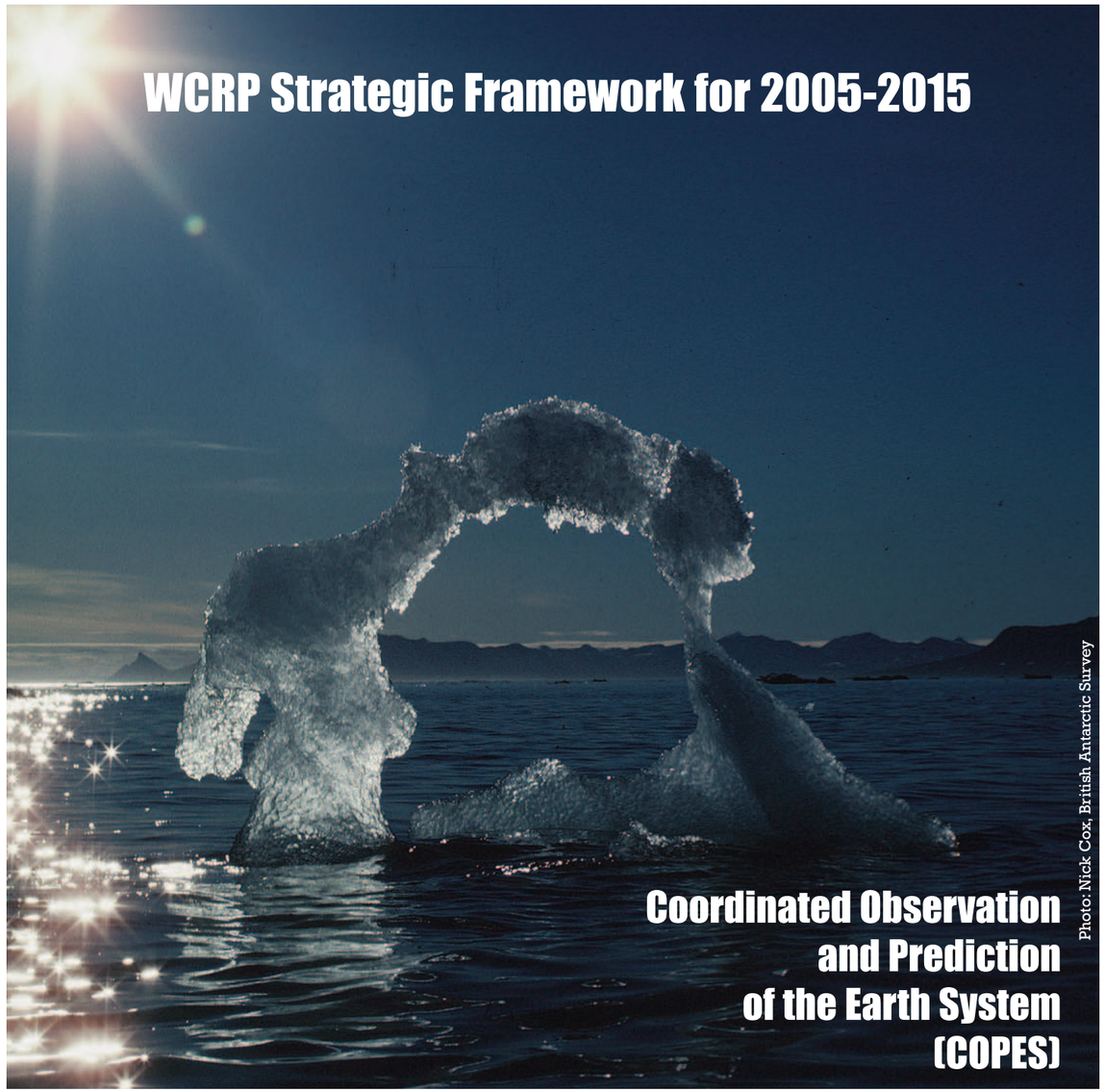
WCRP

WORLD CLIMATE RESEARCH PROGRAMME



ICSU International Council for Science

WMO

IOC of UNESCO

WCRP today

The main objectives, set for WCRP at its inception in 1980 and still valid, are to determine the predictability of climate and to determine the effect of human activities on climate.

To achieve these objectives, WCRP adopts a multidisciplinary approach and organizes large-scale observational and modelling projects focusing on aspects of climate too large and complex to be addressed by any one nation or individual scientific discipline. Today the WCRP consists of four major core projects, several working groups, and various cross-cutting and co-sponsored activities that are designed to improve scientific understanding and knowledge of processes that in turn result in better models. These projects play the central role in WCRP.

THE CORE PROJECTS

Global Energy and Water Cycle Experiment (GEWEX)

Water in the atmosphere and at the surface of the Earth is essential for life. In addition, it is the most influential factor regulating our environment, controlling clouds and radiation and driving the global circulation of the atmosphere. GEWEX carries out investigations of the atmosphere, its global water cycle and energy budget, and how they might affect and adjust to the global changes associated with the increase in greenhouse gases.

