM) Panel

b. [2] 2. GCM Reality Intercomparison Project for SPARC

VI. CLIVAR - Publications

CLIVAR's Newsletter

1. CLIVAR News sheet, August 95 (out of print)
2. CLIVAR ExchangesPublished quarterly, available from the ICPO (icpo@soc.soton.ac.uk) or electronically through the Web.

Vol. 1: 1996: No. 1 (Feb.) No. 2 (May) No. 3 (Aug.) No. 4 (Dec.)
Vol. 2: 1997: No. 1 (April) No. 2 (Aug.) No. 3/4 (Dec.)
Vol. 3: 1998: No. 1 (April) No. 2/3 (July) No. 4 (Nov.)
Vol. 4: 1999: No. 1 (March) No. 2 (June) No. 3 (Sept.) No. 4 (Dec.)
Vol. 5: 2000: No. 1 (March) (with Pages) No. 2, (June) No. 3 (Sept.) No. 4 (Dec.)
Vol. 6: 2001: No. 1 (March) No. 2, (June) No. 3 (Sept.) No. 4(Dec.)
Vol. 7: 2002: No. 1 (March) No. 2, (June) No. 3/4 (Sept.)
Vol. 8: 2003: No. 1 (March) No. 2/3 (Sept.) No.4 (December)
Vol 9: 2004: No. 1 (March) No. 2 (June) No. 3 (October)
Vol 10: 2005 No. 1 (Jan) No. 2 (April) No. 3 (July)
Vol.11: 2006 No. 1 (Jan). No. 2 (April), No. 3 (July), No. 4 (October)
Vol 12: 2007 No. 1 (Jan), NO. 2 (April), No. 3 (July), No. 4 (October)
Vol 13: 2008 No. 1 (Jan)

Reports and Documents

ICPO Publ. No.	Title
	Scientific Plan for CLIVAR, WCRP-89, Aug. 1995, WMO/TD No. 690
1	**CLIVAR DecCen/ACC Numerical Experimentation Group** (CLIVAR NEG-2), *First Session*, 11-13 September 1995, Hamburg, Germany (*out of print)*
2	**CLIVAR Upper Ocean Panel** (UOP), *First Session*, 18-19 December 1995, La Jolla, USA *(out of print)*
3	**CLIVAR GOALS Numerical Experimentation Group** (CLIVAR NEG-1), *First Session*, 26-29 February 1996, Montego Bay, Jamaica *(out of print)*
4	**CLIVAR DecCen/ACC Numerical Experimentation Group** (CLIVAR NEG-2), 2nd Session, 9-12 September 1996, Victoria, B.C., Canada *(out of print)*
5	**TAO Implementation Panel**, *5th Session*, 18-21 November 1996, Goa, India *(out of print)*
6	Fifth Session of the CLIVAR Scientific Steering Group (CLIVAR SSG), 3-7 June 1996, Sapporo, Japan *(out of print)*
7	**CLIVAR Asian-Australian Monsoon Panel**, First Session, 19-22 November 1996, Panaji, Goa, India *(out of print)*
8	**JCESS-CLIVAR Workshop on Decadal Climate Variability**, 22-24 April 1996, Columbia, MD, USA *(out of print)*
9	**CLIVAR Upper Ocean Panel** (*2nd Session*) and **Joint Workshop with CLIVAR NEG-1: Assessment of the Pacific Observing System for Analyses, Model-Testing and El Niño Forecasts**, 21-24 October 1996, Villefranche-sur-mer, France *(out of print)*
10	**CLIVAR - A Research Programme on Climate Variability and Predictability for the 21st Century**, August 1997.
11	**CLIVAR Ocean Programme for DecCen Climate Variability**, 28-31 October 1996, Villefranche-sur-mer, France *(out of print)*
12	**CLIVAR Scientific Steering Group** (SSG), *6th Session*, 28 April-2 May 1997, Washington DC, USA *(out of print)*

13 **TAO Implementation Panel**, *6th Session*, 4-6 November 1997, Reading, United Kingdom

14 **CLIVAR Initial Implementation Plan**, WCRP-103, June 1998, WMO/TD No. 869.

