

WCRP ANNUAL REPORT 2005-2006

New Futures: Building on Great Success

World Climate Research Programme
improving climate predictions and understanding human influence on climate

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MESSAGE FROM THE CHAIRS



Information on climate is in great demand from a wide range of stakeholders. Hardly a day goes by without newspaper articles or radio or TV news items on some aspect of climate variability or change. This is a great opportunity for the WCRP. It is also a major challenge.

The WCRP has a pivotal role in catalyzing the necessary research to improve understanding of climate processes and facilitating the incorporation of this understanding in a range of products, predictions and projections to meet a broad range of user requirements – this is the central focus of WCRP’s Strategic Framework 2005-2015. One of a number of examples where the WCRP has had a major impact in recent years is the coordination and intercomparison of climate change model results by the Working Group on Coupled Modelling. This activity is essential to the Intergovernmental Panel on Climate Change and has already resulted in over 200 published or submitted papers.

Equally challenging is strengthening links with research partners, funders, stakeholders and users, and the accurate communication of climate information for use in an increasing range of practical applications of direct relevance, benefit and value to society. To this end, the WCRP actively participated in the most recent sessions of the United Nations Commission on Sustainable Development (New York) and is actively engaged with the Subsidiary Body on Scientific and Technological Advice of the United Nations Framework Convention on Climate Change (Bonn). The WCRP is also moving to better understand the needs of its key stakeholders through a series of interviews and small workshops. The report from this Networking Survey will be available for consideration in early 2007.

Over the years, WCRP scientists have been recognized for major achievements. The latest is CLIVAR’s co-chair Dr Tim Palmer and his collaborators who won the 2006 Norbert Gerbier-Mumm International Award for their ground-breaking research into the application of ensemble predictions used e.g. in early-warnings of malaria outbreaks. Congratulations, Tim and all of your collaborators.

2006 is a year of transition. Dr David Carson retired in late 2005 after five years as Director of the WCRP. Professor Peter Lemke stepped down after six years as Chair of the WCRP in March 2006. On behalf of all WCRP scientists, we wish both David and Peter all the very best in their future activities.

Finally, a very warm welcome to Professor Ann Henderson-Sellers, the new Director of the WCRP from January 2006. Ann brings great enthusiasm, drive and competence to the role of Director. We wish her all the very best in her new role.



John Church
*Incoming Chair,
WCRP*



Peter Lemke
*Immediate Past Chair,
WCRP*

September 2006



BENEFITS DELIVERED IN 2005-2006



WCRP Strategic Framework: 2005-2015

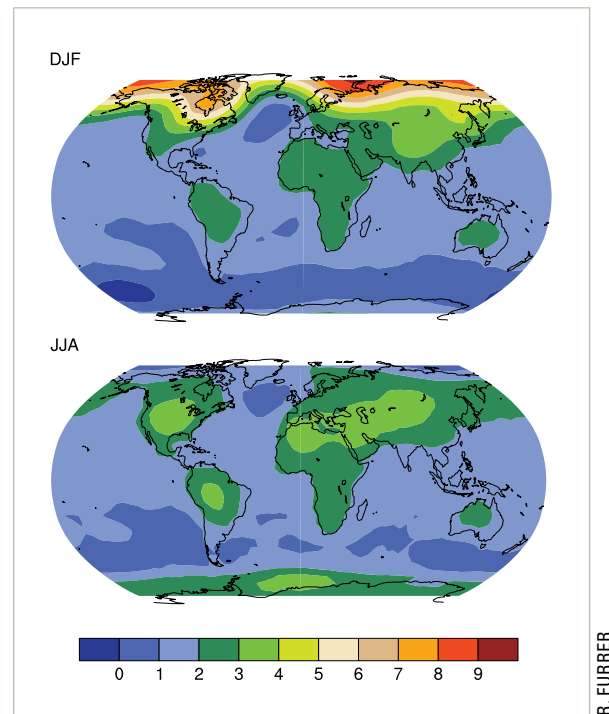
Since its establishment in 1980, the WCRP has had two major objectives: to determine the extent to which climate can be predicted, and to determine the extent of human influence on climate.

In 2005, the WCRP launched its Strategic Framework for 2005-2015 entitled 'Coordinated Observation and Prediction of the Earth System'. Through its core projects and cross-cutting activities, the WCRP is currently implementing this new strategy, which aims 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. In moving to provide a broader suite of products and services to a larger group of users, the WCRP is re-prioritising its activities to maximize societal benefits. One of the primary WCRP pathways to application and end-user benefits will continue to be the integration of observations and models to generate new understanding, leading to enhanced benefits from climate predictions. The 2005-2015 WCRP strategy will promote the creation of comprehensive, reliable, end-to-end global climate observations and models for the dual purpose of describing the structure and variability of the climate system and of generating a platform for future prediction of climate. The complete text of the WCRP Strategic Framework 2005-2015 is available on the attached CD and at http://wcrp.wmo.int/pdf/WCRP_stratgImple_LowRes.pdf.

World's First Comprehensive Archive and Analyses of Future Climate

Modelling activities within the WCRP have been fundamental to the completion of the forthcoming IPCC

Fourth Assessment Report, to be published in 2007. WCRP scientists and projects contribute significantly to the collection and assembly of climate observations, model development and understanding of the climate system necessary for the detection and attribution of past climate change, and the provision of climate information, including projections of future change based on various emission scenarios.



Model estimate of surface warming (°C) at year 2080-2100 relative to 1980-2000 for the emission scenario A1B, calculated for the Fourth Assessment Report (AR4) of the Intergovernmental Panel on Climate Change (IPCC) for December-January-February (top) and June-July-August (bottom).

The 'International Workshop on Analyses of Climate Model Simulations for the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)', convened by WCRP's US CLIVAR in Hawaii, March 2005, marked the world's first comprehensive collection and analysis of climate model projections. The workshop was mainly organized by the WCRP Working Group on Coupled Modelling (WGCM). Over 400 scientists have registered to analyze the model data prepared by the WGCM for the IPCC Fourth Assessment Report. More than 200 papers have already been published or submitted to peer-reviewed journals. A summary of the workshop is included in the CD inside the back cover and workshop information is available at <http://ipcc-wg1.ucar.edu/meeting/CMSAW/>.



Dr Buruhani Nyenzi, Director of the World Climate Programme, and Professor Ann Henderson-Sellers at the UNFCCC SBSTA side event in Bonn in May 2006.

Climate Change Research Videos

A DVD entitled 'Climate Change Research Achievements and Challenges' was created from WCRP's seminar at the UNFCCC's Subsidiary Body on Scientific and

Technological Advice (SBSTA) meeting in Bonn, Germany, May 2006. The DVD features a 15 minute video, which can be used with a general audience, plus longer clips and the full event that focussed on research gaps for managing climate change impacts and facilitating adaptation to future climate change. Questions addressed by WCRP scientists were: How dangerous is sea-level rise? How confident are we about climate change projections? What forces climate change and how well do we know it? What climate extremes are awaiting us? For live web-casts on the side event see http://unfccc.meta-fusion.com/kongresse/SB24/templ/ply_sideevent.php?id_kongresssession=168&player_mode=isdn_real or send a request for a copy of the DVD to wcrp@wmo.int.

Sea-Level Rise Sources of Uncertainty Understood

In June 2006, the WCRP brought together all relevant scientific expertise to identify the uncertainties associated with sea-level rise and the research and observational activities needed for narrowing these uncertainties (<http://copes.ipsl.jussieu.fr/Workshops/SeaLevel/index.html>). The workshop was hosted by the Intergovernmental Oceanographic Commission (IOC) of UNESCO in Paris. Participants agreed that since the beginning of high-accuracy satellite altimetry in the early 1990s, global mean sea-level has been observed by both tide gauges and altimeters to be rising at a rate of just above 3 mm/year, compared to a rate of less than 2 mm/year from tide gauges over the previous century. The extent to which this increase reflects natural variability versus anthropogenic climate change is unknown. About half of the sea-level rise during the first decade of the altimeter record can be attributed to thermal expansion due to a warming of the oceans; the other major contributions include the combined

effects of melting glaciers and ice sheets. Changes in the storage of water on land (such as the depletion of aquifers and increases in dams and reservoirs) remain very uncertain. A Summary Statement from the workshop has identified the priority research and observational requirements. This Statement is on the back-cover CD. In addition, oral and poster presentations from the workshop are available at <http://copes.ipsl.jussieu.fr/Organization/Activities/SeaLevel.html>.

Climate Prediction Breakthrough for Malaria Outbreaks

The 2006 Norbert Gerbier-Mumm International Award given to WCRP CLIVAR's co-chair, Dr Tim Palmer, and his 24 collaborators (from 13 institutions from 7 nations) recognized their major contribution to ensemble climate



Andrew Morse, Francisco Doblas-Reyes, Tim Palmer and Renate Hagedorn (from left to right) on behalf of their colleagues are receiving the 2006 Norbert Gerbier-Mumm International Award at WMO, June 2006.

prediction applications that significantly improved early-warning techniques such as for malaria outbreaks. Dr Palmer's work was published in 2004 in Volume 85 of the *Bulletin of the American Meteorological Society*. In his acceptance speech (June 2006), Dr Palmer thanked the Norbert Gerbier-Mumm foundation, the European Commission for funding and the WCRP for providing fora for the modelling community, noting that climate ensemble predictions were pioneered through and by the WCRP. Dr Palmer announced that the prize money would be used to train African scientists to make use of the ensemble climate prediction products.

New 2005-2006 WCRP (Research) Products

Ezine

- WCRP's Ezine (electronic newsletter), published quarterly, available at http://wcrp.wmo.int/Newsletter_index.html; to subscribe send a mail with your electronic contact details to wcrp@wmo.int.

Brochures

- World Climate Research Programme: 25 Years of Science Serving Society (2005). Download from <http://wcrp.wmo.int/pdf/wcrpbrochure.pdf> [pdf].
- WCRP Strategic Framework for 2005-2015 (2005). Download from http://wcrp.wmo.int/pdf/WCRP_strateglmp_Implement_Flyer.pdf [pdf].
- Climate Change – Research Priorities (2006). Download from http://wcrp.wmo.int/pdf/SBSTA_brochure2tabloids.pdf [pdf].

CDs/DVDs

- WCRP Strategic Framework 2005-2015 (August 2005): Coordinated Observation and Prediction of the Earth System; full report and brochure [CD, send request for copy to wcrp@wmo.int].

