World Climate Research Programme
Open Science Conference

Climate Research in Service to Society

Antonio J. Busalacchi
Chair, WCRP Joint Scientific Committee

Director, ESSIC, U. Maryland

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WCRP Joint Scientific Committee

Chair, A. Busalacchi, ESSIC, University of Maryland, USA
Vice-Chair (outgoing), D.J. Griggs, Monash University, Australia
Vice-Chair (incoming), J. Marotzke (Officer), Max Planck Institute for Meteorology, Germany

Members:
G. Flato (Officer), Environment Canada
S. Gille, Scripps Institution of Oceanography, USA
F. Giorgi, Abdus Salam International Centre for Theoretical Physics (ICTP), Italy
B.N. Goswami, Indian Institute of Tropical Meteorology
T. Karl , National Climatic Data Center, USA
D. Karoly, University of Melbourne, Australia
V. Kattsov (Officer), Voeikov Main Geophysical Observatory, Russia
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H. Liao, Chinese Academy of Sciences, China
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J. Slingo, University of Reading, UK
C. Vera (Officer), University of Buenos Aires, Argentina
P. Yanda, University of Dar Es Salaam, Tanzania

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Scientific Organizing Committee

- Jim Hurrell, **Chair**, NCAR, USA
- Ghassem Asrar, WCRP, Switzerland
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- Koni Steffen, Univ. Colorado, USA
- Kevin Trenberth, NCAR, USA
- Carolina Vera, Univ. Buenos Aires, Argentina
- Martin Visbeck, IFM-GEOMAR, Germany

http://conference2011.wcrp-climate.org

Mission & Objectives

- **World Climate Research Programme** supports **climate-related decision making** and planning **adaptation to climate change** by coordinating research required to improve

(1) climate predictions and

(2) our understanding of human influence on climate

"for use in an increasing range of practical applications of direct relevance, benefit and value to society" *(WCRP Strategic Framework 2005-2015).*

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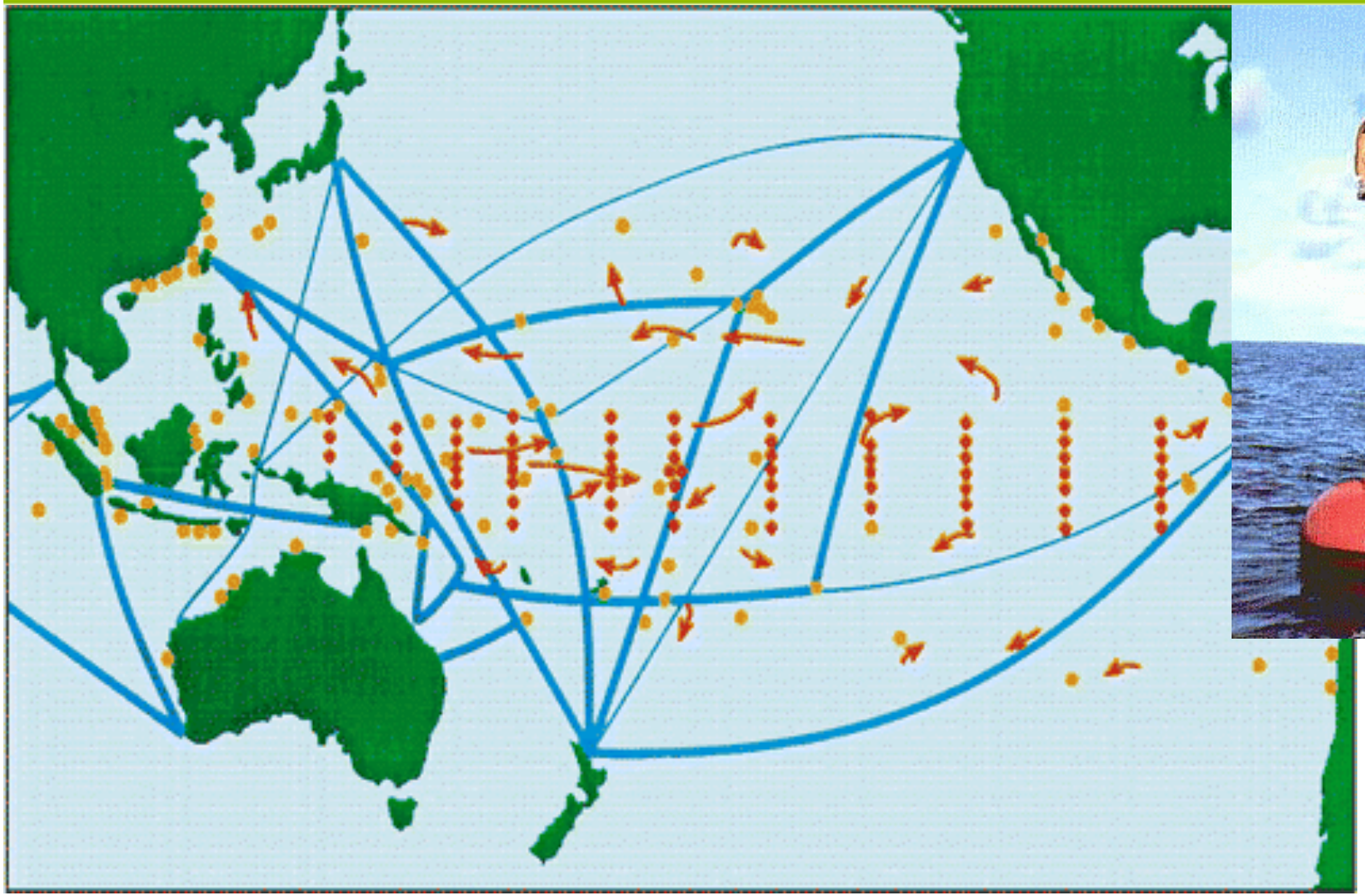

