



WORLD CLIMATE RESEARCH PROGRAMME



The Climate Variability and Predictability (CLIVAR) Handbook

July 2013



Contents

CLIVAR Overview.....	3
Programme Structure.....	4
CLIVAR Panels and Working Groups.....	5
Cross-cutting or Global Panels.....	5
CLIVAR Scientific Steering Group (SSG).....	5
CLIVAR/WGCM Panel on OMD (POMD).....	6
CLIVAR Global Synthesis and Observation Panel (GSOP).....	7
CLIVAR/PAGES Working Group.....	8
Regional Panels.....	9
CLIVAR Asian-Australian Monsoon Panel (AAMP).....	9
CLIVAR/GOOS Indian Ocean Panel (IOP).....	10
Atlantic Panel.....	11
Pacific Panel.....	12
CLIVAR/CliC/SCAR Southern Ocean Panel.....	14
Variability of the American Monsoon Systems (VAMOS) Panel.....	15
CLIVAR Variability of the African Climate Panel (ACP).....	16
CCI/CLIVAR Expert Team on Climate Change Detection and Indices.....	17
CLIVAR Research.....	18
CLIVAR Publications.....	19
CLIVAR's Newsletter.....	19
CLIVAR Bulletin.....	19
CLIVAR and Social Media.....	19
International CLIVAR Project Office (ICPO).....	320
CLIVAR Website.....	331

CLIVAR Overview

Climate Variability and Predictability (CLIVAR) is one of the four core projects of the World Climate Research Programme (WCRP). WCRP was established in 1980 under the joint sponsorship of the International Council for Science (ICSU) and the World Meteorological Organisation (WMO), and since 1992 has also been sponsored by the Intergovernmental Oceanographic Commission (IOC) of UNESCO. The main objectives set for WCRP at its inception – which are still valid today – were to determine the predictability of climate and to determine the effect of human activities on climate. A detailed description of WCRP and its other three core projects are available at www.wrcp-climate.org.

CLIVAR was established in 1995. CLIVAR's mission is to facilitate observation analysis and prediction of changes in the Earth's climate system, with a focus on ocean-atmosphere interactions, enabling better understanding of climate variability, predictability, and change, to the benefit of society and the environment in which we live. At SSG-20 in May 2013 CLIVAR was renamed as Oceans and Climate with the goals of addressing Variability, Predictability and Change. The objectives of CLIVAR are to:

1. Understand the causes of climate variability on the intra-seasonal to centennial time scales through observation, analysis, and modelling;
2. Improve predictions of climate variability and change associated with both internal and external processes; and
3. Extend the observational climate record through assembly of quality-controlled paleoclimatic and instrumental data sets.

Programme Structure

The organisational structure of CLIVAR is summarised in Figure 1.

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 panels and working groups have been established. Some are organised jointly with other WCRP component programmes or in close collaboration with the International Geosphere-Biosphere Programme (IGBP), the Global Climate and Global Ocean Observing Systems, or the Intergovernmental Panel on Climate Change (IPCC) activities.

The CLIVAR SSG continuously reviews the organisational 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 (ICPO) is responsible for the coordination of both the scientific and administrative aspects of the CLIVAR programme under the oversight of the CLIVAR SSG. The ICPO is supported by the UK's Natural Environmental Research Council (NERC) and the US CLIVAR Office, which receives support from US funding agencies; primarily NASA, NOAA, and NSF.

The Terms of Reference and present membership of each of the CLIVAR panels and working groups are provided in section 3.