Climate Variability and Predictability (CLIVAR)

CLIVAR is the WCRP project that addresses climate variability and predictability with a particular focus on the role of ocean-atmosphere interactions in climate. The oceans' large heat capacity both exerts a moderating influence on seasonal and longer climate changes and provides a mechanism for sustained oceanic influence on the atmosphere. CLIVAR studies the El Niño/Southern Oscillation and its impacts, monsoon systems around the world, as well as climate phenomena controlling longer-term climate variability and change.

Climate and Cryosphere (CliC)

The frozen water in the Earth's climate system — sea-, lake- and river-ice, solid precipitation and snow cover, ice caps and ice sheets, glaciers, permafrost and frozen ground — significantly influences climate locally and globally. CliC's goals are to improve observations and modelling of the cryosphere, investigate its contribution to climate predictability, and project its reaction to the warming climate. These results will be used in studies of mean sea level, water resource management, and several other applications of high practical value.

Stratospheric Processes And their Role in Climate (SPARC)

Studies of the stratosphere hold the key to the understanding of formation of polar stratospheric clouds and ozone depletion, penetration of ultra-violet radiation into the troposphere, sudden stratospheric warmings, and even weather predictability beyond one week. The stratosphere exhibits long-term trends, which are different from ones in the troposphere. The SPARC project addresses these issues and provides the WCRP with expertise in atmospheric chemistry.

THE NEW CHALLENGES AND OPPORTUNITIES

The WCRP has made huge advances in understanding the variability and predictability of individual components (ocean, land, atmosphere, cryosphere) of the climate system and their interactions. This progress has opened unprecedented opportunities to address the predictability of the total climate system, which is one of the original objectives of WCRP, and to exploit the advances in observations and computing in many applications of direct benefit to society. In particular, it is now possible for WCRP to work towards a seamless prediction system that would bridge weekly weather forecasting to prediction of seasonal, decadal and centennial climate variations and projection of anthropogenic climate change. The scope of modern research goes well beyond the initial "physical" domain of the WCRP. Comprehensive Earth system models make it feasible to address the broader issues of the changes in habitability of our planet and the sustainability of modern society.

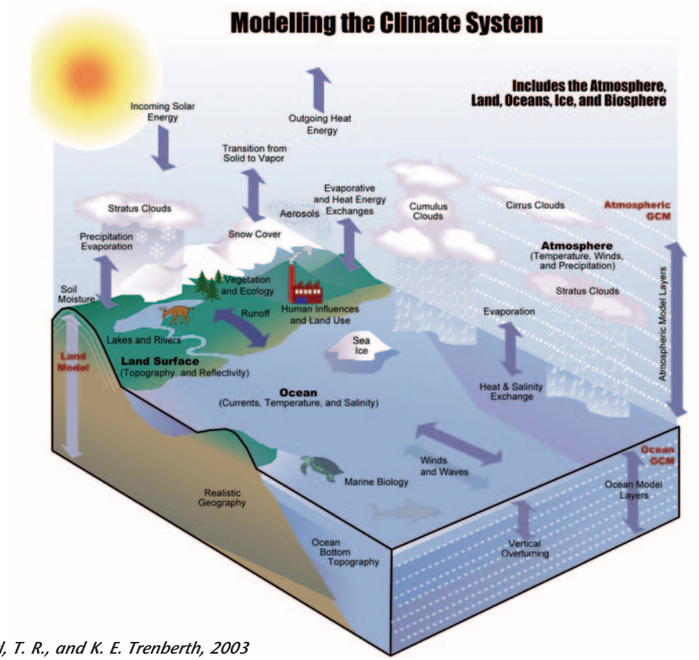
THE WCRP STRATEGIC FRAMEWORK 2005-2015

Coordinated Observation and Prediction of the Earth System

WCRP has defined a new strategic framework for the next ten years under the title "Coordinated Observation and Prediction of the Earth System" (COPES). It will capitalize on past progress with the aim *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.*

COPES will provide the unifying context and agenda for the wide range of climate science coordinated by, and performed through, WCRP core projects and other activities, and for demonstrating their relevance to society.

Under this strategic framework, WCRP will aim to determine what aspects of climate are predictable, and how far in advance and for what regions they can be predicted. This information will provide invaluable input for climate risk management in both the public and private sectors, contribute to planning for sustainable development and form a basis for natural hazard disaster reduction and mitigation. An essential step for better prediction of climate and its application is observing and understanding the current climate state. Deficiencies in understanding will reveal the need for new observing strategies (for both remote-sensing and *in situ* systems), process studies and improved prediction models.