- WCRP Side Event at the SBSTA-24 session of the UNFCCC, Bonn, Germany, 19 May 2006 (May 2006): Climate Change Research Achievements and Challenges; live web-casts [DVD, send request for copy to wcrp@wmo.int].
- World Ocean Circulation Experiment (WOCE) (April 2005): Southern Ocean Hydrographic Atlas; [CD, send request for copy to wcrp@wmo.int].
- Baseline Surface Radiation Network (BSRN) Operations Manual Version 2.1 (April 2005) [CD].

Special Reports

- 'Assessment of Stratospheric Aerosol Properties' conducted by WCRP's project on Stratospheric Processes And their Role in Climate (SPARC); download report from <http://www.atmosp.physics.utoronto.ca/SPARC/ASAP/V3c1.pdf> [pdf].
- 'Blue Book' published by the Working Group on Numerical Experimentation (WGNE) on 'Research Activities in Atmospheric and Ocean Modelling'; for access use WGNE website <http://collaboration.cmc.ec.gc.ca/science/wgne/> to receive your personal password for log-in.

Other Products

- World Ocean Circulation (WOCE) (April 2005): Southern Ocean Hydrographic Atlas. Compiled by A. Orsi and T. Whitworth, 223 pages (340 x 480 mm); send request to mdsp@noc.soton.ac.uk.
- African Climate Atlas, Part IV on means and composites of ERA-40 reanalysis data, published by the Variability of the African Climate System (VACS) programme of WCRP's project CLIVAR; see <http://www.geog.ox.ac.uk/~clivar/ClimateAtlas/>.
- Cloud and Radiation Data Sets published by the International Satellite Cloud Climatology Project (ISCCP) within the WCRP; see http://www.gewex.org/ISCCP_data_products_4-2006.pdf [pdf].

- Global time series of soil moisture, evapotranspiration, sensible heat flux and other surface water and energy cycle variables, published by WCRP's project GEWEX; see http://www.gewex.org/GLDAS_data_product_4-2006.pdf [pdf].

JSC Reports

- See web http://wcrp.wmo.int/PG_Reports_JSC.html.

WCRP Series Reports

- See web http://wcrp.wmo.int/PG_Reports_WCRPSeries.html.

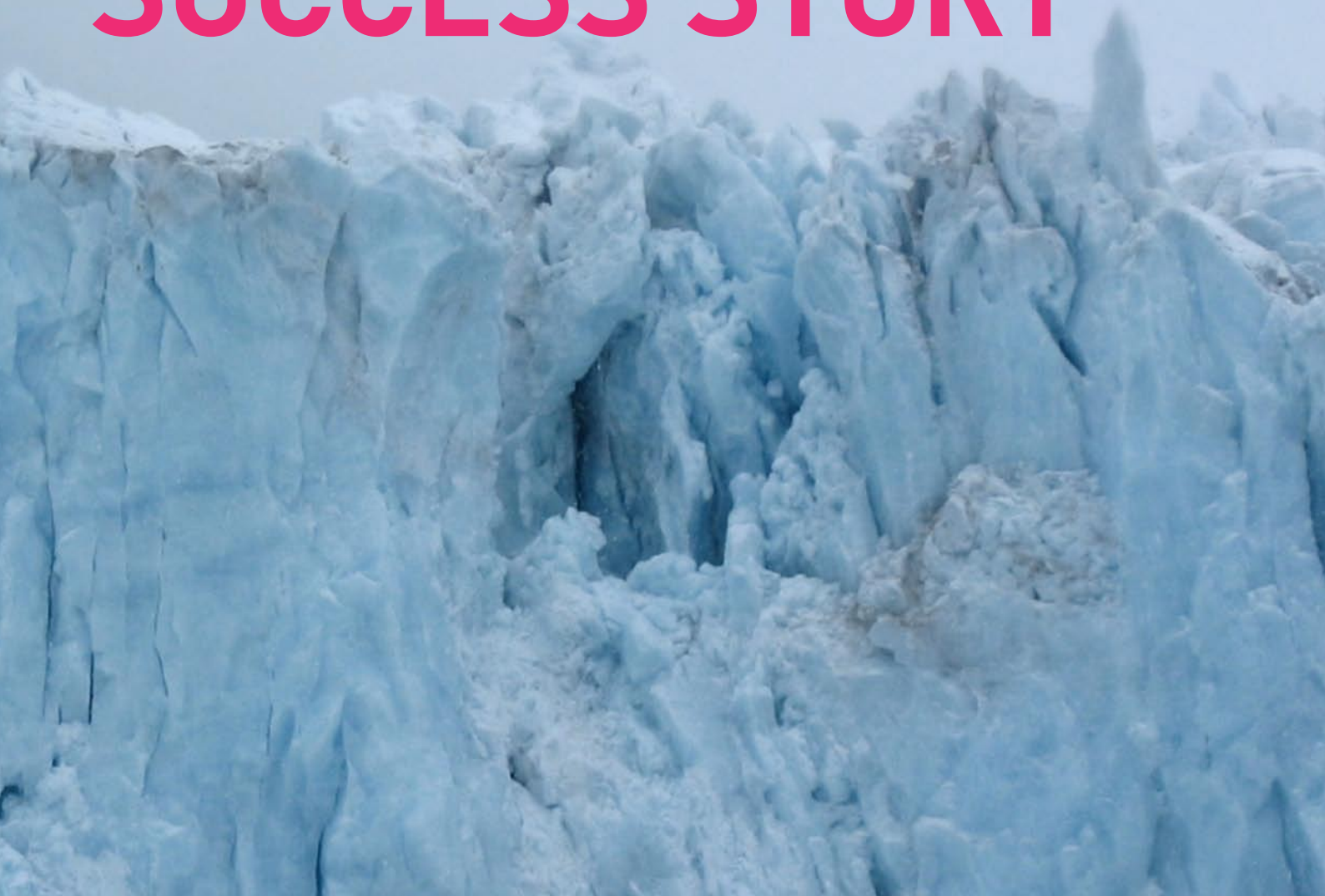
WCRP Informal Reports

- See web http://wcrp.wmo.int/PG_Reports_WCRPInformal.html.

WCRP Project Newsletters

- GEWEX News for download at www.gewex.org/gewex_nwsltr.html.
- CLIVAR Exchanges for download at www.clivar.org/publications/exchanges/exchanges.php.
- SPARC Newsletter for download at www.atmosp.physics.utoronto.ca/SPARC/Newsletters.html.
- CliC Ice and Climate News for download at cliv.npolar.no/disc/disc_newsletters.php?choice=CliC.

A SHORT HISTORY OF A LONG SUCCESS STORY



“It is fair to say that with the enlightened support of its sponsors, in its first 25 years the World Climate Research Programme... has successfully coordinated the multiple challenges in climate research and will continue to coordinate the international aspects of the emerging future challenges in climate research with great success”, write Professor Lawrence Gates, Chairman of the Joint Scientific Committee of the WCRP from 1994 to 2000, and Dr Roger Newson, member of the WCRP Joint Planning Staff from 1981 to 2002. Their review of the history of the World Climate Research Programme and its predecessor, the 1967 funded Global Atmospheric Research Programme, describes the achievements in coordinating observational and modelling research that have contributed to revolutions in climate research.

Development of the World Climate Research Programme

Modern climate science began with the creation of physically-based numerical models of atmospheric and oceanic circulations in the 1950s and, in the 1960s, captured the observations of new Earth-orbiting satellites. The idea of a global experiment to measure and predict the large-scale atmospheric circulation gradually took shape, requiring the assistance of both governmental and non-governmental organizations, the former to coordinate observational aspects and the latter to represent the research community. In

1967, the World Meteorological Organization (WMO) and the International Council for Science (ICSU) agreed to jointly organize and sponsor the international Global Atmospheric Research Programme (GARP), which had a Joint Organizing Committee to develop the scientific strategy and a Joint Planning Staff in Geneva to guide the international coordination of the programme. With GARP, the world’s first international community taking action towards climate research had been born.

GARP comprised a number of observational sub-programmes to characterize particular features of the atmospheric circulation, including in the tropics the GARP Atlantic Tropical Experiment (GATE), observations of monsoon circulations and the influence of mountains (the ALPine EXperiment, ALPEX). The culmination of GARP was the First GARP Global Experiment (also known as the Global Weather Experiment), which set new horizons in utilizing a wide variety of observational platforms, particularly polar-orbiting and geostationary satellites and buoy systems. This first global perspective of the Earth’s atmospheric circulation and climate system offered the potential for realizing global climate studies and investigating the physical processes important in the climate system.

The idea of an international research programme on climate and climate change, organized by the WMO,





Very early simulation from a global atmospheric model

ICSU and the United Nations Environment Programme (UNEP), was born. The 8th WMO Congress in May 1979 formally established the World Climate Programme, which included a climate research component (to be jointly managed by the WMO and ICSU), as well as activities in gathering, managing and applying climate data as well as assessing the potential of impacts of climate change (to be managed by UNEP). The World Climate Research Programme had from the outset two major foci: on climate predictability and on human influence on climate.

Evolution of Climate Research

The WCRP identified the scientific complexity and breadth of the climate system from its outset: the Scientific Plan for the programme, prepared in 1984, recognized clearly the roles of radiation, cloudiness, the ocean, the hydrological cycle and the biosphere. Oceans, land

surfaces, the cryosphere and biomass all needed to be taken fully into account and incorporated into global climate models. The extensive model development and numerical experimentation required the exploration of the sensitivity of the climate to changes in atmospheric CO₂ concentration (as well as other gases and aerosols). Early work on the assessment of research into CO₂ effects on climate anticipated that of the Intergovernmental Panel on Climate Change (IPCC). In view of the critical role of oceans in the climate system, close co-operation was established with the oceanographic community, with the Intergovernmental Oceanographic Commission (IOC) of the UNESCO subsequently joining WMO and ICSU as sponsors of the WCRP in 1993.