15 **JSC/CLIVAR Working Group on Coupled Modelling** (WGCM), *First Session*, 22-25 September 1997, Paris, France, WCRP informal report 3/1998.

16 **Report of the GCOS/GOOS/WCRP "International Sea Level Workshop"**, 10-11 June 1997, Honolulu, USA

17 **PAGES/CLIVAR Working Group**, First Session 24-25 October 1996, Villefranche-sur-mer, France

18 **CLIVAR AA-Monsoon Panel**, *2nd Session*, 20-22 April 1998, Kyongju, Korea

19 **CLIVAR Upper Ocean Panel**, *3rd Session*, 27-29 April 1998, Toulouse, France

20 **CLIVAR VAMOS Panel**, *First Session*, and **VAMOS/PACS Workshop on Field Programmes**, 30 March - 2 April 1998, São Paulo, Brazil

21 **The Design and Implementation of Argo, A Global Array of Profiling Floats**

22 **Can we predict the climate for the 21st Century**, (Poster)

23 **JSC/CLIVAR Working Group on Coupled Modelling** (WGCM), *2nd Session*, 16-17 October 1998, Melbourne, Australia.

24 **CLIVAR GOALS Numerical Experimentation Group** (CLIVAR NEG-1), *3rd Session*, 8 12 November 1998, Palisades, NY, USA

25 **CLIVAR Scientific Steering Group**, *7 th Session*, 27-30 April 1998, Santiago de Chile, Chile

26 **TAO Implementation Panel**, *7th Session*, 11-13 November 1997, Abidjan, Ivory Coast

27 **Proceedings of the International CLIVAR Conference**, 2-4 December 1998, Paris, France.

28 **WOCE/CLIVAR Workshop on Ocean Modelling for Climate Studies**, 10-13 August 1998, Boulder, CO, USA

29 **Climate Research for Africa**, December 1999

30 **CLIVAR VAMOS Panel**, *2nd Session*, 15-18 March 1999, Buenos Aires, Argentina

31 **CLIVAR Upper Ocean Panel (UOP). Special Joint Session with OOPC**, 17-21 May 1999, Woods Hole, USA

32 **JSC/CLIVAR Working Group on Coupled Modelling** (WGCM), *3rd Session*, 20-22. September 1999, Hamburg, Germany

33 **CLIVAR Working Group on Seasonal-to-Interannual Prediction** (WGSIP, formerly NEG-1), *4th Session*, 9-12 November 1999, Bologna, Italy.

34 **Proceedings of the 3rd PMIP workshop**, 4-8 October 1999, Canada

35 **CLIVAR Africa Implementation Plan**

36 **CLIVAR Scientific Steering Group**, *8th Session*, 10-14 May 1999, Southampton, UK.

37 **CLIVAR VAMOS Panel**, *3rd Session*, 9-10 April 2000, Santiago, Chile

38 **CLIVAR Atlantic Implementation Panel**, *2nd Session*, 1-2 Dec. 2000, Orense, Spain

39 **Decadal Predictability Workshop**, October 2000, La Jolla, USA

40 **JSC/CLIVAR Working Group on Coupled Modelling**, *4th Session*, October 2000, La Jolla, USA

41 **PAGES/ CLIVAR Workshop on "Climate of the last Millennium"**, 8-12 November, 1999, Venice, Italy

42 **CLIVAR Workshop on shallow tropical-subtropical overturning cells (STCs) and their interaction with the atmosphere**, 9-13 October 2000, Venice, Italy

43 **CLIVAR Scientific Steering Group**, **9th Session**, May 1999, Honolulu, USA

44 **TAO Implementation Panel**, *8th Session*, 15 October 1999, St. Raphael, France

(electronic version only)

