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## **INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (of UNESCO)**

### **INFORMATION DOCUMENT**

## **WMO-IOC-ICSU WORLD CLIMATE RESEARCH PROGRAMME (WCRP): YEAR 2015 REPORT**

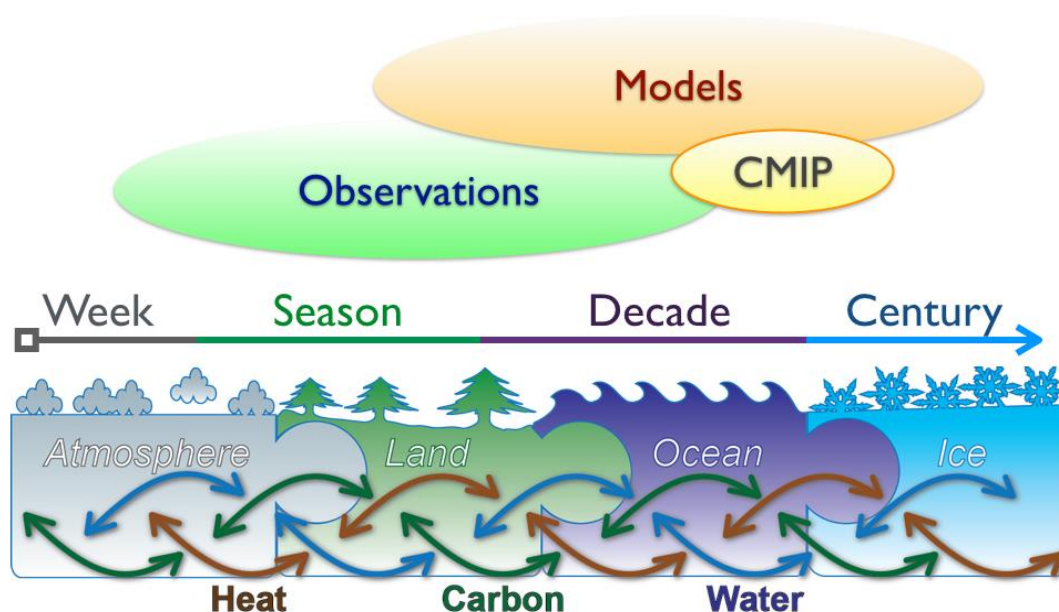
### Summary

The World Climate Research Programme, a shared program of IOC, ICSU and WMO, serves as the primary international coordination mechanism for international climate research. WCRP's community-assembled data products - covering stratosphere, land (precipitation), ice (including permafrost carbon) and ocean - stimulate a wide range of research and feed into global reanalysis. WCRP's model intercomparison projects - the so-called CMIPs - serve as the backbone of climate research and support numerous national and international assessments. The WCRP Grand Challenges set the agenda for conferences, workshops, special issues and calls for proposals. WCRP supports numerous workshops and summer schools across the globe that excites and trains a vital and diverse network of new climate scientists. In this report to the 28th Session of the IOC Assembly WCRP provides a brief general summary of recent activities and addresses issues of mutual interest with respect to ocean modeling, ocean observing technology, and sea level.



## Introduction

WCRP focuses on the exchanges of heat, water and carbon within and among atmosphere, land, ocean and ice components of the climate system. Its analysis and prediction efforts involve observations and models covering time scales from weeks to centuries.



## Modelling and Model Intercomparisons

Products from WCRP's fifth Coupled Model Intercomparison Project (CMIP5) provided the fundamental modelling basis for the entire IPCC 5th Assessment Report (AR5), permeated many chapters of the Working Group I report and continue to enable a very wide range of climate and oceanographic research and analysis. WCRP's broad-ranging planning efforts for a CMIP6 process have identified a research-driven set of climate diagnosis, evaluation and characterization experiments accompanied by standardization, coordination, infrastructure, and documentation functions to allow all simulations and their main characteristics performed under CMIP to be made available to a broader community. Ocean-related experiments proposed as part of CMIP6 include a Coupled Climate Carbon Cycle MIP, a Decadal Climate Prediction MIP, a Flux Anomaly Forced MIP, a Global Monsoons MIP, a Sea Ice MIP and an Ocean Model MIP.

CMIP6 will publish a Special Issue in GMD. This special issue describes the new design and organization of CMIP and the suite of experiments of its next phase (i.e., CMIP6), providing description of the CMIP6 experiments and forcing data sets in detail. The papers provide the information required to produce a consistent set of climate model simulations that will address the three broad scientific questions of CMIP6: (1) How does the Earth system respond to forcing?; (2) What are the origins and consequences of systematic model biases?; and (3) How can we assess future climate changes given climate variability, predictability and uncertainties in scenarios?

Interested readers should consult the following guide:

*Griffies et al.: Sampling the physical ocean in CMIP6 simulations - CLIVAR Ocean Model Development Panel (OMDP), Committee on CMIP6 Ocean Model Output.*

High-impact and very useful products have emerged from WCRP's Coordinated Regional Climate Downscaling Experiment (CORDEX) project. Although the CORDEX climate products for research, analysis, validation, and inter-comparison of regional climate data cover many of the world's land areas, they also cover important marginal seas including the Caribbean, Mediterranean and Baltic

Seas. WCRP welcomes the initiative and support of the Swedish Meteorological and Hydrological Institute to establish a new International Project Office for CORDEX. Interested readers can find more information at <http://www.cordex.org/>.