International Research Initiatives

The first coupled atmosphere-ocean initiative, the Tropical Ocean and Global Atmosphere (TOGA) project,

began in 1984. TOGA studied the influence of the ocean's surface temperature in the tropical Pacific on the large-scale atmospheric circulation and established the prototype of the ocean observing system now in place. The project led to major breakthroughs in operational seasonal forecasting because it laid the physical basis for understanding and predicting world-wide anomalies in the global atmospheric circulation and the temperature and precipitation patterns linked to El Niño. Other early important initiatives of the WCRP were the International Satellite Cloud Climatology Project (ISCCP) in 1982, the compilation of a Surface Radiation Budget (SRB) data set from 1985 and the Global Precipitation Climatology Project (GPCP) in 1985. These were based on exciting new techniques developed to blend remotely-sensed and in situ data optimally, providing for the first time new insights into the role of clouds in the climate system and the interaction of clouds with both radiation and the hydrological cycle. These activities formed the starting point for the comprehensive Global Energy and Water Cycle EXperiment (GEWEX) established in 1988, which is still one of the largest programmes of the WCRP.

The World Ocean Circulation Experiment (WOCE) was the largest and most successful global ocean research programme ever undertaken. Between 1990 and 1997, WOCE collected oceanographic data of unprecedented quality and coverage. These data, contributed by over thirty nations, have been fundamental in the development of basin-scale ocean models and have shaped our current understanding of ocean mixing processes.

Since 1992, the role of the stratosphere in the Earth's climate system has been the focus of the WCRP project on Stratospheric Processes And their Role in

Climate (SPARC). In 1993, the Arctic Climate System Study (ACSYS) opened up a polar perspective with the examination of key processes in the Arctic that have an important role in global climate. The scope of this study was broadened to the whole of the global cryosphere with the establishment of the Climate and Cryosphere (CliC) project in 2000.

The WCRP, always concerned with the question of climate variability, implemented the CLimate VARIability and Predictability (CLIVAR) project in 1995. Monsoons, the El Niño Southern Oscillation and other global coupled atmosphere-ocean phenomena are investigated by CLIVAR on seasonal, interannual, decadal and centennial timescales. CLIVAR further examines the detection and attribution of anthropogenic climate change based on high quality climatic records.

Numerical modelling activities have always been the main unifying component of the World Climate Research Programme. Improved climate models have constantly underpinned increasingly accurate simulations and predictions of natural climate variations, as well as the growing confidence in projections of human-induced climate change. Through the Working Group on Numerical Experimentation (WGNE) and the Working Group on Coupled Modelling (WGCM), the WCRP modelling programme has provided essential input to the three published assessments of the IPCC, and is doing so for the forthcoming Fourth IPCC Assessment Report to be published in 2007. WCRP researchers have also provided much of the scientific basis for the ozone protocols and CO₂- and aerosol-emission scenarios used by the United Nations Framework Convention on Climate Change (UNFCCC).

Collaboration in Earth System Science

Throughout its history, the WCRP has had extensive interactions with many groups concerned with climate and climate research, and has collaborated widely with other international scientific organizations on aspects of climate research that involve biogeochemistry as well as physics. The WCRP collaborates with the International Geosphere-Biosphere Programme (IGBP) and multiple examples of active collaboration between the WCRP and the IGBP can be found in the projects GEWEX, SPARC and CLIVAR. Furthermore, the WCRP strongly supported the WMO's establishment of the Global Climate Observing System (GCOS) in 1992 in cooperation with ICSU, UNEP and the IOC. The WCRP is also a co-sponsor of the international global change SysTem for Analysis, Research and Training (START) that promotes environmental research capacities in developing countries.

In 2001, projections of possible future climate change and of increasing variations in climate stimulated the establishment of the Earth System Science Partnership (ESSP) between the WCRP, the International Geosphere-Biosphere Programme (IGBP), the International Human Dimensions Programme (IHDP) and the international programme of biodiversity science (DIVERSITAS). This partnership is promoting a coordinated focus on important global issues of common concern, namely the carbon budget, food systems, water systems and human health, that could be affected by possible future climate change and increasing climate variability.

Prepared for Future Climate Research

A major new strategic initiative of the WCRP is the Coordinated Observation and Prediction of the Earth

System, which represents WCRP's new strategic framework for the period 2005-2015. The decadal goal is "to make new advances in the analysis and prediction of the variability and change of the comprehensive Earth system for use in an increasing range of practical applications of direct relevance, benefit and value to society". The reinforced and expanded framework promotes the coordination of climate science conducted through its projects with other programmes of WMO, ICSU and IOC, with the intergovernmental Group on Earth Observations (GEO) and with satellite agencies and numerical weather and climate prediction centres.



WCRP celebrates its 25th birthday. From left to right: Lawrence Gates, Peter Lemke and David Carson.

Professor Peter Lemke, Chair of the WCRP Joint Scientific Committee for the past six years, summarizes WCRP's future aspirations: "Understanding climate and its change represents one of the most difficult challenges to modern science! The WCRP, in the 25 years since it was established, has made enormous contributions to

advancing climate science and will continue to make a significant contribution to the understanding and governance of the Earth”.

With its strong background of leading climate science and planning strategic research initiatives, the WCRP is

more than able and has strong ambitions and intentions to enhance and develop future climate research.

Reference:

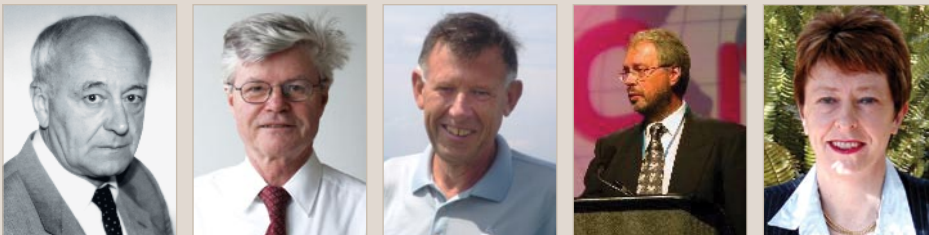
Gates, W.L. and R.L. Newson (2006), The History of the WCRP. *WMO Bulletin* 55 (3): 210 –216.

Chairs, Joint Scientific Committee



1) Joseph Smagorinsky, 2) John Houghton, 3) John Mason, 4) Gordon McBean, 5) Lawrence Gates, 6) Peter Lemke, 7) John Church

Directors, WCRP



1) Pierre Morel, 2) Hartmut Grassl, 3) Roger Newson, 4) David Carson, 5) Ann Henderson-Sellers
Bo Doos was Director of the Joint Planning Staff (JPS) for GARP when it first became the JPS for WCRP.

WCRP JOINT SCIENTIFIC COMMITTEE



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Professor Ann Henderson-Sellers, Director since
January 2006

Dr David Carson, Director 2000-2005

HIGHLIGHTS IN WCRP ACTIVITIES



Building on 25 years of experience, the WCRP continues to facilitate world-class climate research to the benefit of society. Milestones among WCRP's activities from July 2005 to June 2006 include the launch and implementation of WCRP's Strategic Framework for 2005-2015; the appointment of a new Director and the election of the new Chair for the WCRP; extensive modelling and analysis activities in support of the IPCC Fourth Assessment Report; and contributions to the UN Framework Convention on Climate Change (UNFCCC). WCRP scientists were recognized on several occasions for their outstanding work, which improved our understanding of climate variability and change. WCRP's development and distribution of new research products continues to contribute to advances in climate research.

Awards

The prestigious Roger Revelle Memorial Lectures were initiated by the Intergovernmental Oceanographic Commission (IOC) of UNESCO in 1992. Dr John Church, the Chair of the WCRP, delivered the 2006 Lecture entitled "Global Sea Levels: Past, Present and Future" and received the Roger Revelle medal at the 39th Session of the IOC Executive Council (Paris, June 2006).



Professor John Burrows of the University of Bremen and a member of the WCRP SPARC Scientific Steering Group has been awarded the William Nordberg Medal for 2006 by the ICSU Committee on Space Research (COSPAR). This medal is awarded to scientists who have made a distinguished contribution to the application of space science.

The Norbert Gerbier-Mumm International Award encourages and rewards excellent scientific publications on the influence of meteorology in a particular field of the physical, natural or human sciences or, conversely, on the influence of one of these sciences on meteorology. The 2006 award recognized the importance of the development of ensemble prediction techniques to provide National Meteorological and Hydrological Services around the world with the best state-of-the-art tools to deliver useful climate information to their clients. Dr Tim Palmer, speaking for all 25 awardees, stressed that a major achievement of the DEMETER project was to demonstrate the value of this approach for highly valued user applications. The awardees have successfully applied the model output to crop-yield forecasting in several regions of the world and to the prediction of epidemic malaria in parts of Africa.

Professor Lennart Bengtsson, a very active chair and member of many WCRP activities, has been awarded the 51st International Meteorological Organization (IMO) Prize for his outstanding contribution to international scientific collaboration in meteorology.

Sponsor and Partner Recognition Increases

ICSU: Dr Thomas Rosswall, Executive Director of the International Council for Science (ICSU), praised the global success of the WCRP and described WCRP as the "jewel in the crown of international environmental research" during his address to the WMO Executive Council meeting in June 2006.

WMO: to support and facilitate WCRP's new strategic initiatives, the World Meteorological Organization (WMO) increased its funding by over US\$ 150 000 as a one-off financial benefit in 2006.

IOC: the Executive Council of the Intergovernmental Oceanographic Commission (IOC) of UNESCO honoured WCRP's new Chair with the 2006 Roger Revelle Medal. Having discussed the role and quality of the WCRP-led research, the Council has decided to fund the IOC's contribution to the Joint WMO/ICSU/IOC Climate Research Fund from the Regular Programme budget.

ESSP: the Earth System Science Partnership (ESSP) of the WCRP, IGBP, IHDP and DIVERSITAS combined presentations in May 2006 at UNFCCC in Bonn, Germany, on research needs for global change and also on joint proposals to the International Group of Funding Agencies (IGFA). ESSP created and established new governance and structure in June 2006 and is seeking additional resources for its central office and co-ordinating administration.

Sea-Level Rise: an unprecedented number of 52 organizations and agencies collectively supported the WCRP Workshop on Understanding Sea-level Rise and Variability hosted by the IOC in Paris, France, in June 2006. We are grateful to all supporters of the workshop listed on the Summary Statement from the Workshop on the CD in the back cover.