45 **TAO Implementation Panel**, *9th Session*, 16-17 November 2000, Perth, Australia (electronic version only)

46 **CLIVAR Panel on the Variability of the African Climate System** (VACS), *1st Session*, 29-31 January, 2001, Nairobi, Kenya

47 **WOCE/WGCM Working Group on Ocean Model Development**, *1st Session*, 5-7 March 2001 Santa Fe, USA (summary only)

48 **Report on the Activities of the Working Group on Climate Change Detection and Related Rapporteurs 1998-2001** – electronic version only

49 **CLIVAR VAMOS Panel**, *4th Session*, 26-30 March 2001, Montevideo, Uruguay

50 **Working Group on Seasonal to Interannual Prediction** (WGSIP), *5th Session*, 1-3 November 2000, Buenos Aires, Argentina (in press)

51 **CLIVAR Pacific Implementation Workshop**, 5-8 February 2001, Honolulu, USA

52 **CLIVAR Scientific Steering Group**, *10th Session*, May 2000, Toulouse, France

53 **Climate Research – A Challenge for the 21st Century**

54 **PAGES/CLIVAR Working Group**, *Minutes of the 2nd Meeting*, 14. July, 2001, Amsterdam, The Netherlands

55 **WOCE/CLIVAR Representativeness and Variability Workshop**, 17-20 October 2000, Fukuoka, Japan

56 **Current Status of ENSO Forecast Skill. A Report to the CLIVAR Working Group on Seasonal to Interannual Prediction**, Eds.: B. Kirtman et al., Nov. 2001

57a **CLIVAR Asian Australian Monsoon Panel**, *4th Session*, 29-31 August 2001, Reading, UK *th*

57b **CLIVAR Working Group on Seasonal to Interannual Prediction**, *Session*, 5-7. November 2001, Budapest, Hungary

58 **CLIVAR Atlantic Implementation Panel**, *3rd Session*, 7-8 September 2001, Paris, France

59 **CLIVAR Ocean Observations Panel** (OOP), 27-30 March 2001, Hobart, Australia

60 **TAO Implementation Panel** (TIP-10), 10th Session

61 **CLIVAR Pacific Panel**, *1st Session*, 5-7 February 2002, Hawaii, USA

62 **JSC/CLIVAR Working Group on Coupled Modelling**, *5th Session*, 4 - 7. February 2002, Bracknell, UK

63 **WOCE/CLIVAR Working Group on Ocean Model Development**, *3rd Session*, 5-8 May 2002, Hamburg, Germany

64 **CLIVAR VAMOS Panel**, *5th Session*, 11-15 March 2001, San Jose, Costa Rica

65 **CLIVAR/Clic Southern Ocean Panel**, *1st Session*, 11-13 March 2002, Hobart, Australia

66 **CLIVAR Variability of the African Climate System (VACS) Panel**, *2nd Session*, 25-28 February, 2002, Niamey, Niger

67 **JSC/CLIVAR Working Group on Coupled Modelling** – *6th Session*, 7-10. October 2002, Victoria, Canada

68 **CLIVAR Working Group on Seasonal to Interannual Prediction** -*7th Session*, 19-22. November 2002, Cape Town, South Africa

69 **CLIVAR Atlantic Implementation Panel** -*4th Session*, 10.-12. July 2002, Bermuda

70 **CLIVAR VAMOS Panel** -*6th Session*, 24-25 April 2003, Miami, USA

71 **WGCM/CLIVAR Working Group on Ocean Model Development** – *4th Session*, 13-15 April 2003, Villefranche-sur-mer, France

72 **CLIVAR Asian Australian Monsoon Panel**, *5th Session*, 24-27 February 2003, Atlanta, USA

73 **CLIVAR Atlantic Implementation Panel** -*5th Session*, 13-15 April 2003, Villefranche-sur-mer, France

74 **CLIVAR Variability of the African Climate System (VACS) Panel** – *3rd Session*, 15-17 January 2003, Cape Town, South Africa