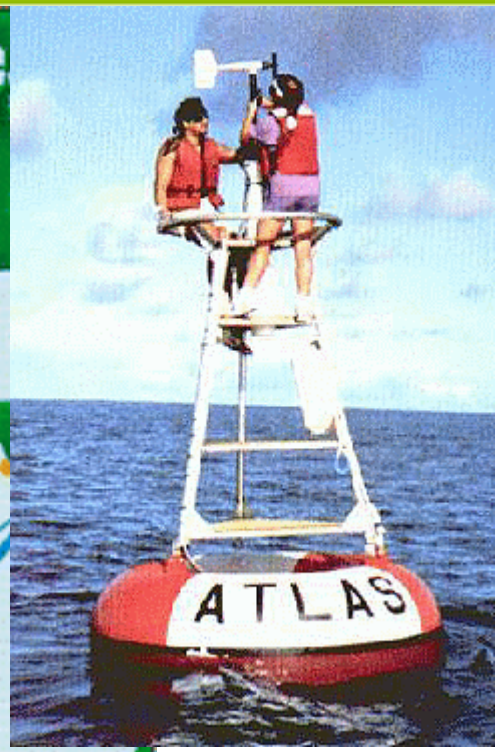

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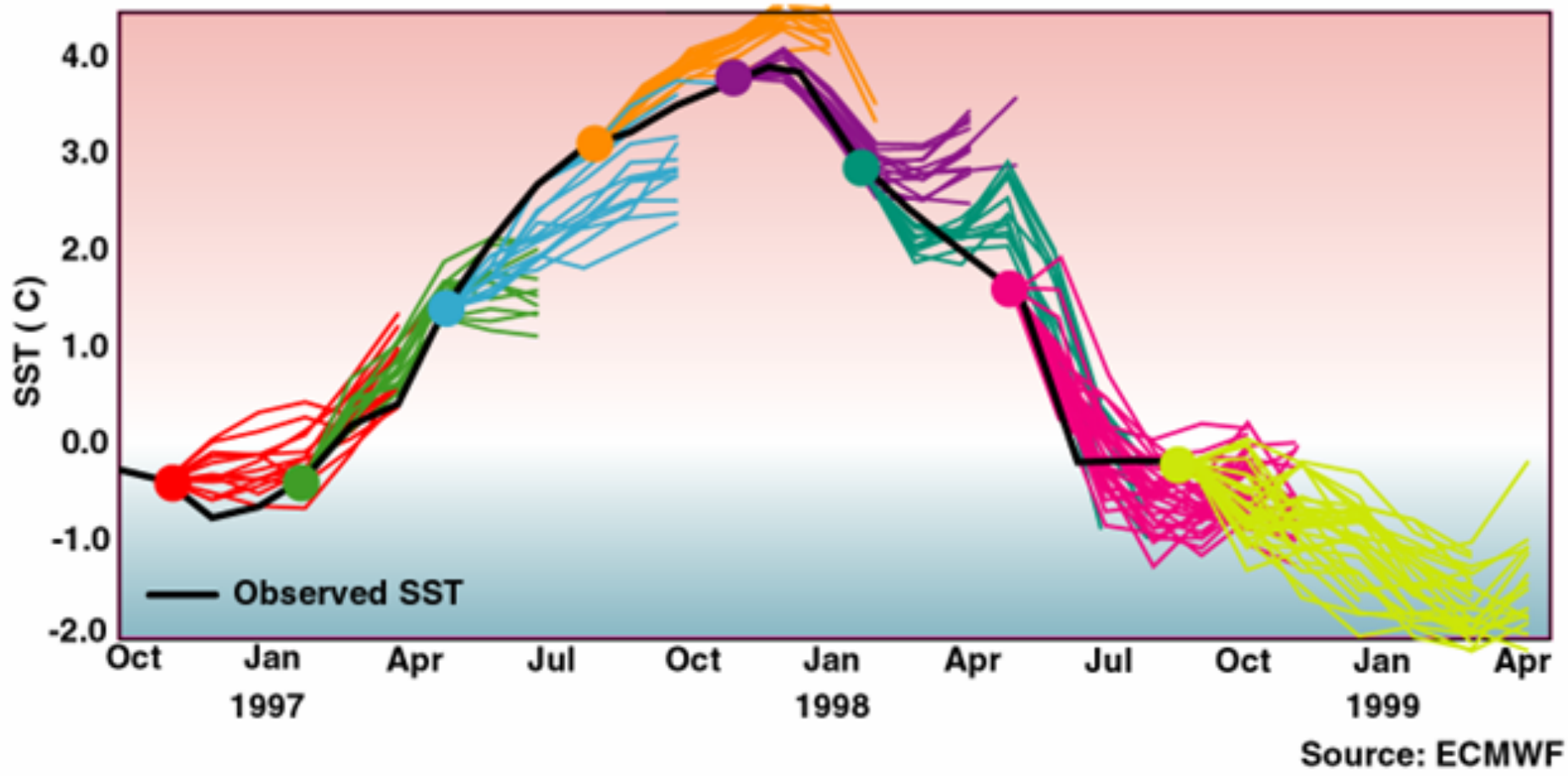
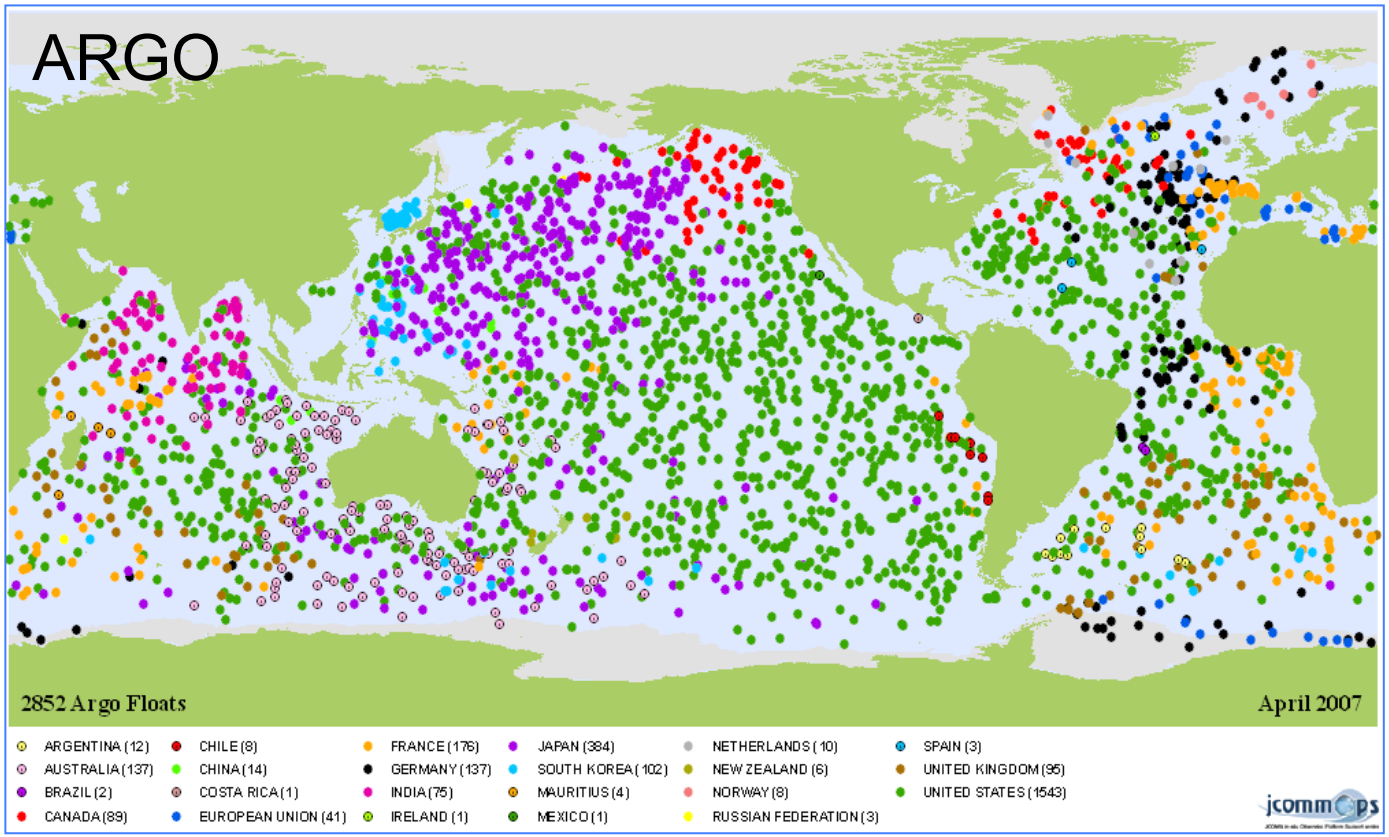
El Niño 1997/98
Seasonal Predictions