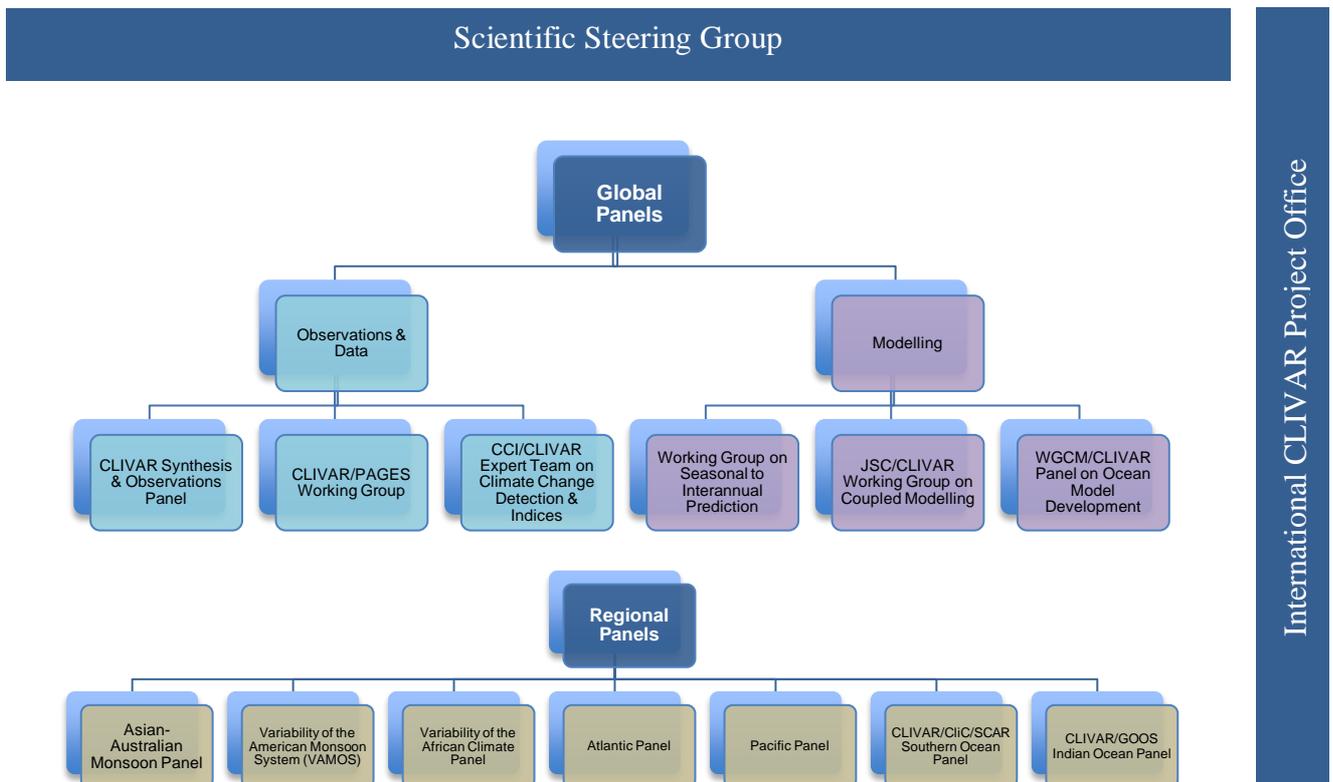


Figure 1: Schematic diagram summarising the current structure of CLIVAR

CLIVAR Panels and Working Groups

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 organisations 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

M. Visbeck (co-chair) (14)	IFM-GEOMAR, Kiel, Germany
L. Goddard (co-chair) (15)	Earth Institute at Columbia, USA
A. Bracco (15)	School of Earth and Atmospheric Sciences, Atlanta, USA
K. Drinkwater (14)	Institute of Marine Research, Bergen, Norway
S. Gulev (14)	Russian Academy of Sciences, Moscow, Russian Federation
E. Hawkins (15)	Department of Meteorology, University of Reading, UK
V. Masson-Delmotte (13)	Atomic Energy Commission and Energy Alternatives, France
P. MS Monteiro (15)	CSIR, South Africa
D. Stammer	University of Hamburg
S. Schubert (14)	NASA Goddard Space Flight Centre
L. Wu (14)	Ocean University of China, China

Ex-Officio Members

One chair/co-chair from each CLIVAR panel and working group (with other co-chairs as alternates)

Dr Kevin Trenberth NCAR, Boulder, USA
(chair, GEWEX)

Contact

The group email address for the CLIVAR SSG is clivar-ssg@clivar.org.

The ICPO contact for the CLIVAR SSG is [Professor Roger Barry](#)

CLIVAR/WGCM Panel on OMD (POMD)

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 the CLIVAR Scientific Steering Group.

Members

G. Danabasoglu (14) (co-chair)	NCAR, Boulder, USA
H. Drange (14) (co-chair)	University of Bergen, Bergen, Norway
E. Curchitser (13)	Rutgers University, USA
K. Fennel (13)	Dalhousie University, Canada
D. Holland (13)	Courant Institute, NYU, USA
H. Johnson (14)	Department of Earth Sciences University of Oxford
S. Marsland (14)	CSIRO, Australia
G. Nurser (13)	National Oceanography Centre, Southampton, UK
H. Tsujino (14)	Japan Meteorological Agency, Tsukuba, Japan
M. Winton (14)	Geophysical Fluid Dynamics Lab., NOAA, Princeton, USA

Ex Officio Members

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

Contact

The group email address for this panel is clivar-wgomd@clivar.org.

The ICPO contact for CLIVAR/WGCM POMD is [Dr Anna Pirani](#).