75 **CLIVAR Pacific Panel** – *2nd Session*, 14-16 July 2003, Yokohama, Japan

76 **Report of the 2nd Session of the CLIVAR /CliC Southern Ocean Panel**, 8-11 September 2003 Bremerhaven, Germany

77 **CCI/CLIVAR Expert Team for Climate Change Detection, Monitoring and Indices 1st Team meeting report.** 24-26 November 2003, Norwich, United Kingdom

78 **CLIVAR Working Group on Seasonal to Interannual Prediction:** Report of the 8th Session 5-7 November 2003, Honolulu, USA

79 **COPE Workshop on Seasonal Prediction** November 3-5, Norwich, United Kingdom

80 **Report of the 1st Indian Ocean Panel and 6th Asian-Australian Monsoon Panel Joint Meeting** 18-20 February 2004, Pune, India

81 **Proceedings of the CLIVAR Workshop on Atlantic Climate Predictability,** 19-22 April 2004, Reading, United Kingdom

82 **Working Group on Coupled Modelling** 7th Session, 24-26th September 2003, Hamburg, Germany

83 **Report of the CLIVAR Workshop on Assessment of a new generation of Ocean Climate Models** 16-18 June 2004, Princeton, USA

84 **Report of the first CLIVAR Data Planning Meeting, focusing on Ocean Observations,** March 24-26 2004, La Jolla USA

85 **5th Session of the CLIVAR Working Group on Ocean Model Development,** 15, 18 and 19 June 2004, Princeton, USA

86 **Report of the 6th Meeting of the CLIVAR Atlantic Implementation Panel,** 20th June 2004 Baltimore USA

87 Duplicated no. see 90

88 **Report of the 7th Session of the CLIVAR VAMOS Panel,** 22-24 March 2004 Guayaquil, Equador

89 **Report of the 3rd Meeting of the CLIVAR/PAGES Intersection Working Group,** 8-10 November 2004 Victoria, Canada

90 **Report of the 1st Session of the CLIVAR Global Synthesis and Observations Panel (GSOP),** 10-12 November 2004 Boulder, USA

91 **Report of the TACE Implementation Workshop,** 3rd February 2005, Miami, USA

92 **Report of the 2nd CLIVAR / GOOS Indian Ocean Panel Meeting,** 30th March - 2nd April 2005, Hobart, Australia

93 **Report of the 1st CLIVAR Workshop on Ocean Reanalysis**, 8-10 November 2005, Boulder, USA

94 Number duplicated see 98

95 Number duplicated see 100

96 **Report on the 8th Session of the Working Group on Coupled Modelling** 25-27 October 2004, Yokohama, Japan

97 **Report of the 8th meeting of the VAMOS Panel** 7-11 March 2005, Mexico City, Mexico

98 **Reports of THE MODES OF SOUTHERN HEMISPHERE CLIMATE VARIABILITY WORKSHOP (27-28th June 2005) and THE THIRD SESSION OF THE CLIVAR/CLIC/SCAR SOUTHERN OCEAN REGION PANEL MEETING (29-30th June 2005)** Cambridge, United Kingdom

99 **Report of the 7th Session of the Atlantic Implementation Panel,** 20-21 October 2005, Venice, Italy

100 **Understanding the role of the Indian Ocean in the Climate system – Implementation plan for Sustained Observations**

101 **Report of the 6th meeting of the WGOMD** 8 and 11 November, Hobart, Australia

102 **Report of the Southern Ocean Modelling Workshop** 9-10 November 2005, Hobart, Australia

103 **1st Pan-WCRP Workshop on monsoon climate systems: Towards better prediction of the monsoons** 15-17 June 2005 University of California, Irvine, USA

104 **Report of the 9th meeting of the Working Group on Seasonal to Interannual Prediction** 14-16 October 2005, Met Office, Exeter, United Kingdom

105 **Report of the International Repeat Hydrography Workshop,** 14-16 November 2005, Shonan Village, Japan

106 **Report of the Ninth Session of the JSC/CLIVAR Working Group on Coupled Modelling,** 3-5 October 2005, Exeter, United Kingdom

107 **Report of the Third Meeting of the CLIVAR-GOOS Indian Ocean Panel,** 27 February – 2 March 2006, Honolulu, U.S.A.