Karl, T. R., and K. E. Trenberth, 2003

Predicting future climate

Water resource managers, health workers, aid organizations, the energy sector and many other industries all need better climate information and predictions in order to plan for the risks associated with natural climate variations and human-induced climate change and their relations to changing type, frequency, severity and impacts of weather and climate extremes. The WCRP will develop a new generation of models that will advance our understanding of what can be predicted and provide the basis for improved climate predictions.

Sustainable development

As the world's population continues to grow so does the demand for food, water, energy and other goods and services. Improved climate information can lead to more efficient agricultural production and use of water resources, facilitate more sustainable use of natural resources and the development of renewable energy sources. A new generation of Earth observing satellites will produce an unprecedented stream of information on the climate of the Earth. WCRP will interact closely with the user community through national, regional and international institutions to determine exactly what climate information is most useful and to develop new products to address these needs.

Disaster reduction and mitigation

Close to 90 per cent of all disasters in the last 10 years have been the result of weather-, climate- and water-related hazards. The annual economic impacts of natural disasters have been increasing over the recent decades. Loss of life due to natural disasters continues. WCRP, in cooperation with the WMO Natural Disaster Prevention and Mitigation Programme, will facilitate enhanced climate predictions and design products that will help decision makers to better manage their climate-related risks.

INITIAL ACTIVITIES INITIATED THROUGH COPES

The Joint Scientific Committee (JSC) for the WCRP has the overall responsibility for implementation of the COPES strategy. In recognition of the central role of modelling and the need to coordinate such activities across the various WCRP projects and groups, a WCRP Modelling Panel (WMP) has been established. A WCRP Observations and Assimilation Panel (WOAP) will provide a focus for the coordination of WCRP observational activities and act as the liaison to other climate observing activities.

Specific time-limited objectives will be identified and set annually by the JSC. A list of initial topics includes: seasonal prediction, monsoons, sea-level rise, atmospheric chemistry and climate, and anthropogenic climate change. The necessary contributions to achieve these objectives will, in general, be provided through the WCRP projects. The JSC envisages a greater involvement of decision makers and stakeholders from the beginning to determine what avenues of research and experimental products might be of greatest value.

Improving seasonal climate predictions

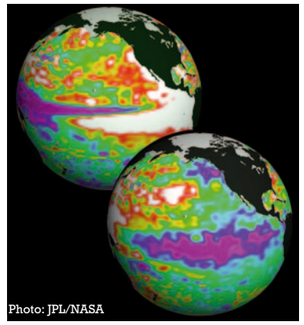


Photo: JPL/NASA

Knowing what the climate will be in a given region at least a season in advance can be of tremendous value to farmers, water managers, industry, health workers and many others. Building on the WCRP-led understanding of El Niño, current WCRP activities are aimed at identification of what is predictable and improving our ability to make seasonal climate predictions. WCRP will build on the progress already made and will organize cross-cutting activities within WCRP and with its partners, with a clear aim to exploit new methods and greater computing power for more accurate and detailed seasonal climate predictions.

Determining how fast sea-level will rise

The IPCC Third Assessment Report projects sea-level rise in the 21st century in the range of 9-88 cm. WCRP aims to reduce this range of uncertainty by determining how best to estimate the thermal expansion of the ocean water, glacier and ice sheet melt, and storage of water on land and what observational and modelling activities are required to achieve this aim.

Predicting monsoon rains


Photo: FAO/G. Bizzarri

Over half the world's population lives within the influence of the Asian monsoon and a further large fraction lives within the monsoon areas of Africa and the Americas. Forecasting monsoon characteristics, including their onsets, breaks and duration, remains a challenging (but critically important) scientific problem because of the complexities of the interactions involved. Advances in simulation of clouds and radiation, progress in assimilating humidity and temperature data to produce better atmospheric analyses, and use of new ocean observations have set the stage for WCRP to improve monsoon prediction capabilities.

COLLABORATIONS

Strong collaborations will be formed with other research, development and applications programmes, satellite agencies, numerical weather/climate prediction centres, and with a broad range of stakeholders and users of climate information.

Developing country involvement will be actively sought and strongly encouraged, particularly through the global change SysTem for Analysis, Research and Training (START).

Research collaborations on the broader Earth system aspects will be built with the International Geosphere - Biosphere Programme (IGBP), the International Human Dimensions Programme on Global Environmental Change (IHDP) and DIVERSITAS (an international programme of biodiversity science), which with WCRP comprise the Earth System Science Partnership (ESSP).

Strong ties will be developed with THORPEX, a major project of the WMO World Weather Research Programme. The WCRP will continue to work in concert with the WMO World Climate Programme and its components, such as the Climate Information and Prediction Services (CLIPS).

WCRP will continue to be a major contributor to providing the scientific basis for the assessments of the WMO/UNEP Intergovernmental Panel on Climate Change (IPCC) and to the development of the Global Climate Observing System and the Global Earth Observation System of Systems (GEOSS).

WCRP

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