CLIVAR Global Synthesis and Observation Panel (GSOP)

Terms of Reference

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/optimisation 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 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, 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 reports to the CLIVAR SSG.

Members

K. Haines (co-Chair) (13)	ESSC, University of Reading, UK
T. Lee (co-Chair) (14)	Jet Propulsion Laboratory, USA
T. Awaji (14)	Kyoto University, Japan
M. Balmaseda (14)	ECMWF, UK
B. Barnier (14)	Laboratoire Ecoulements Geophysiques et Industriels, Grenoble, France
C. Domingues (15)	Antarctic Climate and Ecosystems CRC, Australia
P.P. Mathieu (15)	ESA, Italy
M. Palmer (14)	Met Office, Hadley Centre, UK
L. Yu (15)	WHOI, USA

Ex-Officio Members

M. McPhaden - chair of the Tropical Moored Buoy Implementation Panel	NOAA/PMEL, Seattle, USA
D. Roemmich - co-chair of the ArgoScripps Institution of Oceanography, La Jolla, USA Steering Team	

U. Send - co-chair of OceanSITES Scripps, La Jolla, USA

Contact

The group email address for this panel is clivar-gsop@clivar.org.

The ICPO contact for GSOP is [Dr Nico Caltabiano](#).

CLIVAR/PAGES Working Group

Terms of Reference

The PAGES / CLIVAR Working Group will work to:

1. Promote improved high resolution, well-dated, quantitative paleoclimate records with seasonal to interannual resolution, in regions that are of direct relevance to IGBP and WCRP.
2. Formulate and promote, in collaboration with [PAGES](#) and CLIVAR, a programme for analysing and synthesising paleoclimatic data in order to reveal evidence of patterns of variability within the climate system over seasonal to millennial time scales.
3. Promote improved quantitative methods of model-data comparison and evaluation in order to understand the variability present in both the paleoclimatic record and the models.
4. Promote the use of paleoclimate data to examine issues of climate predictability.
5. Coordinate with other modelling activities of relevance to IGBP and WCRP.

Members

V. Masson-Delmotte (co-chair) (12)	Lab. de Modelisation d. Climat et de l'Environnement, Gif-sur-Yvette, France
G Schmidt (co-chair) (12)	NASA/Goddard Institute for Space Studies, New York, USA
K. Anchukaitis (14)	Columbia University, US
K. Cobb (12)	Georgia Institute of Technology, Atlanta, USA
M. Feng (14)	CSIRO, Australia
J. Gergis (14)	University of Melbourne, Australia
J. Jungclaus (12)	Max Planck Institute for Meteorology, Hamburg, Germany
H. Linderholm (14)	University of Gothenburg, Sweden
M. Mann (12)	University of Virginia, Charlottesville, USA
Y. Wang (14)	University of Sussex, UK

Contact

The group email address for this panel is clivar-pages@clivar.org.

The ICPO contact for the PAGES/CLIVAR Working Group is [Dr Anna Pirani](#)

The PAGES contact for the PAGES/CLIVAR Working Group is [Dr Thorsten Kiefer](#).

Regional Panels

CLIVAR Asian-Australian Monsoon Panel (AAMP)

Terms of Reference: Updated version

1. Evolve and coordinate strategies to increase understanding of climate variability, predictability and predictions of the coupled ocean-atmosphere-land system in the Asian-Australia-Africa monsoon on timescales from intraseasonal to decadal and longer (tie into WGSIP/THORPEX);
2. Promote improvement of model simulations, predictions, and projections of monsoon, especially recognizing the fundamental role of monsoon intraseasonal variability (tie into GCSS/GEWEX, WGCM, WGNE)
3. Contribute to design and implementation of monitoring strategies, including process studies and sustained long term observations, for the Indian Ocean, Western Pacific and surrounding marginal seas and land regions necessary for monitoring and investigating the structure and mechanisms of monsoon variability and change. (into IOP and PP)
4. Co-ordinate and promote interactions among meteorologists, oceanographers and hydrologists in order to foster... (not sure: to recognize coupled nature of the land-ocean-atmosphere nature of the monsoon and to better deliver predictions of monsoon variability including impacts on hydrology)
5. Work in co-operation with other existing and planned regional and multinational programs 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) (13)	BMRC, Melbourne, Australia
K. Sperber (co-chair) (13)	Lawrence Livermore National Laboratory, Livermore, USA
H. Annamalai (15)	IPRC, University of Hawaii, USA
A. Kitoh (13)	Meteorological Research Institute, Japan
R. Krishnan (15)	Indian Institute of Tropical Meteorology, India
M. Lengaigne (14)	National Institute of Oceanography, Goa, India
G. Martin (15)	UK Met Office
A. Turner (13)	University of Reading, UK
J. Vialard (15)	LOCEAN, France
B. Wang (13)	University of Hawaii, Honolulu, USA
Y. Xue (15)	UCLA, USA
T. Zhou (13)	State Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Dynamics, China

Contact

The group email 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 endeavor 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.

