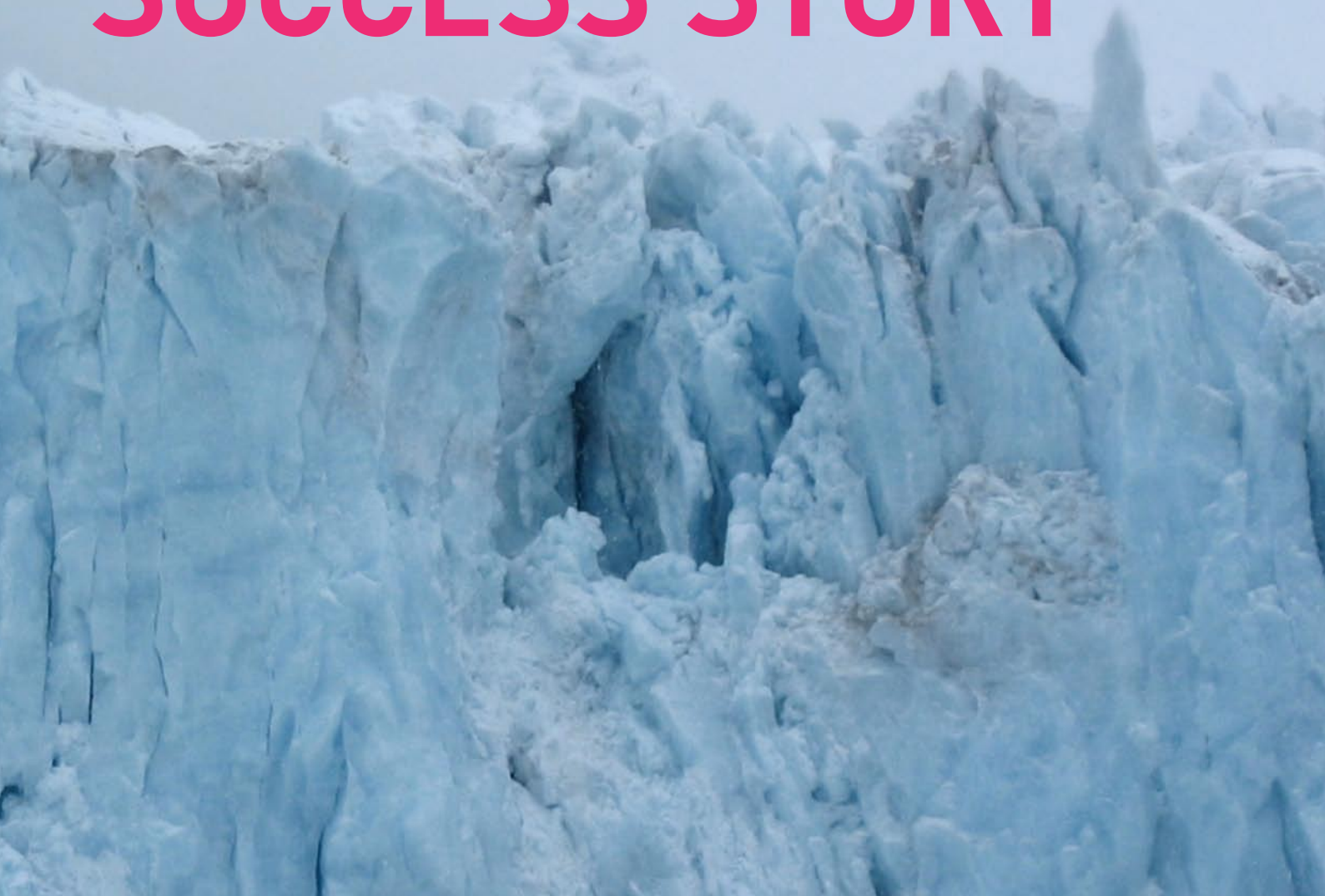


# A SHORT HISTORY OF A LONG SUCCESS STORY



“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 CO<sub>2</sub> concentration (as well as other gases and aerosols). Early work on the assessment of research into CO<sub>2</sub> 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 CO<sub>2</sub>- 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:

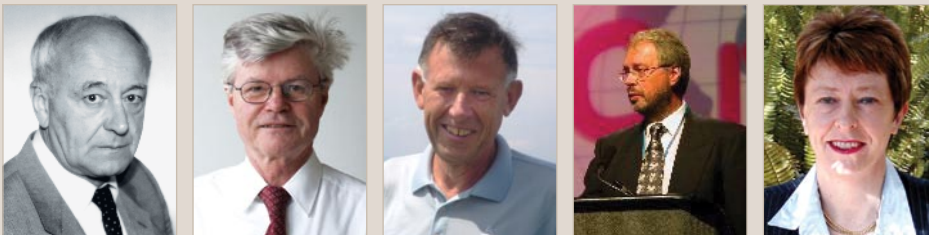
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### Chairs, Joint Scientific Committee



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.*