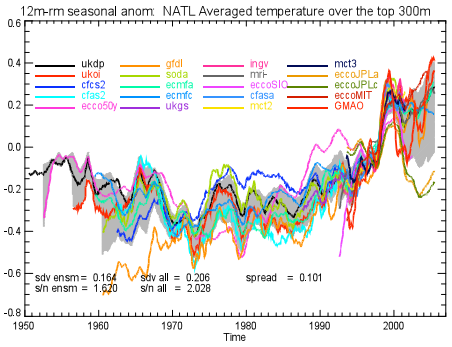


The ocean observing system



CLIVAR GSOP: Ocean Synthesis Evaluation Workshops

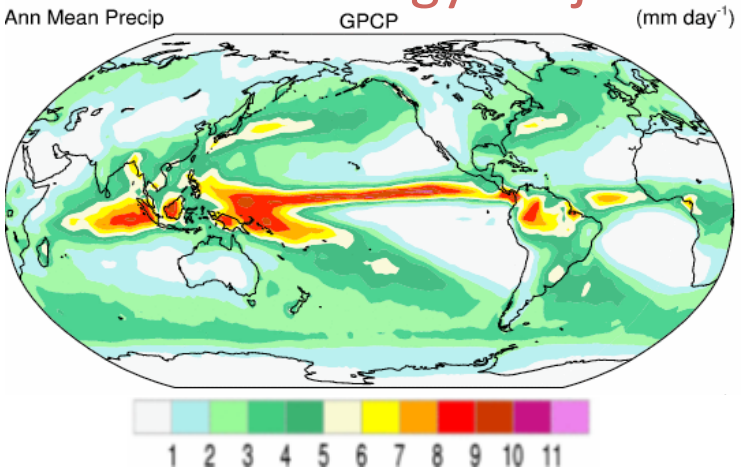
N. Atlantic Temp (0-300 m)