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 ACP 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) (13)	First Institute of Oceanography, Qingdao China
M. Ravichandran (co-chair) (14)	INCOIS, India
M. Feng (12)	CSIRO, Australia
W. Han (14)	University of Colorado, USA
R. Hood (12)	Horn Point Lab. Uni. Maryland, USA
T. Lee (13)	NASA Jet Propulsion Laboratory, Pasadena, USA
C. Magori (14)	Kenya Marine and Fisheries Research Institute, Kenya
Y. Masumoto (12)	FORSGC, JAMSTEC, Tokyo, Japan
M. McPhaden (13)	NOAA, PMEL, Seattle, USA
W. de Ruijter (13)	University of Utrecht, NL
D. Sengupta (12)	Indian Institute of Science, India
T. Shinoda (14)	Navel Research Lab, Stennis, USA
A. Supangat (14)	National Council on Climate Change, Indonesia
G. Vecchi (13)	NOAA-GFDL, Princeton, USA
J. Vialard (13)	LOCEAN, Paris, France

Contact

The group email for this panel is clivar-iop@clivar.org.

The ICPO contact for the Indian Ocean Panel is [Dr Nico Caltabiano](#).

Atlantic Panel

Terms of Reference

1. 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 CLIVAR's Science and Initial Implementation Plans, particularly with respect to the Principal Research Areas D1 (NAO), D2 (TAV), D3 (THC), and anthropogenic climate change.
2. Collaborate with JSC/CLIVAR WGCM, POMD, 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 initialise models.
3. Liaise with relevant CLIVAR panels, in particular the Arctic Climate Panel, the Southern Ocean Panel, and the VAMOS and ACP panels to ensure that best use is made of resources from regional research programmes.
4. Liaise with GSOP, OOPC, PIRATA, ARGO, and the IOC-CO2 panel to ensure that CLIVAR benefits from and contributes to GEOSS.
5. 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 programmes.
6. 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. Report to the CLIVAR SSG.

Members

(co-chair)

P. Brandt (co-chair) (13)	IfM-GEOMAR, University of Kiel, Germany
M. Baringer (12)	NOAA/AOML/PHOD Miami, USA
S. Camargo (12)	LDEO Columbia University, USA
P. Chang (12)	Texas A&M University College Station, USA
T. Farrar (13)	Woods Hole Oceanography Institution, USA
B. Hansen (13)	Faroe Marine Research Institute, Faroe Islands
Y. Kushnir (11)	LDEO, Columbia University, USA
M. Mata (12)	FURG Rio Grande, Brazil
M. Rouault (13)	University of Cape Town, South Africa
D. Smith (12)	Hadley Centre, Met Office, UK
A. Treguier (12)	LPO IFREMER Plouzane, France

Ex-Officio Members

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

Contact

The group email address for this panel is clivar-atlantic@clivar.org.

The ICPO contact for the CLIVAR Atlantic Panel is [Dr Nico Caltabiano](#).

Pacific Panel

Terms of Reference

1. 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; and
 - Indo-Pacific Decadal Variability.And also on Pacific impacts on:
 - Variability and predictability of the American Monsoon system;
 - Southern Ocean Climate variability; and
 - Climate change prediction/detection and attribution.
2. 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. 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. Organise 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. 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. 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. Advise the CLIVAR SSG of progress and obstacles towards successful implementation of CLIVAR in the Pacific.

Members

W. Cai (co-chair) (13)	CSIRO, Div. of Atmospheric Research, Aspendale, Australia
A. Ganachaud (co-chair) (13)	Legos.IRD, Noumea, New Caledonia
K. Ando (14)	JAMSTEC, Japan
M. Collins (14)	University of Exeter, UK

CLIVAR Handbook

M. Lengaigne (12)	LOCEAN, Paris, France
S. Power (13)	BMRC, Melbourne, Australia
U. Takayabu (13)	University of Tokyo, Japan
P. Wiles (14)	PI-GOOS, Samoa
S. Yeh (14)	Department of Environmental Marine Science, Hanyang University,
C. Van de Wyngard (16)	Universidad de Concepción, Chile
W. Kessler (16)	NOAA, USA
X. Lin (16)	Ocean University of China

Ex-officio Members

M. McPhaden	NOAA/PMEL, Seattle, USA (Tropical Moored Buoy Implementation Panel)
-------------	---

Contact

The group email address for this panel is clivar-pacific@clivar.org.