108 **Report of the 4th Meeting of the CLIVAR Variability of the African Climate System (VACS) Panel,** 13 and 15 July 2006, Dar es Salaam, Tanzania

109 **Report of the CLIVAR VACS Southern and Eastern African Climate Predictability Workshop,** 10-13 July 2006, Dar es Salaam, Tanzania

110 **Report of the Tenth Session of the CLIVAR Working Group on Seasonal to Interannual Prediction (WGSIP),** 13-16 February 2006, Wellington, New Zealand

111 **Southwest Pacific Ocean Circulation and Climate Experiment (SPICE). Part 1. Scientific Background**

112 **Summary Report: A Strategy for Climate Change Stabilization Experiments with AOGCMs and ESMs.** July 30 – August 5 2006, Aspen, Colorado

113 **Report of the 4th Meeting of the CLIVAR/CliC/SCAR Southern Ocean Region Panel,** 14 and 17 November 2006, Buenos Aires, Argentina

114 **Report of the CLIVAR/OOPC/IAI Workshop on the South Atlantic Climate Observing System (SACOS),** 6-8 February 2003, Angra do Reis, Brazil

115 **Joint CCL/CLIVAR/JCOMM Expert Team on Climate Change Detection and Indices,** 14-16 November 2006, Niagara-on-the-Lake, Canada

116 **CLIVAR/OOPC/Argo/GOOS/CPPS Workshop on the South Pacific,** 11-14 October 2005, Concepción, Chile

117 **Report of the tenth session of the JSC/CLIVAR Working Group on Coupled Modelling (WGCM),** 25-26 September 006, Victoria, BC, Canada

118 **NAME Modeling and Data Assimilation: A Strategic Overview,** June 2005

119 **NAME Science and Implementation Plan,** May 2005

120 **Report of the Eighth Meeting of the Atlantic Implementation Panel,** 21-22 March 2007, Kiel, Germany

121 **Report of the Second Session of the Global Synthesis and Observations Panel, 8-9 December 2006, La Jolla, CA, USA**

122 **Report of the 14th Meeting of the CLIVAR Scientific Steering Group (SSG),** 19 – 21 April 2006, Buenos Aires, Argentina

123 **Report of the 4th Meeting of the Indian Ocean Panel (IOP),** 23-25 April 2007, Pretoria, South Africa

124 **Report of the 11th Meeting of the Working Group for Seasonal to Interannual Prediction.** 7-8 June 2007, Barcelona, Spain.

125 **Workshop Report: A monitoring system for heat and mass transports in the South Atlantic as a component of the Meridional Overturning Circulation.** 8-10 May 2007, Buenos Aires, Argentina

126 **Report of the 15th Meeting of the CLIVAR Scientific Steering Group,** 11-14 September 2007, Geneva, Switzerland (in progress)

VII. International CLIVAR Project Office (ICPO)

The CLIVAR Programme is administered by the International CLIVAR Project Office.

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VIII. Appendix

CLIVAR Internet Pages

The CLIVAR programme has its own homepage on the WWW at the URL - address:

http://www.clivar.org/

and a mirror site at UCAR (Boulder):

http://www.clivar.ucar.edu/

Besides finding overviews about the structure and organization of the CLIVAR programme, you will also find information about recent and planned activities, meetings, conferences, CLIVAR projects and publications. Links may also be made to other sites and programmes interfacing to CLIVAR. We hope to develop this site to the full potential of the medium in order that you, the interested scientist, can not only read about what others are doing in CLIVAR but can also provide feedback and actively participate in the implementation of the programme.