New Director and Chair for the WCRP

From the beginning of January 2006, Ann Henderson-Sellers has been the new Director of the WCRP. Being a mathematician with a Ph.D. and D.Sc. in atmospheric science, Professor Henderson-Sellers has had a long history with the WCRP especially in GEWEX as the lead investigator for the Project



Sea-Level Rise workshop co-sponsors and participating programmes



for Intercomparison of Land-surface Parameterization Schemes (PILPS) and more recently exploiting stable water isotopes in iPILPS. In March 2006, the Joint Scientific Committee (JSC) of WCRP elected Dr John Church as their new Chair, replacing Dr Peter Lemke. Dr Church is lead scientist of the Sea Level Rise Programme at the

Antarctic CRC and CSIRO Marine Research Centre in Australia and was lead author on sea level rise changes for IPCC's Third Assessment Report.

Greening the WCRP

The WCRP is one of the first international global environmental change programmes within ESSP and the World Meteorological Organization to offset carbon emissions: an environment-friendly work policy has long been an important goal for the WCRP. Working at the forefront of international climate research, a 'green' work environment and 'green' work practices have always been a first choice for the WCRP. E-mailing and tele-conferencing has been practised for many years and WCRP is now investigating web-conferencing to link to climate researchers around the world. In addition, the Joint Planning Staff are now offsetting greenhouse gas emissions for WCRP business travels with renewable energy and energy-efficiency projects to make WCRP participation in conferences and meetings climate neutral. For details on WCRP's carbon-offset initiatives see http://wcrp.wmo.int/pdf/WCRP_carbonOffset.pdf.

WCRP JSC 27th Annual Meeting, Pune, India, March 2006

The Joint Scientific Committee (JSC) of the WCRP held a successful meeting hosted by the Indian Institute

of Tropical Meteorology in Pune, India, including two days together with the Scientific Committee of the International Geosphere-Biosphere Programme. The JSC, which provides guidance for the WCRP, consists of world leaders in climate-related disciplines in atmospheric, oceanic, hydrological and polar sciences. The JSC members, directors and project leaders from the WCRP core projects CliC, SPARC, GEWEX, CLIVAR, Panels and Working Groups focussed in their discussions on the implementation of the WCRP's Strategic Framework: 2005-2015. Professor Ann Henderson-Sellers, the Director of the WCRP, outlined her vision for the future of international climate research, stressing important questions such as 'What is the safe level of climate change?' and 'Are climate warnings understood?' The JSC agreed the main lines of WCRP actions in leading, coordinating, helping prioritise and facilitating world-class climate research towards the objectives of the WCRP Strategic Framework 2005-2015 and, at the same time, re-asserted the importance of WCRP's two-fold original objectives: to determine climate predictability; and to determine the effect of human activities on climate.



Members of the Joint Scientific Committee in Pune, March 2006.

CROSS-CUTTING ACTIVITIES IN WCRP



Modelling

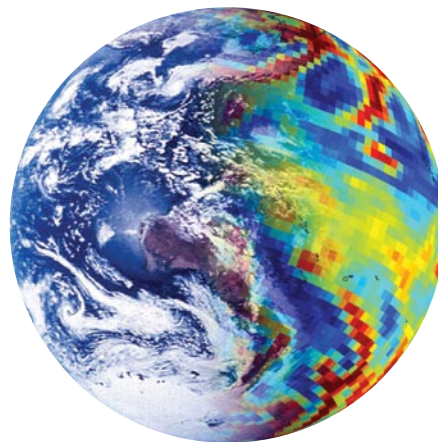
The development and evaluation of global climate models have long been important unifying components of the WCRP, building on scientific and technical advances in the more discipline-oriented activities in all WCRP activities. Models are the fundamental tool for understanding and predicting climate variations and providing reliable predictions of natural and anthropogenic climate change. Moreover, models provide an essential means of exploiting and synthesizing in a synergistic manner all relevant atmospheric, oceanographic, cryospheric and land-surface data collected in the WCRP and other programmes.

In 2005-2006, modelling activities within the WCRP have been essential to the completion of the forthcoming Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), to be published in 2007. WCRP scientists and projects contribute significantly to the collection and assembly of climate observations, process studies, model development and understanding of the climate system necessary for the detection and attribution of past climate change, and the provision of climate information, including projections of future change based on various emission scenarios, which are assessed by the IPCC Working Group (WG) I, and provide much of the input to the impacts, adaptation and mitigation research assessed by WG II and WG III.

At the **57th session of the WMO Executive Council** held in Geneva, Switzerland, June 2005, WCRP activities were recognized as fundamental to the IPCC assessments and particularly WCRP-coordinated model evaluation and intercomparison projects were highlighted as crucial to assessment outcomes. The unique WCRP collection

of global modelling predictions based on IPCC emission scenarios created by researchers around the world was welcomed as enabling the largest ever analysis of future regional climate change and predictions of extreme events.

The current focus of the **Working Group on Coupled Modelling (WGCM)** is to study natural and future climate variability in the context of anthropogenic climate change. Recent initiatives include: the Coupled Model Intercomparison Project (CMIP), which underpins the IPCC multi-model analysis; the International Cloud Feedback Model Intercomparison Project (CFMIP) and the Coupled Climate Carbon Cycle Model Intercomparison Project; Regional Climate Modelling; Palaeoclimate Modelling; and



Atmospheric relative humidity at 700hPa from NCEP reanalysis data (7 December 1972) combined with a photograph taken by Apollo 17 astronauts for the same time (NASA Image modified by K. McGuffie).

data archiving, management and distribution in support of the IPCC Fourth Assessment Report.

The **Working Group on Numerical Experimentation (WGNE)**, jointly established by the WCRP and the WMO Commission for Atmospheric Sciences (CAS), leads the development of atmospheric models for both climate studies and numerical weather prediction. The WGNE also is the focal point in the WCRP for encouraging and reviewing the reanalysis projects carried out by various centres with fixed state-of-the-art assimilation systems providing a multi-year homogeneous data set for a range of atmospheric and climate diagnostic studies. The 40-year European Re-Analysis (ERA-40) of the global atmosphere was completed by the European Centre on Medium-range Weather Forecasting (ECMWF). One of the results is a comprehensive atlas of the atmospheric general circulation (<http://www.ecmwf.int/research/era/>). Also the Japanese 25-year Reanalysis Project (JRA-25) is soon to be completed (<http://www.jreap.org/>).

At the **21st WGNE** Meeting held in St. Petersburg, Russia, November 2005, a session was devoted to the THORPEX project of the WMO Global Atmospheric Research Programme. The WGNE is playing a crucial role in the planning and implementation of THORPEX, which seeks to accelerate improvements one day to two week high-impact weather forecasting. Linked to this project are improvements in model resolutions (e.g. to ~40 km in global circulation models); the statistics of tropical and extra-tropical storm tracks (such as of 'Katrina' and other hurricanes); and an intercomparison of forecasts of typhoon tracks in the western North Pacific, which is being conducted by the Japan Meteorology Agency. WGNE oversees the Atmospheric Model Intercomparison

Project (AMIP), supported by the Programme for Climate Model Diagnosis and Intercomparison (PCMDI) at the Lawrence Livermore National Laboratory, USA.

All WCRP projects (except for CliC) have modelling groups that meet together in the **WCRP Modelling Panel (WMP)**. At the joint **1st WMP/9th WGCM-session** at the UK Met Office in Exeter, October 2005, WCRP scientists debated some of the most important questions facing the modelling community such as causes of model errors, the evaluation and validation of models, next-generation models and limits of parameterization, resolution and computing power amongst others. Comprehensive papers by leading scientists in this field of research are available online at <http://copes.ipsl.jussieu.fr/Organization/COPESStructure/ModellingPanel.html>.

Chairs:

Professor J. Shukla (Chair, WMP), George Mason University, USA

Professor J. Mitchell (Co-Chair, WGCM), UK Met Office, UK

Dr G. Meehl (Co-Chair, WGCM), NCAR, USA

Dr M. Miller (Chair, WGNE), ECMWF, UK

WGCM

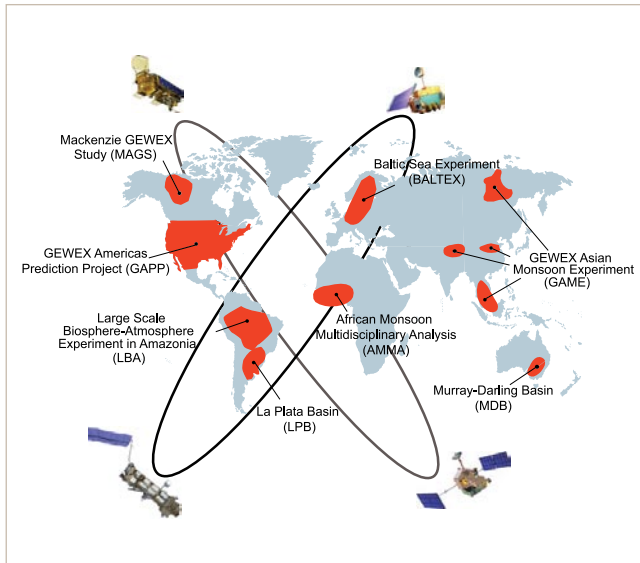
<http://www.clivar.org/organization/wgcm/wgcm.php>

WGNE

<http://collaboration.cmc.ec.gc.ca/science/wgne> [password protected]

WMP

<http://copes.ipsl.jussieu.fr/Organization/COPESStructure/ModellingPanel.html>



The WCRP observing strategy includes continental- and basin-scale experiments as well as global observations from satellites.

Observation and Analysis

The **WCRP Observation and Assimilation Panel (WOAP)** works in close co-operation with the Global Climate Observing System (GCOS) and especially with the WCRP/GCOS co-sponsored panels AOPC (Atmospheric Observation Panel for Climate) and OOPC (Ocean Observation Panel for Climate) to establish requirements of climate researchers for in situ as well as satellite observation networks and systems.

The **1st WOAP** meeting was held at the NASA Goddard Institute for Space Studies in New York, USA, June 2005. The meeting focussed on interaction with the intergovernmental Group on Earth Observations (GEO) and data management, recovery and archiving. A crucial need in order to improve analysis and forecasts of extreme

events is worldwide sharing of quality high frequency observations. WCRP projects and contributors have led atmospheric re-analysis for 20 years and are now closely involved in the development of ocean data re-analyses and future consideration of comprehensive Earth system re-analyses. Progress was discussed at a **Workshop on Reanalysis** held at ECMWF, Reading, UK, in June 2006

<http://copes.ipsl.jussieu.fr/Organization/COPESStructure/WGOA.html>.