The ICPO contact for the Pacific Panel is [Dr Nico Caltabiano](#).

CLIVAR/CliC/SCAR Southern Ocean Panel

Terms of Reference

1. Design a strategy to assess climate variability and predictability of the coupled ocean-atmosphere-ice system in the Southern Ocean region.
2. Engage and interact with the Southern Ocean Observing System (SOOS) programme on Southern Ocean sustained observations and model experiments needed to meet the objectives of CLIVAR, CliC, SOOS and SCAR.
3. 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/SCAR are met and resources are used efficiently.
4. Enhance interaction between the meteorology, oceanography, cryosphere biogeochemistry and paleoclimate communities with an interest in the climate variability of the Southern Ocean region.
5. 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. Work with the CLIVAR, CliC, SCAR, SOOS and WCRP Data Council data systems on issues related to distribution and archiving of Southern Ocean observations.
7. Advise the CLIVAR, CliC, SOOS and SCAR SSGs on progress achieved towards implementation.

Members

M. England (co-chair) (13)	University of New South Wales, Australia
L. Talley (co-chair) (15)	Scripps Institution of Oceanography, USA
T. Chereskin (14)	Scripps Institute of Oceanography
Y. Fukumachi (13)	Hokkaido University, Sapporo, Japan
S. Griffies (14)	NOAA
H. Hellmer (14)	Alfred Wegener Institute
N. Lovenduski (14)	University of Colorado, USA
G. Marshall (13)	British Antarctic Survey, UK
A. Naveira Garabato (13)	National Oceanography Centre, Southampton, UK
A. Orsi (14)	Texas A&M University, College Station, USA (iAZone)
K. Speer (13)	Florida State University, Tallahassee, USA
S. Swart (14)	CSIR
D. Thompson (13)	Colorado State University, Fort Collins, USA

Contact

The group email address for this panel is clivar-sthnocean@clivar.org.

CLIVAR Handbook

The ICPO contact for the CLIVAR Southern Ocean Panel is [Dr Nico Caltabiano](#)

The ICPO South America contact is [Dr Carlos Ereño](#).

Variability of the American Monsoon Systems (VAMOS) Panel

Terms of Reference

1. Be responsible for the formation of detailed scientific plans and conceptual designs of international projects to investigate the variability and predictability of the American monsoon system in the context of global climate variability and predictability.
2. Promote and coordinate studies of climate change impacts on the American monsoon system as well as studies of adaptation, including the social sciences perspective.
3. Coordinate and promote interactions among atmospheric scientists, environmental scientists, oceanographers and hydrologists, and in general Earth System science researchers from interested nations to work on VAMOS problems.
4. Coordinate, advise and support other CLIVAR and WCRP groups on investigations that need to be carried out to meet VAMOS objectives, and provide the VAMOS products that may be useful to those groups.
5. Work closely and coordinate with other national, regional and international projects and organisations interested in this area of research, e.g. US CLIVAR, the Inter-American Institute for Global Change Research (IAI), the International Research Institute for Climate and Society (IRI), and GEWEX.

Members

E.H. Berbery (co-chair) (12)	University of Maryland, USA
D. Gochis (co-chair) (14)	NCAR RAO, Boulder, Colorado, USA
R. Arritt (14)	Iowa State University, USA
W. E. Baethgen (14)	IRI, Palisades, USA
M. Barreiro (14)	Universidad de la Republica, Uruguay
I. Cavalcanti (14)	CPTEC, INPE, Brazil
A. Douglas (14)	Creighton University, USA
B. Kirtman (12)	RSMAS, Miami, USA
M. Rojas (14)	University of Chile
P. Salio (14)	CIMA, Universidad de Buenos Aires, Buenos Aires, Argentina
M. Taylor (14)	University of the West Indies, Jamaica
R. Wood (14)	University of Washington
P. Zuidema (13)	Rosenstiel School of Marine and Atmos. Sciences, University of Miami

Contact

The group email address for this panel is clivar-vamos@clivar.org.

The ICPO contact for the CLIVAR VAMOS Panel is [Dr Carlos Ereño](#).

The CLIVAR-GEWEX African Climate Panel

Terms of Reference

1. Develop and refine the Clivar-Gewex African Climate Panel 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).
3. Promote and coordinate efforts for evaluations and improvements of model simulations (e.g., AMIP, CMIP, IPCC) 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, and INFOCLIMA.
5. Promote the involvement of African scientists within the Clivar-Gewex African Climate Panel and the use of VACS products in capacity building activities.
6. Develop cooperative investigations with other CLIVAR groups and national, regional, or international research programmes and organisations interested in this area of research.
7. Develop links with programmes and organisations interested in the application of the Clivar-Gewex African Climate Panel research (e.g. CLIPS and START) and, as far as feasible, integrate requirements of these programmes and organisations into the Clivar-Gewex African Climate Panel
8. Execute the Clivar-Gewex African Climate Panel 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 Clivar-Gewex African Climate Panel plan.