## **Grand Challenges**

WCRP's five Grand Challenges serve as a mechanism to certify and focus community attention on urgent and actionable issues. The five challenges – Water Availability, Regional Sea Level Rise, Snow and Ice, Clouds, Circulation and Climate Sensitivity, and Climate Extremes – move through stages of visioning, definition and implementation, with several already submitting large-scale multinational proposals to external funding sources. These Grand Challenges allow WCRP to identify areas for significant progress and to recognize and prioritize crosscutting limitations - in fundamental ocean modelling skill, for example. The WCRP Grand Challenges fit a paradigm of global processes with regional and local impact; they rapidly propagate into the organizing structures of climate conferences and workshops and into the planning processes of funding agencies. Although perhaps not obvious from the short titles, one can clearly find an ocean component in all the existing Grand Challenges. The WCRP Regional Sea Level Grand Challenge represents an area of close coordination and active partnership with IOC. Based on community input and partner interest, WCRP will very likely develop two new grand challenges focused on decadal climate variability and biogeochemistry and aerosols, both with strong ocean context.

## **Core Projects**

The WCRP Core Projects stimulate and coordinate timely and essential activities in the four essential compartments - land, ocean, ice, atmosphere - of the Earth's climate system. Through a variety of exchanges, partnerships, and co-sponsorships, the WCRP Projects maintain close and vital interactions and develop shared activities such as the joint CLIVAR/GEWEX science and steering group meetings in 2014. Two of the WCRP Project, Climate Variability (CLIVAR) and Climate in the Cryosphere and their shared Southern Ocean Panel, focus on global ocean processes.

CLIVAR focus areas include ENSO in a changing climate, ocean roles in planetary heat budgets, biophysical aspects and dynamics of upwelling systems, decadal variability and predictability, climate extremes and dynamics, and monsoons. The recent CLIVAR report to WCRP JSC offers details and more information.

CliC focus areas include sea ice working groups for Arctic and Antarctic, the Southern Ocean Regional Panel and a report on Southern Ocean satellite data requirements, and a Marine Ice Sheet Ocean MIP. The CLIC 2014 Annual Report provides details and additional information.

WCRP expresses sincere appreciation to present - Norway for CliC, USA for GEWEX, Switzerland for SPARC - and new - China and India for CLIVAR - national contributions for welcome and essential support to the WCRP International Project Offices.

## **Polar Challenge**

The WCRP Polar Challenge initiative (<http://www.wcrp-climate.org/polarchallenge>) seeks to stimulate technological innovation towards a new paradigm for long-term under-ice observations and a cost-effective, autonomous and scalable ocean monitoring network for the Polar Regions. The Polar Challenge synchronizes with and compliments the WCRP's Polar Climate Predictability Initiative and enhances WCRP's collaboration with WMO polar activities and efforts including the Polar Prediction Project and the Year of Polar Prediction.

## Sponsors and Partners

WCRP continues positive and effective relationships with its co-sponsoring organizations, the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the International Council for Science (ICSU) and the World Meteorological Organization. These three organizations recruit and determine the membership of WCRP's Joint Science Committee. On behalf of these three sponsors WCRP negotiated formal declaration of partnership with the emerging programme Future Earth sponsored by the Science and Technology Alliance for Global Sustainability. Together with IGBP, Scientific Committee on Oceanic Research (SCOR), and the international Commission for Atmospheric Chemistry and Global Pollution (iCACGP), WCRP serves as a co-sponsor of the Surface Ocean – Lower Atmosphere Study (SOLAS). WCRP engages successfully with WMO co-sponsored programmes and technical commissions including the Global Climate Observing System (GCOS) through shared membership on the GCOS science panels for ocean, atmosphere and land (OOPC, AOPC and TOPC, respectively); the GCOS OOPC connection represents a close intersection with IOC Global Ocean Observing System (GOOS). Based on mutual interest in the development and definition of climate observing networks and essential climate variables, WCRP works with the Commission for Climatology through the CLIVAR/CCI/JCOMM/GEWEX Expert Team on Climate Change Detection and Indices (ETCCDI). WCRP, the World Weather Research Programme (WWRP) specifically, and the Atmospheric Research and Environment Branch (ARE) generally engage in mutually planned, implemented and sponsored research on sub-seasonal to seasonal prediction, high-impact weather and polar prediction.

Working closely with Working Group I of the Intergovernmental Panel on Climate Change (IPCC), WCRP organized and supported a September 2015 Lessons Learnt Workshop with respect to the recently published IPCC Fifth Assessment Report (AR5), which recorded the good match between goals of the WCRP Grand Challenges and AR5 uncertainties. WCRP has developed plans to promote additional progress and collaboration within the Grand Challenges on actions identified by the Workshop, including attention to ocean heat and carbon uptake, the need for greater emphasis on understanding natural variability and forced change on annual to decadal time scales, the need for better descriptions and incorporation of aerosols into climate scenarios and predictions, and the growing need to incorporate interactive components of the carbon cycle, including terrestrial and oceanic geochemical and ecological sources and sinks, into analyses and models. WCRP and ESA organized a successful Climate Symposium (October 2014, Darmstadt, Germany) in close cooperation with EUMETSAT and other partners to define requirements and further the development of an efficient and sustained international space-based Earth observing system.

WCRP takes a small amount of credit for contributing to the skills and experience of the new IOC Executive Secretary and thanks the Executive Secretary, his friendly and cooperative staff and the IOC Members for continued support of WCRP.

**Intergovernmental Oceanographic Commission (IOC)**  
 United Nations Educational, Scientific and Cultural Organization  
 7, place de Fontenoy  
 75 732 Paris Cedex 7, France  
 Tel.: +33 1 45 68 10 10  
 Fax: +33 1 45 68 58 12  
<http://ioc.unesco.org>