Chairs:

Dr K. Trenberth (Chair, WOAP), NCAR, USA

Dr D.E. Harrison (Chair, OOPC), NOAA Pacific Marine Environmental Laboratory, Seattle WA, USA

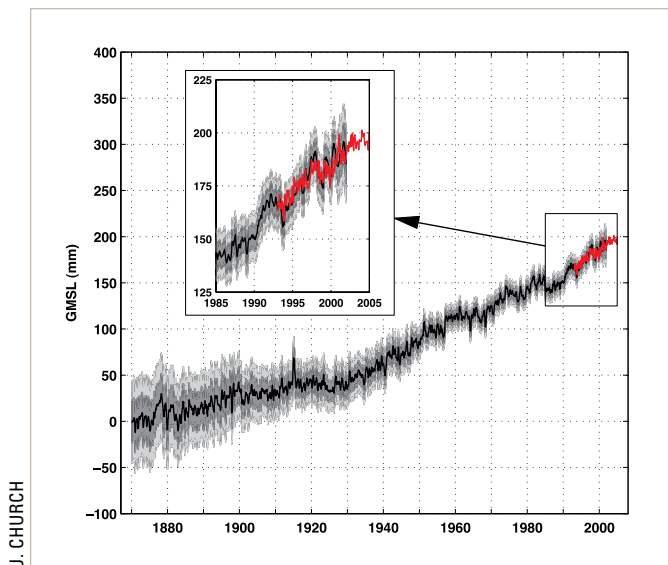
Dr A. Simmons (Chair, AOPC), ECMWF, UK

WOAP

<http://copes.ipsl.jussieu.fr/Organization/COPESStructure/WGOA.html>

Sea-Level Rise

The WCRP has established short-term cross-cutting activities to develop and coordinate research of immediate importance to end-users. One such challenge is understanding and improving projections of sea-level rise and variability. The coastal zone has changed profoundly during the 20th century, primarily due to growing populations and increasing urbanization. In 1990, 23 per cent of the world's population (or 1.2 billion people) lived both within a 100 km distance and 100 m elevation of the coast at densities about three times higher than the global average. By 2010, 20 out of 30 mega-cities will be on the coast with many low-lying locations threatened by sea-level rise. With coastal development continuing at a



Reconstructed sea levels from 1870 to 2000 indicate an increase in the rate of global mean sea-level (GMSL) rise

rapid pace, society is becoming increasingly vulnerable to sea-level rise and variability – as Hurricane *Katrina* recently demonstrated in New Orleans. Rising sea levels will contribute to increased storm surges and flooding, even if hurricane intensities do not increase in response to the warming of the oceans. Rising sea levels will also contribute to the erosion of the world's sandy beaches, 70 percent of which have been retreating over the past century. Low-lying islands are also vulnerable to sea-level rise. The Sea-level Rise Task Team was established by the WCRP to tackle this end-user research challenge.

In June 2006, the Sea-level Rise Task Team organized the WCRP workshop 'Understanding Sea-level Rise and Variability' in Paris, France (<http://copes.ipsl.jussieu>.

[fr/Workshops/SeaLevel/index.html](http://copes.ipsl.jussieu.fr/Workshops/SeaLevel/index.html)). The group's goal was to bring together all relevant scientific expertise with a view towards identifying the uncertainties associated with sea-level rise and the research and observational activities needed for narrowing these uncertainties. The Workshop was also conducted in support of the Global Earth Observation System of Systems (GEOSS) 10-Year Implementation Plan. As such, the workshop helped to develop international and interdisciplinary scientific consensus for those research and observational requirements needed to address uncertainty in sea-level rise and its variability. Workshop contributions came from many WCRP projects and activities: from CLIVAR on ocean thermal expansion; from CliC on glacier and ice sheet melt; from GEWEX on terrestrial water storage; and from WGCM on coupled climate modelling. There were also participants from IOC, GLOSS, OOPC, GWSP satellite agencies and GEOSS. In total there were 163 participants from 29 countries.

Oral and poster presentations from the workshop together with the Workshop Summary Statement are available at <http://copes.ipsl.jussieu.fr/Organization/Activities/SeaLevel.html>. The full conference proceeding will be published as a book in 2007.

Responsible:

Dr T. Aarup, Intergovernmental Oceanographic Commission of UNESCO, France

Dr J. Church, CSIRO Marine and Atmospheric Research and Antarctic Climate and Ecosystems CRC, Hobart, Tasmania, Australia

Dr S. Wilson, NOAA/NESDIS, Silver Spring MD, USA

Dr P. Woodworth, Proudman Oceanographic Laboratory, Liverpool, UK

Monsoons

At the **1st Pan-WCRP Workshop on Monsoon Climate Systems: Toward Better Prediction of the Monsoons**, held in Irvine, USA, June 2005, experts from CLIVAR and GEWEX gathered to assess the current understanding of the fundamental physical processes governing monsoon variability and to highlight outstanding problems in simulating the monsoon that can be tackled through enhanced cooperation between CLIVAR and GEWEX. WCRP's monsoon modelling strategy was defined and improvements in monsoon observations, analyses and predictive systems promoted. Both WCRP projects have monsoon panels active in South America, Africa and Asia/Australia. (See workshop report at http://eprints.soton.ac.uk/19335/01/icpo_pub_103.pdf.)

Responsible:

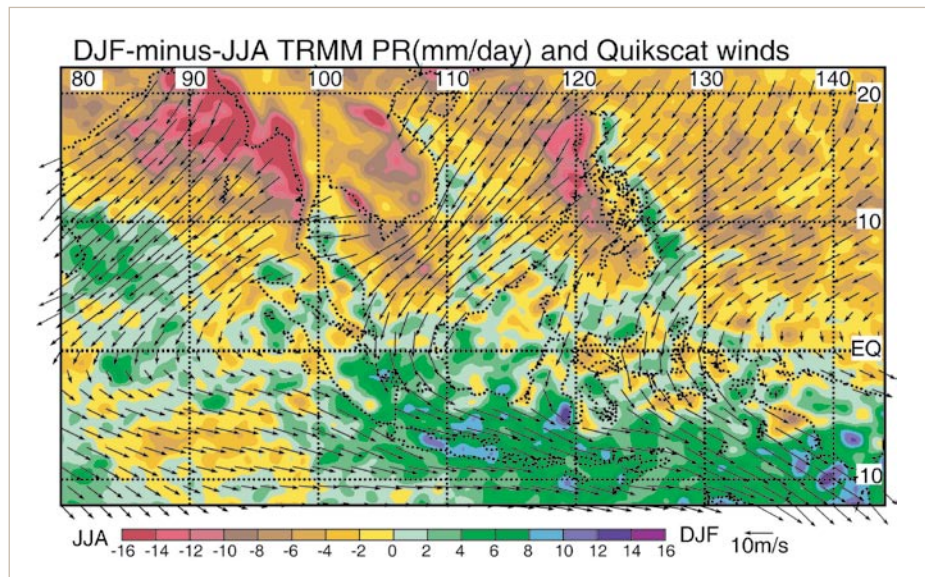
Dr A. Busalacchi, (Co,-Chair CLIVAR), ESSIC, University of Maryland, USA

Dr T. Palmer (Co-Chair, CLIVAR), ECMWF, UK

Professor S. Sorooshian (Chair, GEWEX), University of California, Irvine, USA

Anthropogenic Climate Change

Significant progress in the understanding and projection of climate change has been made over the last decade. However, large uncertainties remain, particularly in the determination of the rate of climate change, impacts on regional scales where society and environment are most vulnerable, and the occurrence of extremes (e.g. intense storms). Reduction of these uncertainties



Satellite data provide information on precipitation and wind direction/speed. The figure illustrates the boreal summer and winter monsoon regimes above Indonesia and Malaysia in warm and cool colours, respectively (courtesy: C-P. Chang).

requires the filling of significant gaps in observational programmes and understanding, as well as improved models for projection of climate change, both regionally and globally. Many WCRP activities are directed towards research on questions such as: How is climate changing; What is driving the change; How to deliver more useful projections of future climate; and How to better inform management of climate-related risks? WCRP's special Task Team on Anthropogenic Climate Change addresses these (and many more) questions. The WCRP is engaged with the Intergovernmental Panel on Climate Change (IPCC) and the wider Earth System Science Partnership (ESSP) in a dialogue on specification of new and standard emission scenarios.

At the **UNFCCC's Subsidiary Body on Scientific and Technological Advice (SBSTA) meeting** in Bonn, Germany, May 2006, WCRP convened a side event on climate change research achievements and challenges.

Responsible:

Dr John Mitchell, UK Met Office, UK

Dr Tony Busalacchi, ESSIC, University of Maryland, USA

Dr Venkatachalam Ramaswamy, NOAA Geophysical Fluid Dynamics Laboratory, USA

Dr John Church, Antarctic CRC and CSIRO Marine Research, Australia

Seasonal Prediction

The Working Group on Seasonal to Interannual Prediction (WGSIP) under the CLIVAR project oversees development of improved models, assimilation systems and observing system requirements for seasonal prediction. Recently, recognizing the potential to improve seasonal



PHILIPPE CHEVALIER (IRD)

Reliable seasonal predictions are imperative to reduce socio-economic drought effects.

prediction by tapping results and outputs from all WCRP elements, the WCRP established a limited term Task Force on Seasonal Prediction (TFSP), which draws on expertise in all WCRP core projects (i.e. CLIVAR, GEWEX, CliC and SPARC), together with WGNE and WGCM. The overarching goal of the TFSP is to determine the extent to which seasonal prediction is possible and useful in all regions of the globe with currently available models and data.

During the **2nd TFSP Implementation Workshop** held in Trieste, Italy, in August 2005, the Task Force presented plans for a seasonal prediction experiment to utilize advances, understanding and assessment skills across all WCRP projects. A workshop (June 2007 in Barcelona, Spain) will: (1) assess the nature and level of seasonal prediction activities across the whole of WCRP. The questions to address are as follows: What is the current state-of-the-art in seasonal predictions? What prediction data sets are currently

available?; (2) develop a strategy and working plan for determining the extent to which seasonal prediction is possible and useful in all regions of the globe with currently available models and data; (3) identify the current limitations and prospects for improving seasonal predictions. What are the present data sets that support seasonal prediction; What new/improved data sets are required to advance seasonal prediction skill; What sort of advances might be expected?; (4) assess the current and planned process studies and field experiments that will have a demonstrable impact on improved seasonal prediction; and (5) describe the programmatic structures or mechanisms that are needed to facilitate the development and improvement of WCRP seasonal prediction activities.