Members

R. Washington (chair) (13)	School of Geography and the Environment, University of Oxford, Oxford, UK
A. Tall (14) (chair)	Red Cross/Red Crescent Climate Center, and Université Cheikh Anta Diop de Dakar, Senegal
E. Afiesimama (14)	Nigerian Meteorological Agency, Nigeria
R. Anyah (14)	University of Connecticut, USA
M. Kadi (14)	ACMAD, Niamey, Niger
P. Lamb (14)	University of Oklahoma, USA
S. Mason (14)	IRI, USA
J. Mutemi (14)	University of Nairobi, Kenya
M. Rouault (14)	University of Cape Town, S. Africa
F. Semazzi (14)	North Carolina State University, USA
M. Shongwe (14)	Ministry of Tourism & Environmental Affairs, Swaziland

Contact

The group email address for this panel is clivar-africa@clivar.org.

The ICPO contacts for the The Clivar-Gewex African Climate Panel are [Dr Nico Caltabiano](#) and [Dr Anna Pirani](#).

CCI/CLIVAR Expert Team on Climate Change Detection and Indices (ETCCDI)

Terms of Reference

1. Provide international coordination and help organise collaboration on climate change detection and indices relevant to climate change detection.
2. Further develop and publicise indices and indicators of climate variability and change from the surface and sub-surface ocean to the stratosphere.
3. Encourage the comparison of modelled data and observations perhaps via the development of indices appropriate for both sources of information.
4. 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, and START, as well with the joint WCRP JSC/CLIVAR Working Group on Coupled Modelling, the WCRP Observations and Assimilation Panel, and regional associations.
5. Explore, document and make recommendations for addressing the needs for capacity building in each region, pertinent to this topic.
6. Submit reports in accordance with timetables established by the OPAG chair and/or Management Group.

Members

X. Zhang (co-chair) (14)	Climate Research Division, Canada	CLIVAR
A. Klein-Tank (co-chair) (14)	KNMI, The Netherlands	CCI
L. Alexander (14)	University of New South Wales, Australia	CLIVAR
A. Dai (14)	NCAR, USA	GEWEX
G. Hegerl (14)	University of Edinburgh, UK	CLIVAR
K. Horsburgh	National Oceanography Centre, UK	JCOMM
M. Rusticucci (14)	University of Buenos Aires, Argentina	CCI
B. Trewin (14)	Bureau of Meteorology, Australia	CCI
X. Wang (14)	Canadian Weather Service, Canada	JCOMM
S. Woodruff (14)	NOAA, USA	JCOMM
P. Zhai (14)	China Meteorological Administration, China	CCI
F. Zwiers (14)	Environment Canada, Canada	CLIVAR

Contact

The group email address for this panel is clivar-etccdi@clivar.org.

The ICPO contact for the CCI/CLIVAR/JCOMM ETCCDI is [Dr Anna Pirani](#).

CLIVAR Research

The overall aim of WCRP's strategic framework for 2005-2015 (Coordinated Observation and Prediction of the Earth System, COPES) is to facilitate analysis and prediction of Earth system variability and change for use in an increasing range of practical applications of direct relevance, benefit, and value to society. To help focus its activities under COPES, WCRP has developed an Implementation Plan for its activities for the period 2010-2015 and a summary of its achievements under COPES to date. These can be downloaded via the following links:

WCRP Implementation Plan 2010-2015:

http://wcrp.wmo.int/documents/WCRP_IP_2010_2015.pdf

WCRP 2008-2009 Achievements Report:

http://wcrp.wmo.int/documents/WCRP_AR_2008_2009.pdf

At the JSC-33 Meeting in 2012 WCRP identified a set of Grand Challenges.

