The World Climate Research Programme (WCRP): a short update to SCOR-2023

The World Climate Research Programme

"The World Climate Research Programme (WCRP) coordinates and facilitates international climate research to develop, share and apply the climate knowledge that contributes to societal well-being."

WCRP leads the way in addressing frontier scientific questions related to the coupled climate system — questions that are too large and too complex to be tackled by a single nation, agency or scientific discipline. Through international science coordination and partnerships, WCRP contributes to advancing our understanding of the multi-scale dynamic interactions between natural and social systems that affect climate. WCRP engages productively through these partnerships to inform the development of policies and services and to promote science education.

Like SCOR, WCRP does not fund science directly, but provides coordination and a platform for the exchange of ideas on specific high-priority research topics related to the climate system. Funds for WCRP activities come from its co-sponsors[1] as well as voluntary contributions from various countries and agencies. Since the COVID-19 pandemic, WCRP activities have been organised virtually or in hybrid format whenever possible, including meetings of the Joint Scientific Committee (JSC), the body responsible for providing scientific guidance to the Programme.

Currently, WCRP is in the process of implementing its new research strategy (WCRP Strategic Plan 2019-2028[2]). Major elements of the Science and Implementation Plan are to strengthen support for core research, ensure engagement of the next generation of scientists and improve the diversity of WCRP leaders (across nations, regions, and disciplines), deepen our interaction with partners at national and international levels, and ensure that society has the climate knowledge that it needs for decision-making.

WCRP has reoriented itself to ensure that there is the science, knowledge and understanding needed to target frontier problems, such as disaster risk reduction, climate adaptation, mitigation, and intervention strategies, that need to be solved together with partners for which WCRP's core research continues to be essential for developing answers. The integral role of WCRP in developing knowledge of the climate system will result in an increased understanding of the Earth system, including of the complex interactions between the physical environment and society.

These efforts will culminate in the WCRP Open Science Conference (https://www.wcrp-climate.org/wcrp-osc23), 23-27 October 2023 in Kigali, Rwanda, which will bring together more than 1400 participants both virtually and on-site from diverse research communities, programmes and partners to discuss the latest developments in climate science, with an emphasis on science-based information for decision making. As the first official event in the lead-up to this fully hybrid once-in a-decade event, taking place at a very important moment of Earth's history, the virtual poster session opened on 09 October.

[1] World Meteorological Organization (WMO), the Intergovernmental Oceanographic Commission (IOC) and the International Council for Science (ISC)

[2] https://www.wcrp-climate.org/wcrp-sp-overview

The WCRP Lighthouse Activities

As of 2023, WCRP has six new 'Lighthouse Activities' (LHAs, two of which are just spinning up) that aim to make critical near-term progress towards meeting WCRP's Vision, Mission, and four Scientific Objectives, as outlined in the WCRP Strategic Plan 2019–2028. The WCRP Lighthouse Activities are designed to be ambitious and transdisciplinary (integrating across WCRP and collaborating with partners) so that they can rapidly advance some of the new science and technologies, and institutional frameworks, that are needed to manage climate risk and meet society's urgent need for robust and actionable climate information more effectively. WCRP's six LHAs are Digital Earths, Explaining and Predicting Earth System Change, My Climate Risk, Safe Landing Climates, and two new ones the Global Precipitation Experiment (GPEX) and Research of Climate Intervention. The WCRP Academy, which started as a LHA is now part of the more permanent structure of WCRP. Though still in the early stages, there are several connections to ocean research. For example, one theme of the Safe Landing Climates' Lighthouse Activity is sea level rise, which aims to quantify an "acceptable" rate of sea level rise and its irreversibility from multiple decades to millennia and study the impact of storm surges and cyclones on coastal communities to assess the potential for adaptation. Digital Earths will push the co-development of ultra-high-resolution modelling of the Earth-system and its components, including the ocean, as well aspects of data assimilation for a comprehensive and consistent description of the state of the system at any given time. These LHAs will partner with Future Earth (Risk KAN, Ocean KAN, Coasts, Surface Ocean – Lower Atmosphere Study (SOLAS)), Global Climate Observing System (GCOS), Global Ocean Observing System (GOOS), and others.

The WCRP Core Projects

Until 2021 WCRP had four Core Projects (Research Communities), CLIVAR (Climate and Ocean Variability, Predictability and Change - www.clivar.org), CliC (Climate and Cryosphere- www.climate-cryosphere.org), GEWEX (Global Energy and Water Exchanges- www.gewex.org) and SPARC (Stratosphere-troposphere Processes And their Role in Climate - http://www.sparc-climate.org). Two new Core Projects have been established: Earth System Modelling and Observations (ESMO) and Regional Information for Society (RifS). ESMO is working on advancing predictions and projections of the Earth system on time scales from weeks to centuries via a model-observation integrating framework, as well as improving monitoring, understanding, and attribution of climate system changes and impacts. RIfS facilitates and catalyses new targeted research related to the provision of actionable information about climate variability and change in support of adaptation and mitigation. Both CLIVAR and CliC endorse of the SCAR/SCOR Southern Ocean Observing System (SOOS). Of these Core Projects, the work of CLIVAR is of particular relevance to SCOR.

The CLIVAR Core Project of WCRP

CLIVAR aims to understand the dynamics, the interaction, and the predictability of the climate system with emphasis on ocean-atmosphere interactions. Many scientific activities carried out by CLIVAR panels and Research Foci groups are of strong relevance to other WCRP core projects, Lighthouse Activities, and other emerging initiatives (e.g., a joint activity on Cycle and Budgets, jointly with GCOS). CLIVAR has also helped identify ocean hubs for My Climate Risk Lighthouse Activity. CLIVAR officially began its new Research Foci on Marine Heat Waves in the Global Ocean in Feb. 2023 with the goal to achieve a better understanding of MHWs globally, including detection, surface and subsurface characteristics, mechanisms, connection with climate change and biogeochemical extremes, in order to increase preparedness and promote efficient adaptation planning, while contributing to the training of the next generation of scientists and providing input to observational

programs.

In the era of post-COVID, many CLIVAR meetings have been shifted from completely online to hybrid, to address the strong desire of in-person meetings, but at the same time, also to facilitate the participation of people from the global south and/or with strict travel limitations. For instance, a CLIVAR workshop on the tropical Pacific and its inter-basin interactions was organized on 14-17 February 2023 at Monash University, Australia and online, by Pacific Regional Panel, and the Tropical Basin Interaction RF. The workshop provided opportunities to connect within and across the four research groups represented at this meeting, share the latest research with each other, and identify synergies for current and future collaborations. Several other workshops and training schools have also taken place in the Northern Hemisphere summer of 2023 such as ICTP-CLIVAR Summer School on Marine Heatwaves: Global Phenomena with Regional Impacts (24-29 July 2023, Trieste, Italy and online); 4th Summer School on Theory, Mechanisms and Hierarchical Modeling of Climate Dynamics: Atlantic Variability and Tropical Basin Interactions at Interannual to Multi-Decadal Time Scales (31 July – 11 August 2023, Trieste, Italy and online); Workshop on Meeting AMOC Observation Needs in a Changing Climate (18-20 July 2023, Hamburg, Germany and online) and Pre-workshop webinar series.

A call for New CLIVAR Research Foci is expected to be launch in the next months to start activities in the upcoming year.

WCRP and CLIVAR look forward to further exploring collaborations in ocean related activities with SCOR in the future. Please contact Hindumathi Palanisamy (WCRP - hpalanisamy@wmo.int)