Chair:

Dr B. Kirtman (Chair, TFSP and WGSIP), Center for Ocean-Land-Atmosphere Studies, Calverton, Maryland, USA

Surface Fluxes and SOLAS

The shared objectives of the Surface Ocean-Lower Atmosphere Study (SOLAS) of the International Geosphere-Biosphere Programme (IGBP), the Scientific Committee on Oceanic Research (SCOR), the Commission on Atmospheric Chemistry and Global Pollution (CACGP) and the WCRP Working Group on Surface Fluxes (WGSF) are to research exchange processes at the air-sea interface and the transport and transformation of substances in atmospheric and oceanic boundary layers; air-sea flux of CO₂ and other short- and long-lived radiatively-active gases. By combining research of the WCRP and IGBP, this cross-cutting effort aims at achieving quantitative understanding of the key biogeochemical-physical interactions and feedbacks between the ocean and

atmosphere, and of how this coupled system affects and is affected by climate and environmental change.

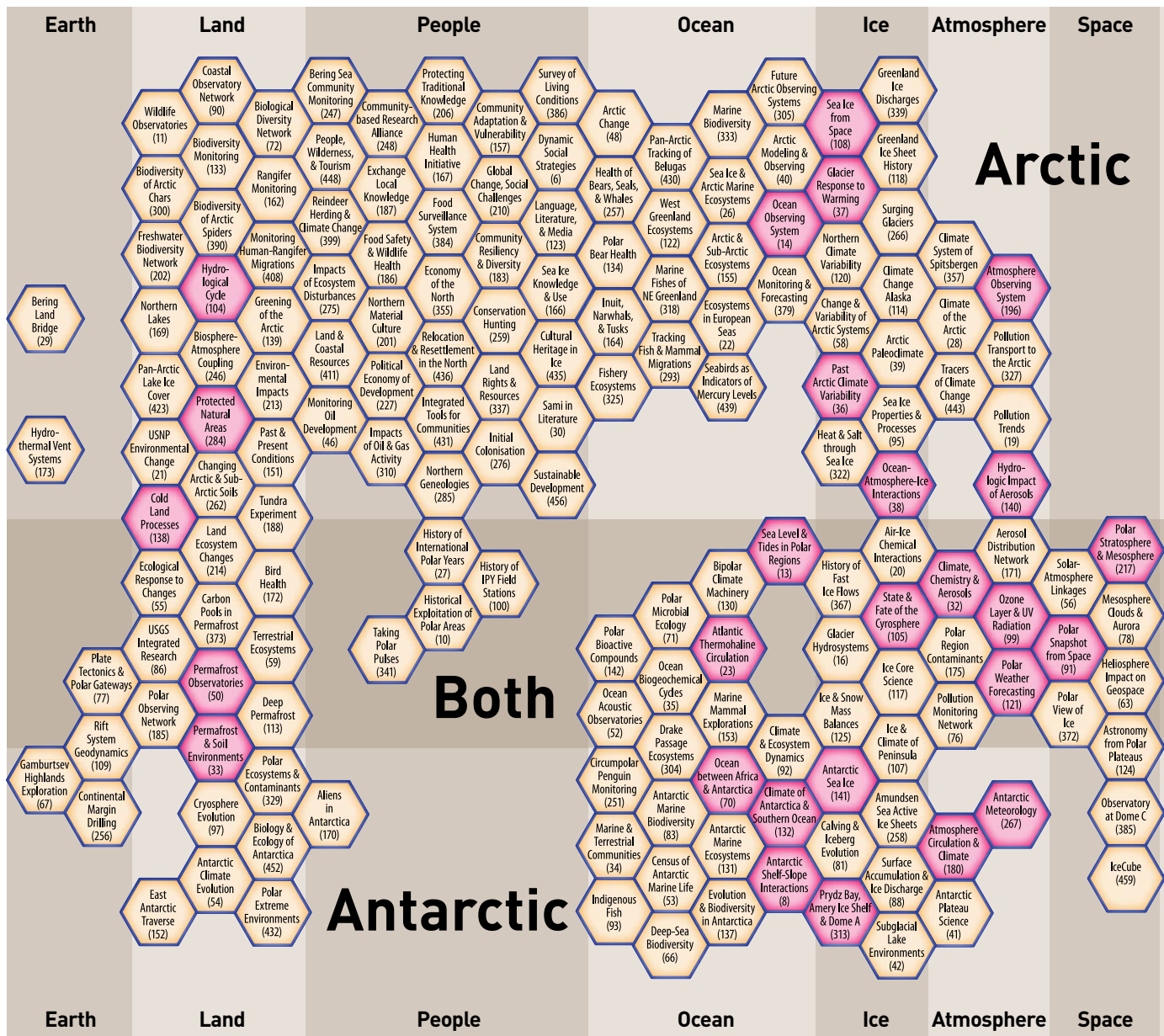
The three main foci of the SOLAS project have successfully completed their implementation plans. Intensive field, modelling and experimental research is ongoing.

In 2005-2006, the WGSF has intensified cooperation with the WCRP/CAS Working Group on Numerical Experimentation (WGNE) to reinvigorate the Surface Flux Analysis (SURFA) project. The goals of SURFA are to provide evaluation and intercomparison of global surface flux products over the ocean produced by operational numerical weather prediction (NWP) centres with high quality in situ and satellite flux products. Accurate representation of surface fluxes in NWP and climate models is necessary to uncover the predictability potential associated with the ocean-atmosphere interaction.

In the field of radiative fluxes, WGSF is seeking to improve measurement and estimation potential. In particular, present methods for buoy- and ship-based measurements are to be evaluated against standard sets by the WCRP Baseline Surface Radiation Network (BSRN).

WGSF published the 'Handbook of Physical Constants and Functions for Use in Atmospheric Boundary Layer Studies' online in 2005. The 'Handbook on Best Practices of Ship/Buoy Flux Measurements' is currently in preparation: ftp://ftp.etl.noaa.gov/user/cfairall/wcrp_wgsf/flux_handbook/.

WGSF scientists reviewed the sections on long-term air-sea flux products and climate changes in air-sea interaction characteristics of the forthcoming IPCC Fourth Assessment Report.



Education & Outreach



Education & Outreach



Chairs:

Professor P. Liss (Chair, SOLAS), UEA, UK

Dr C. Fairall (Chair, WGSF), NOAA, USA

SOLAS

<http://www.solas-int.org>

Working Group on Surface Fluxes

<http://www.etl.noaa.gov/et6/wgsf/>

International Polar Year 2007-2008

Two WCRP sponsors, WMO and ICSU, lead the organization of the International Polar Year (IPY), which will include intensive field investigations from 1 March 2007 to 1 March 2009. All WCRP projects coordinated by the Climate and Cryosphere (CliC) project have very actively participated in the IPY preparations. Climate issues will be at the forefront of the majority of IPY studies. The honeycomb diagram shows the thematic distribution of expected IPY activities. So far, 218 IPY projects have been approved. The volume of funding is of the order of US\$ 3 billion. After the completion of IPY preparations, the WCRP will focus on creating a strong legacy of better understanding of the role of poles in the Earth System and on more comprehensive and better sustained polar observing systems.

IPY

<http://www.ipy.org>

Thematic distribution of expected IPY activities. The 32 projects with WCRP involvement or leadership are marked in pink. Project details can be looked up by ID number at www.ipy.org.

NEWS FROM WCRP CORE PROJECTS



GEWEX

The Global Energy and Water cycle EXperiment (GEWEX) focusses on global water and energy cycle processes within the Earth system. In particular, interactions between the land-surface, the atmospheric boundary layer and clouds are studied at all time scales from diurnal to seasonal. Observational data on clouds, precipitation and soil moisture delivered from NASA's CloudSat and CALIPSO satellites launched in April 2006 is already being exploited in GEWEX. During 2005, significant progress was made in the regional continental-scale experiments coordinated by GEWEX. The MAckenzie GEWEX Study (MAGS) and the GEWEX Asian Monsoon Experiment (GAME) were completed. A follow-on project for GAME named MAHASRI is being planned for 2006-2012. Both the BALTic sea EXperiment (BALTEX) and the Large-scale Biosphere atmosphere experiment in Amazonia (LBA) have entered Phase II of their activities. The Water Resources Applications

Project (WRAP) and the International Land Surface Climatology Project (ISLSCP) were completed in 2005. The Worldwide Integrated Study of Extremes (WISE) Working Group is developing a database on extreme events and will soon start to analyse the processes that link extreme events in different regions.

Research products made available to the scientific community during 2005/06 include high-quality global data sets covering more than two decades of determinations of clouds, precipitation, aerosols (ocean only) and surface and top-of-atmosphere radiation. The ISCCP Cloud and Radiation Data Set can be viewed and downloaded from http://www.gewex.org/ISCCP_data_products_4-2006.pdf. The GLDAS data product on global time series of soil moisture, evapotranspiration, sensible heat flux and other surface water and energy cycle variables is available at http://www.gewex.org/GLDAS_data_product_4-2006.pdf.



NASA

GEWEX astronaut Piers Sellers on his way to the International Space Station on board Discovery in July 2006.

A highlight in 2005 was the launch of the joint GEWEX/CLIVAR African Monsoon Multidisciplinary Analysis (AMMA) project. This large international research effort seeks to improve our understanding of the West African monsoon and its variability by focussing on the physical changes in the environment and their impacts on society. During the first field campaigns from January until June 2006, aircraft and research vessels were on mission and drift buoys and ground stations were operating day-and-night to collect atmospheric and oceanographic data during the dry phase before the onset of the monsoon. The **1st International AMMA Conference**, held in Dakar, Senegal, in November 2005, included 255 participants from 23 countries, among them 100 scientists from African countries. <http://science.amma-international.org/meetings/internationalConferences/dakar2005/>.

The Coordinated Enhanced Observing Period (CEOP) is a scientific project initiated by GEWEX that allows a global synthesis of the water cycle associating surface, satellite and model data. CEOP has developed a prototype

for a climate data and observation management system, which WCRP hopes will be exploited in the International Polar Year.

In June 2005, the international GEWEX community met in Costa Mesa, California, at the **5th International Scientific Conference on the Global Energy and Water Cycle**. The 158 oral presentations and 170 poster presentations convincingly illustrate the significant progress made by GEWEX <http://www.gewex.org/5thConfReport.pdf>.