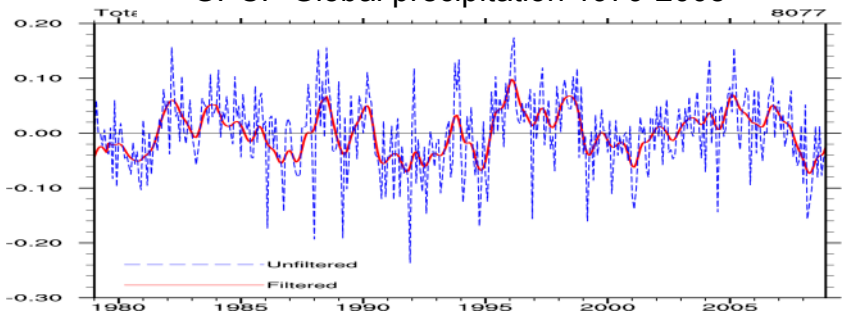
WCRP enabling initialized predictions

Atmospheric data sets

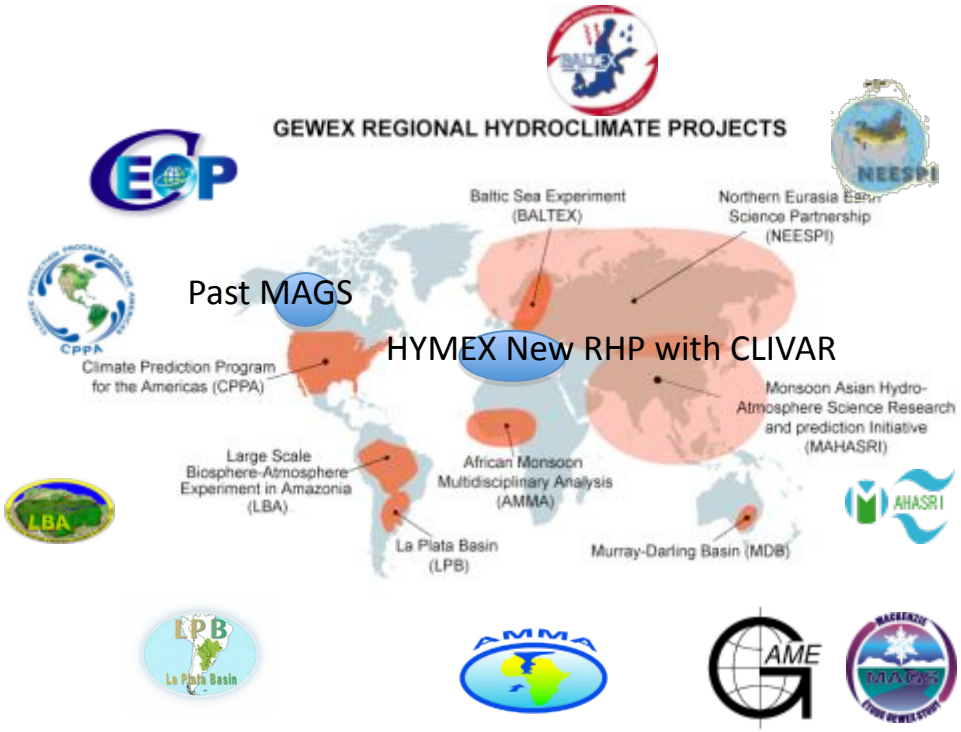
GEWEX Global Precipitation Climatology Project