These concern:

- Provision of Skillful Future Climate Information on Regional Scales (includes decadal and polar predictability)
- Regional Sea-Level Rise
- Cryosphere Response to Climate Change (including Ice Sheets, Water Resources, Permafrost and Carbon)
- Improved Understanding of the Interactions of Clouds, Aerosols, Precipitation, and Radiation and their Contributions to Climate Sensitivity
- Past and Future Changes in Water Availability (with Connections to Water Security and Hydrological Cycle)
- Science Underpinning the Prediction and Attribution of Extreme Events

At SSG 20 CLIVAR defined new research opportunities:

1. Intraseasonal, seasonal and interannual variability and predictability of monsoon systems
2. Decadal variability and predictability of ocean and climate variability
3. Trends, nonlinearities and extreme events
4. Marine biophysical interactions and dynamics of upwelling systems
5. Dynamics of regional sea level variability
6. Consistency between planetary heat balance and ocean heat storage
7. ENSO in a warming world

These are being addressed by Task Teams who will identify 2-3 leading problems and suggest implementation strategies.

CLIVAR Publications

1.1 CLIVAR's Newsletter

CLIVAR produces a newsletter – entitled 'Exchanges' – four times a year. Exchanges provides information on CLIVAR activities, achievements, and issues. The Newsletter is available electronically at the following address:

<http://www.clivar.org/publications/exchanges/exchanges.php>

1.2 CLIVAR Bulletin

CLIVAR publishes an electronic Bulletin each month that summarizes recent and upcoming activities of interest to the CLIVAR community.

1.3 CLIVAR and Social Media

Social media is a digital platform, which is used widely by both the general public and scientists for communication and information dissemination. Social media platforms, which CLIVAR is involved in, include, Facebook, Twitter and LinkedIn. The benefits to using social media include:

- Increasing CLIVARs access to a potentially interested audience
- Improving the accessibility for CLIVAR communications
- Improving long term cost effectiveness of communication
- Increasing the speed of interaction, input and feedback from audiences
- Targeting specific audiences, such as Early Career Scientists
- Broadening the communication strategy away from traditional channels.

The measure of success of any social media tool is whether it allows you to engage with the target audience by facilitating:

- Communication
- Dissemination of information
- Audience interaction, discussion and debate
- Education

The use of social media alone does not make a good communications strategy. It must be combined with an array of other communications tools to deliver some of the abovementioned benefits.

CLIVAR social media strategy

The use of social media has advantages and disadvantages to consider and are highlighted in the table 1.

Overall the advantages gained through the use of social media outweigh the disadvantages. Consequently, terms of reference have been drawn up which try to mitigate the risks that can occur with social media usage, with properly defined regulation, specific to the current CLIVAR social media usage.

- ***The goals***

To raise awareness about CLIVAR and its activities to a wider community, specifically focusing on a younger generation of scientists.

To better interact with scientists through the content published.

- ***The audience***

The CLIVAR social network presence has been developed to primarily communicate to a wider scientific audience, and specifically the Early Career Scientist community and the wider public.

- ***Included content***

The posts will all be science related. Postings about relevant jobs and career development opportunities will be made as well as recent scientific publications and scientific outreach opportunities will be made. Content should be professional, related to climate variability and predictability covering both the ocean and atmospheric sciences.

It is essential that there should be no official CLIVAR discussion of particular policies related to climate. This will ensure that CLIVAR remains a purely scientific organization.

- ***Social media tools***

The social networking tools currently (as of July 2013) used by CLIVAR are Facebook, Twitter and LinkedIn.

Social networking tools such as Facebook and LinkedIn allow information to be shared about the project, its activities and interests with friends, professional colleagues and other communities and individuals following your network. LinkedIn is generally more formal than Facebook for communications.

By contrast, a tweet is a short message, typically less than 140 characters, often broadcast from different locations and events through mobile services, which allows real time updates. Tweets are generally informal.

The CLIVAR Facebook and LinkedIn pages provide an information section with an overview of the programme. Comparatively the twitter page contains only a brief summary. LinkedIn will be used in an entirely professional context, for career development and to network with other scientists (in particular early career scientists), projects (e.g. EU FP7 THOR and NACLIM projects) and organizations (e.g. AGU, ICES etc.). Facebook and Twitter will be used in a slightly more informal context to create a community feel.

- ***Maintenance of social media***

The CLIVAR Facebook and twitter pages will be updated automatically with items posted on the CLIVAR newsfeed. Additional posts can then be added as appropriate.

The CLIVAR webmaster is responsible for developing the structure and architecture of the CLIVAR website, including linking the newsfeed with the social networking sites. An ICPO staff scientist will be responsible for monitoring the content published and adding additional updates to each of these sites as appropriate.

Members of the CLIVAR community who already use social media will be tasked to spread the information further to their own communities of followers on docisl

medis networks. Up to date lists of CLIVAR scientists who are active on the different social media platforms will be made in order to try and track who is using social media most effectively.

- ***Measuring the success of social media***

The success of the social media campaign can be measured through facilities such as the number of followers or people liking the Facebook page/group. Google analytics can also be used to measure how much traffic is being directed to the main CLIVAR website from the social media postings.