Chair:

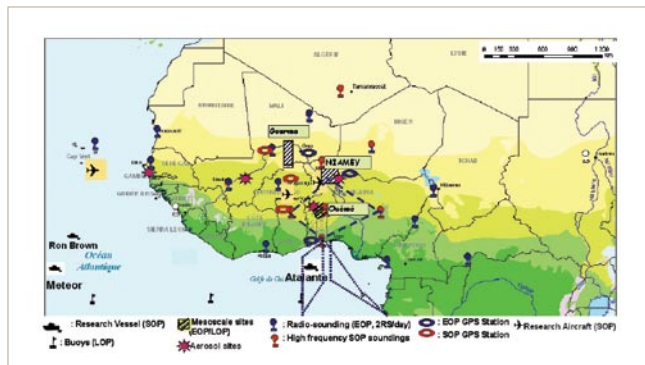
Professor S. Sorooshian, University of California, Irvine, USA

Vice-Chair:

Dr U. Schumann, DLR German Centre for Aerospace Research, Germany

GEWEX

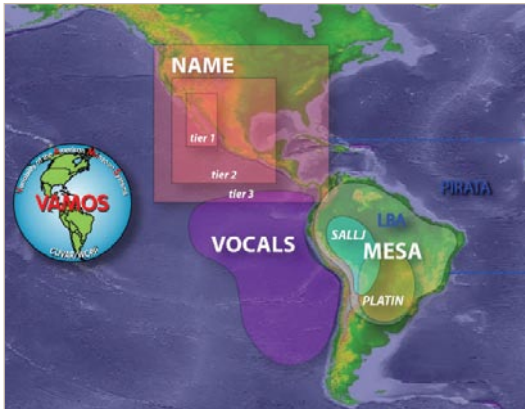
<http://www.gewex.org>



Field Campaign of the African Monsoon Multidisciplinary Analysis (AMMA) project.

CLIVAR

The Hydrographic Programme Atlas Series of the World Ocean Circulation Experiment (WOCE) has published volume 1 with the Southern Ocean Atlas in 2005 and volume 2 with the Pacific Atlas in 2006. The atlases include an unprecedented set of ship-based observations on ocean temperature, salinity, nutrients and other natural and anthropogenic tracers for the period 1990-98. Volume 3 on the Atlantic and Volume 4 on the Indian Ocean are in preparation (http://www.woce.org/atlas_webpage/links.html). New sections were added to the comprehensive African Climate Atlas (<http://www.geog.ox.ac.uk/~clivar/ClimateAtlas/>). The interactive



Geographic areas covered by the various VAMOS (Variability of the American Monsoon) activities.

platforms on African Climatology (Part I), Anomalies (Part II), TOMS Absorbing Aerosol Index (Part III) and ERA-40 Pressure Level Climatologies and Composites (Part IV) have now been completed.

The monsoon panels of the WCRP's project on CLimate VARIability and Predictability (CLIVAR), active in South America (VAMOS), Africa (VACS) and Asia/Australia (AAMP), joined the **1st Pan-WCRP Workshop on Monsoon Climate Systems: Toward Better Prediction of the Monsoons**, held in Irvine, USA, June 2005. Here, WCRP's monsoon modelling strategy was defined and improvements in monsoon observations, analyses and predictive systems promoted (see report at http://eprints.soton.ac.uk/19335/01/icpo_pub_103.pdf).

CLIVAR's Working Group on Seasonal to Interannual Prediction (WGSIP) encourages the application of regional analysis of global model outputs from its modelling panels to user needs. The **2nd joint TFSP/WGSIP/THORPEX workshop** was held in Trieste, Italy,

in August 2005, at which preparations for the seasonal prediction experiment were finalized.

CLIVAR's ocean basin panels are currently developing links to large-scale global activities. The Tropical Atlantic Climate Experiment (TACE), which is still in its conceptual phase, will study the ocean's role in tropical Atlantic climate variability and, as such, complements plans for a programme on the Atlantic Marine ITCZ (Inter-tropical Convergence Zone), the AMMA experiment in tropical West Africa and the experiments run by the Variability of the American Monsoon (VAMOS) panel in tropical South America. The CLIVAR Pacific Panel became involved in the Indian Ocean Tsunami Warning and Mitigation System. The Southern Ocean panel is active in a number of Antarctic studies proposed for the International Polar Year (2007/08). A new focus for the latter panel is an assessment of IPCC models in the Southern Ocean region jointly with the WGCM.



Technicians service a mooring in the tropical Pacific. This buoy is part of a large array spanning the entire basin that was developed to support WCRP research and which is now serving both operational and scientific missions.

At the **14th session of the CLIVAR Scientific Steering Group**, which took place in Buenos Aires, Argentina, April 2006, a 'road map' for CLIVAR for future research on exploring climate variability and change on a variety of timescales and how the interactions between the oceans and the atmosphere influence these was developed. See CLIVAR's Exchanges No. 38 <http://eprints.soton.ac.uk/41286/01/Exchanges38.pdf>.

Co-Chairs:

Dr A. Busalacchi, ESSIC, University of Maryland, USA

Dr T. Palmer, ECMWF, UK

CLIVAR

<http://www.clivar.org>

SPARC

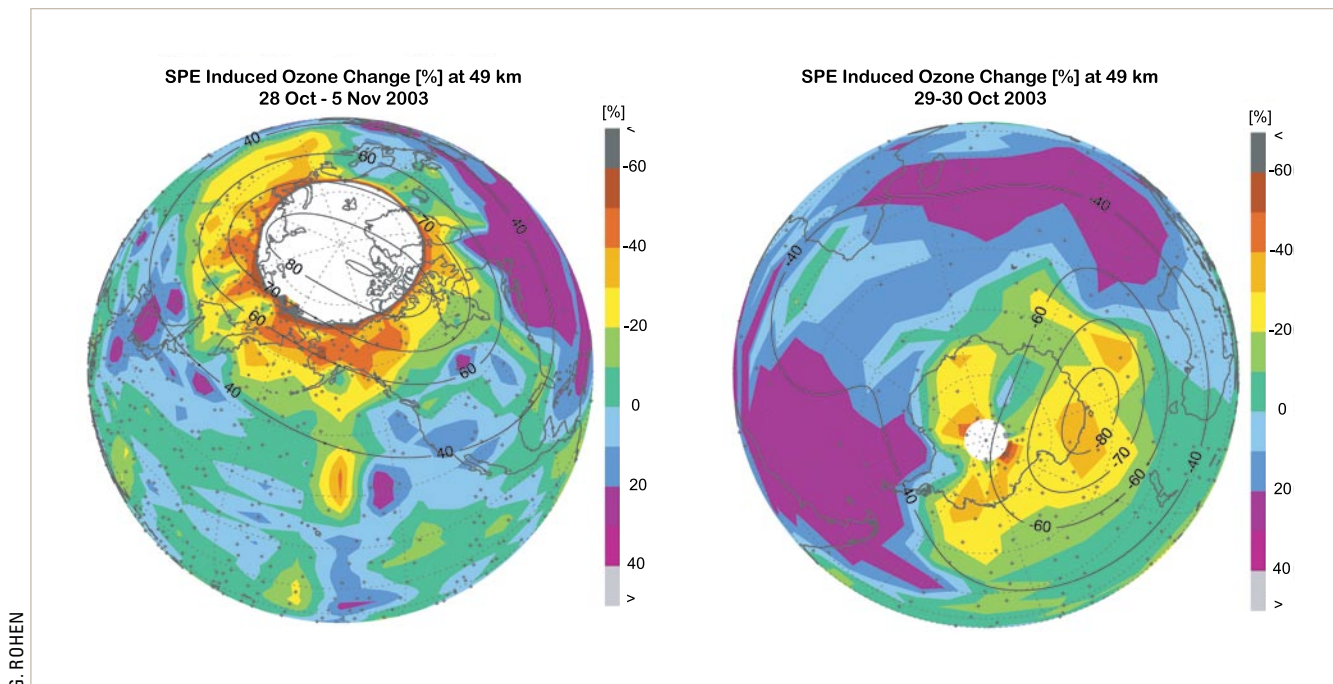
One of the scientific highlights for the WCRP project on Stratospheric Processes And their Role in Climate (SPARC) in 2005-2006 was the completion of the comprehensive SPARC Assessment of Stratospheric Aerosol Properties (ASAP), published in February 2006 (WCRP publication No. 124). The report describes the stratospheric aerosol's morphology during volcanically quiescent and volcanically perturbed periods. The precursor gases and microphysical, chemical and radiative processes that control the structure of the aerosol layer are discussed in detail. Changes in aerosol over the period of the modern observational record are assessed for trends; <http://www.atmosp.physics.utoronto.ca/SPARC/ASAP/V3c1.pdf>.

A major assessment on polar stratospheric cloud (PSC) properties is in preparation. It will address significant gaps in our understanding of stratospheric chemistry,

the lack of consensus on how to describe PSCs and denitrification in global models, the limited and selective use of PSC observations and the risk of instrument-dependent climatologies.

SPARC activities in the Detection, Attribution and Prediction of Stratospheric Changes theme concentrated on an update of the observed stratospheric temperature record (through the year 2004) and on improving our understanding of past changes and predictions of future stratospheric temperature changes. Within the Stratospheric Chemistry-Climate Interactions theme, SPARC focused on the chemistry-climate model validation (CCMVal), with reference simulations for ensemble predictions to support upcoming ozone and climate assessments. One of the questions to answer is: How will stratospheric ozone evolve in the presence of a changing climate as halogen concentrations decline in the atmosphere? In this context, the 2nd CCMVal workshop on Process-Oriented Validation of Coupled Chemistry-Climate Models was held in Boulder, USA, October 2005 <http://www.atmosp.physics.utoronto.ca/SPARC/Newsletter26/CCMVal.html>. Workshop and assessment results provide crucial input to the WMO/UNEP 2006 Ozone Assessment, which is co-authored by SPARC scientists.

In 2005, ten years after its establishment, the GCM-Reality Intercomparison Project for SPARC (GRIPS) formally concluded with its 10th GRIPS workshop held in Toronto, Canada. GRIPS evaluated different dynamical models of the stratosphere to assess how current middle atmosphere-climate models perform and how accurate parameterizations are (http://userpages.umbc.edu/~pawson/html_files/grips.htm). Efforts are under



G. ROHEN

Ozone changes observed in the Northern Hemisphere (left) and the Southern Hemisphere (right) as a result of the 2003 Halloween Storm.

way to develop a follow-on activity within the SPARC community.

Co-Chairs:

Professor A.J. O'Neill, University of Reading, UK

Dr A.R. Ravishankara, NOAA/ERL Aeronomy Laboratory, USA

SPARC

<http://www.atmosph.physics.utoronto.ca/SPARC/>

CliC

The 1st Climate and Cryosphere (CliC) International Science Conference 'Cryosphere, the Frozen Frontier

of Climate Science: Theory, Observations and Practical Applications' was held with great success in Beijing, China, 11-15 April 2005. The participants reached consensus expressed in the Conference Statement that the cryosphere bears a crucial role as an integral part of the climate system but there are large gaps in our abilities to observe, understand and model it (www.clic2005.org).

At the 2nd International Conference on Arctic Research Planning (ICARP II: <http://www.icarp.dk>), Copenhagen, Denmark, November 2005, CliC was recognized as one of the leading programmes coordinating research on the cryosphere system in the Arctic, including the

terrestrial cryospheric and hydrological processes and systems (draft plan available at <http://www.icarp.dk/Wgreports/GW7report.pdf>). The International Permafrost Association and Global Carbon Project are developing – jointly with CliC – an initiative on carbon stocks in permafrost. CliC agreed to co-sponsor the Regional International Permafrost Conference in Lanzhou, China, in August 2006 and to recognize young talented scientists in the permafrost field of research.

The CliC Implementation Strategy Document (http://clic.npolar.no/introduction/wcrp_inf_2005_126.pdf) was completed in 2005. This promotes the development of worldwide cooperation with other cryospheric research groups. Two Scientific Committee on Antarctic Research (SCAR) research programmes integral to CliC are 'Antarctica and the Global Climate System (AGCS)' and 'Antarctic Climate Evolution (ACE)'. These encompass studies of decadal variability, global and regional signals in ice cores, natural and anthropogenic forcing of the Antarctic climate system and the export of Antarctic climate signals. The CliC Workshop on Polar Reanalysis, held in April 2006, Cambridge, UK, identified data sparse areas in the Southern Hemisphere as being critical for reanalysis focus.

A major regional development in CliC was the Asia CliC Symposium (April 2006, Yokohama, Japan) hosted and co-sponsored by JAMSTEC (Japan Agency for Marine Science and TEChnology) and several other organizations. This event starts a new round in the project development that focuses on regional cooperation.

In June 2006, the European Space Agency (ESA) announced the opportunity to conduct scientific research

and application development in CliC research areas in support of the International Polar Year.

Chair:

Dr B. Goodison, Meteorological Service of Canada, Canada

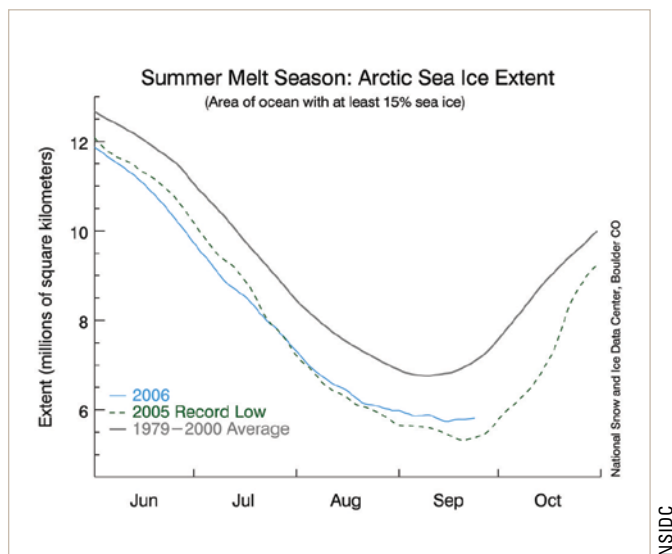
Vice-Chairs:

Dr Anthony Worby, University of Tasmania, Hobart, Australia

Professor Konrad Steffen, CIRES, Boulder, USA

CliC

<http://clic.npolar.no>



Arctic sea ice extent shows record lows in summer 2005 and 2006 compared with the 1979-2000 average.

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WCRP Joint Planning Staff in Geneva.

ACRONYMS

AAMP	Asian-Australian Monsoon Panel	CMIP	Coupled Model Intercomparison Project
ACE	Antarctic Climate Evolution	COSPAR	COmmittee on SPAcE Research
ACSYS	Arctic Climate SYstem Study	DIVERSITAS	international programme of biodiversity science
AGCS	Antarctica and the Global Climate System	ESSP	Earth System Science Partnership
ALPEX	ALPine EXperiment	GARP	Global Atmospheric Research Programme
AMIP	Atmospheric Model Intercomparison Project	GATE	GARP Atlantic Tropical Experiment
AMMA	African Monsoon Multidisciplinary Analyses	GCOS	Global Climate Observing System
AOPC	Atmospheric Observation Panel for Climate	GEO	Group on Earth Observations
ASAP	Assessment of Stratospheric Aerosol Properties	GEOSS	Global Earth Observation System of Systems
BALTEX	BALtic sea EXperiment	GEWEX	Global Energy and Water cycle EXperiment
BSRN	Baseline Surface Radiation Network	GPCP	Global Precipitation Climatology Project
CACGP	Commission on Atmospheric Chemistry and Global Pollution	GRIPS	GCM-Reality Intercomparison Project for SPARC
CAS	Commission for Atmospheric Sciences	ICARP	International Conference on Arctic Research Planning
CCMVal	Chemistry-Climate Model Validation	ICSU	International Council for Science
CEOP	Coordinated Enhanced Observing Period	IGBP	International Geosphere-Biosphere Programme
CFMIP	Cloud Feedback Model Intercomparison Project	IGFA	International Group of Funding Agencies
CLiC	Climate and Cryosphere project	IHDP	International Human Dimensions Programme
CLIVAR	CLimate VARiability and predictability project		

IOC	Intergovernmental Oceanographic Commission of UNESCO	SURFA	SURface Flux Analysis
IPCC	Intergovernmental Panel on Climate Change	TACE	Tropical Atlantic Climate Experiment
IPY	International Polar Year	TFSP	Task Force on Seasonal Prediction
ISCCP	International Satellite Cloud Climatology Project	TOGA	Tropical Ocean and Global Atmosphere project
JPS	Joint Planning Staff of the WCRP	UNEP	United Nations Environment Programme
JSC	Joint Scientific Committee of the WCRP	UNESCO	United Nations Educational, Scientific and Cultural Organization
LBA	Large-scale Biosphere atmosphere experiment in Amazonia	UNFCCC	United Nations Framework Convention on Climate Change
NWP	Numerical Weather Prediction	VACS	Variability of the African Climate System
MAGS	MAckenzie GEWEX Study	VAMOS	Variability of the American MOonsoon System
OOPC	Ocean Observation Panel for Climate	WCRP	World Climate Research Programme
PCMDI	Programme for Climate Model Diagnosis and Intercomparison	WG	Working Group
PILPS	Project of Intercomparison of Land-surface Parameterization Schemes	WGCM	Working Group on Coupled Modelling
PSC	Polar Stratospheric Clouds	WGNE	Working Group on Numerical Experimentation
SBSTA	Subsidiary Body on Scientific and Technological Advice	WGSF	Working Group on Surface Fluxes
SCAR	Scientific Committee on Antarctic Research	WGSIP	Working Group on Seasonal to Interannual Prediction
SCOR	Scientific Committee on Oceanic Research	WISE	Worldwide Integrated Study of Extremes
SOLAS	Surface Ocean-Lower Atmosphere Study	WMO	World Meteorological Organization
SPARC	Stratospheric Processes And their Role in Climate	WOAP	WCRP Observation and Assimilation Panel
START	SysTEM for Analysis, Research and Training	WOCE	World Ocean Circulation Experiment
		WRAP	Water Resources Applications Project



WCRP CD: ANNUAL REPORT 2005-2006

New Futures: Building on Great Success

- WCRP Annual Report 2005-2006
- WCRP web page in html (09/2006)
- WCRP Joint Scientific Committee report
 - Annual Review of the World Climate Research Programme and Report of the 27th session of the Joint Scientific Committee (Pune, India, 6-11 March 2006), 123 pages [pdf, 2.4 MB]
 - Summary of the Main Decisions, Recommendations and Actions, 11 pages [pdf, 156 KB]
- WCRP Presentations
 - WCRP: Leading for 25 years – Researching Climate and its Impacts. 05/2006, WCRP Director Ann Henderson-Sellers [ppt, 54 MB]
 - WCRP’s Research on the Ocean. 06/2006, WCRP Chair John Church [ppt, 5 MB]
- WCRP Research Products
 - WCRP Climate Change Assessment: Climate Model Simulations Analysis Workshop. 1-4 March 2005, Hawaii, USA [pdf, 16 KB]
 - WCRP IPY Chart (2006) [pdf, 1.5 MB]
 - WCRP Sea-Level Rise Workshop. 6-9 June 2006, Paris, France. Summary Statement [pdf, 1.5 MB]
 - WCRP Strategic Framework 2005-2015 [pdf, 8.7 MB]

Getting involved in the WCRP

The great success of the WCRP is directly related to the voluntary involvement of climate scientists and organizations from around the world. The primary means of contributing to this Programme are:

As a scientist: the WCRP invites and encourages individual scientists to make the WCRP Global Secretariat aware of their ongoing research and to suggest ways to integrate local and international initiatives. The WCRP Global Secretariat, as well as the core projects and cross-cutting activities, welcomes proposals for new collaborative activities (research projects, workshops, syntheses etc.) that support the implementation of the WCRP Strategic Plan. Such proposals should be high-priority issues where significant progress can be gained by international co-operation and outcomes expected over a short period of time or should result in a synthesis or integration of research activities from across the breadth of the WCRP.

As a National Committee: the WCRP encourages the establishment of National Committees as a mean of building a truly international network to support integrated climate research. These Committees play an important role in linking national and international programmes, as well as interacting with policy makers and other stakeholders in their home countries.

As a supporter: contributing to WCRP initiatives as a sponsor provides an excellent opportunity for individuals and organizations to demonstrate a strong commitment to climate and climate change research. The WCRP welcomes the opportunity to collaborate with private industries, non-governmental and intergovernmental organizations, foundations and associations.

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