- ***Review of social media strategy***

This strategy is a living document and thus should be regularly updated to reflect the current and up to date needs and consideration of the CLIVA community. It would be advisable to revisit the strategy and terms of reference on an annual basis.

Terms of Reference for CLIVAR social media use

1. To provide an informal avenue of communication to a wide audience, including both scientists outside the CLIVAR community, early career scientists and the general public.
2. To engage with early career scientists and entrain them into the CLIVAR community.
3. To communicate the occurrence of CLIVAR meetings and other relevant events to the wider scientific community.
4. To highlight findings of new scientific publications. These findings should not be expressed as CLIVAR opinion but act as a note to the community that the work has been published.
5. Posts published should be within copyright laws, is credible, respectful and professional. Posts should also not involve any discussion of climate relevant policies.
6. Check for appropriate language to ensure, whenever possible, that communications are not misinterpreted.
7. To publicize the use of social media on email signatures, CLIVAR website, in banners, flyers and brochures.
8. To interact with other WCRP /science projects already registered in social networks to promote key science topics through live chat sessions, hash tags and discussions.

Facebook		Twitter	
Advantageous applications	Disadvantages to consider	Advantageous applications (Beyond that of Facebook)	Disadvantages to consider
<ul style="list-style-type: none"> • Outreach programmes can target different audiences through social media. • Public service announcements. • Publicizing events. • Feedback from the wider community. • Information about the CLIVAR organization. • Networking. • Promotion of CLIVAR science. • Chanel to monitor what wider community thinks about the project. 	<ul style="list-style-type: none"> • Current Facebook Terms of Use implies that all content uploaded to Facebook becomes the property of Facebook. • Significant sensitive and personally identifiable information is maintained on Facebook and is relatively easily accessible. It is important to be sensitive to privacy issues, particularly of third parties such as colleagues, members of the public, etc. • Copyrighted material, such as photos and videos, should not be uploaded to Facebook without permission. • Posts interpreted as project opinion rather than communication of science issues. 	<ul style="list-style-type: none"> • Real time news management e.g. promoting science achievements and communicating news. • Real time monitoring of science topics and news being discussed by the wider community. • Drive traffic to the CLIVAR website via tweets specifying a landing page on the website. • Can be a highly interactive way of engaging with a wider audience. 	<ul style="list-style-type: none"> • Disengaging audiences through automation of tweets, particularly the use of article headlines as tweets. Tweets should be written in informal language and paraphrased. • The possibility for other Twitter users to set up fake accounts and impersonate people to mislead the public. • Tweets interpreted as project opinion rather than communication of science issues. • Tweets may be misinterpreted due to their very short nature.

Table 1. Advantages and disadvantages to using social media.

International CLIVAR Project Office (ICPO)

The CLIVAR Programme is administered by the International CLIVAR Project Office, in consultation with the WCRP Joint Planning Staff Contact.

Contact

International CLIVAR Project Office
National Oceanography Centre, Southampton
University of Southampton Waterfront Campus
Southampton, SO14 3ZH
United Kingdom
tel: +44-23-8059-6777
fax: +44-23-8059-6204
email: icpo@noc.ac.uk

Director
Professor Roger Barry Email: rogbar@noc.ac.uk

Staff

Dr Nico Caltabiano	email: caetano@noc.soton.ac.uk
Dr Carlos Ereño	email: carlos_eren@yahoo.com
Dr Anna Pirani	email: anna.pirani@noc.soton.ac.uk
Mr Tim Waterfield	email: timter@noc.ac.uk
Dr. Jennifer Riley	email: Jennifer.riley@noc.ac.uk
Mrs Jane Wilkinson	email: jankin@noc.ac.uk

WCRP Joint Planning Staff Contact

Mrs Valery Detemmerman
c/o World Meteorological Organization
Case Postale No. 2300
CH-1211 Geneva 2
Switzerland
tel.: +41-22-730-8242
fax: +41-22-730-8036
email: vdetemmerman@wmo.int

CLIVAR Website

The CLIVAR Programme has its own website at the URL-address:

<http://www.clivar.org/>

In addition to finding overviews about the structure and organisation of the CLIVAR programme, you will find information about recent and planned activities, meetings, conferences, CLIVAR projects, and publications. Links with other sites and programmes interfacing with CLIVAR are also listed. 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.

If you notice errors or have any suggestions regarding the contents of this handbook, please advise:

International CLIVAR Project Office
National Oceanography Centre
Southampton, SO14 3ZH
United Kingdom

tel: +44-23-8059-6777
fax: +44-23-8059-6204
email: icpo@noc.ac.uk