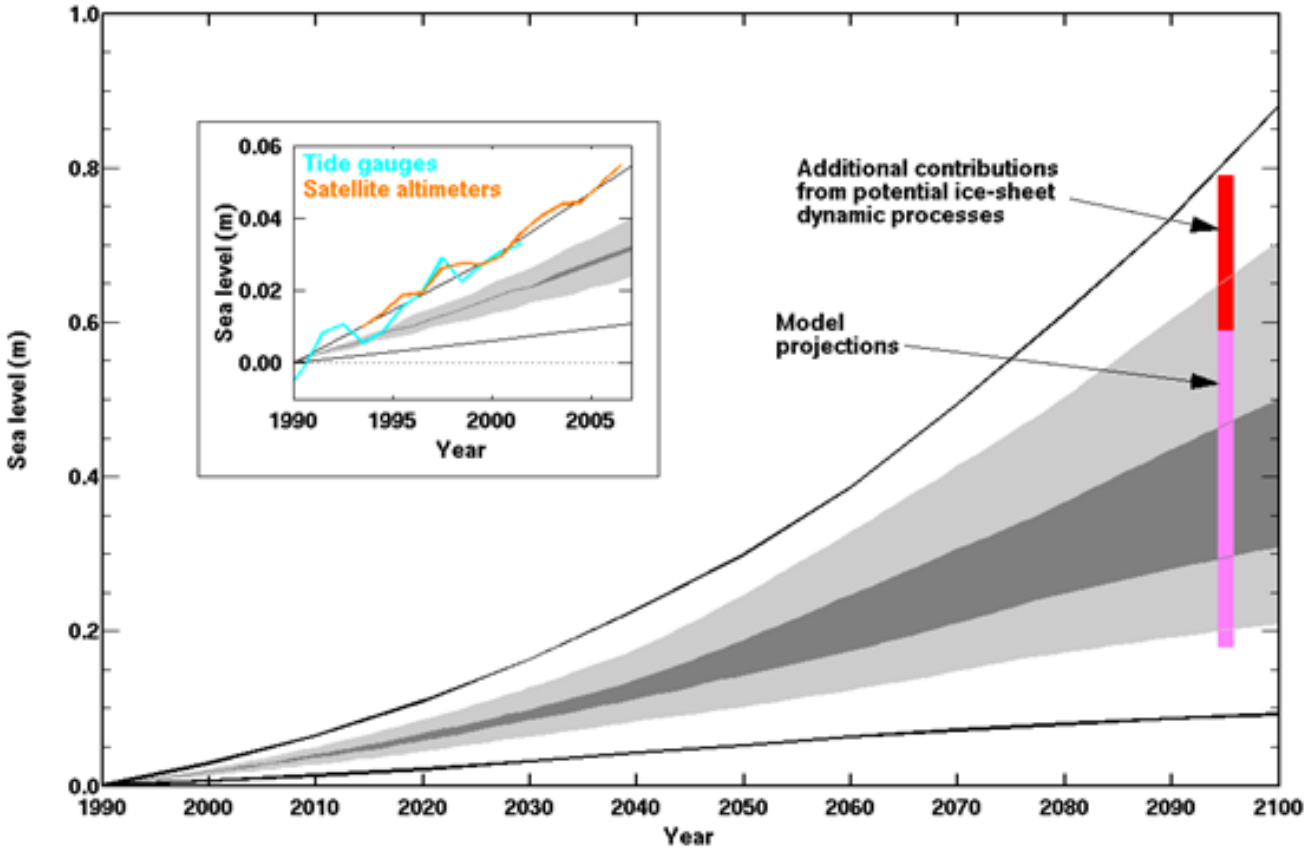
GPCP Global precipitation 1979-2008



Regional Hydrology Data Sets



Sea Level Rise



Church et al., 2001

Chemistry-Climate Model Validation (CCMVal)

- CCMVal Report (June 2010)involved 18 CCM groups and over a hundred scientists as authors and reviewers
  - Widespread use of process-oriented metrics
  - Detailed evaluation of radiative and chemical schemes
  - Statistical evaluation of ozone projections

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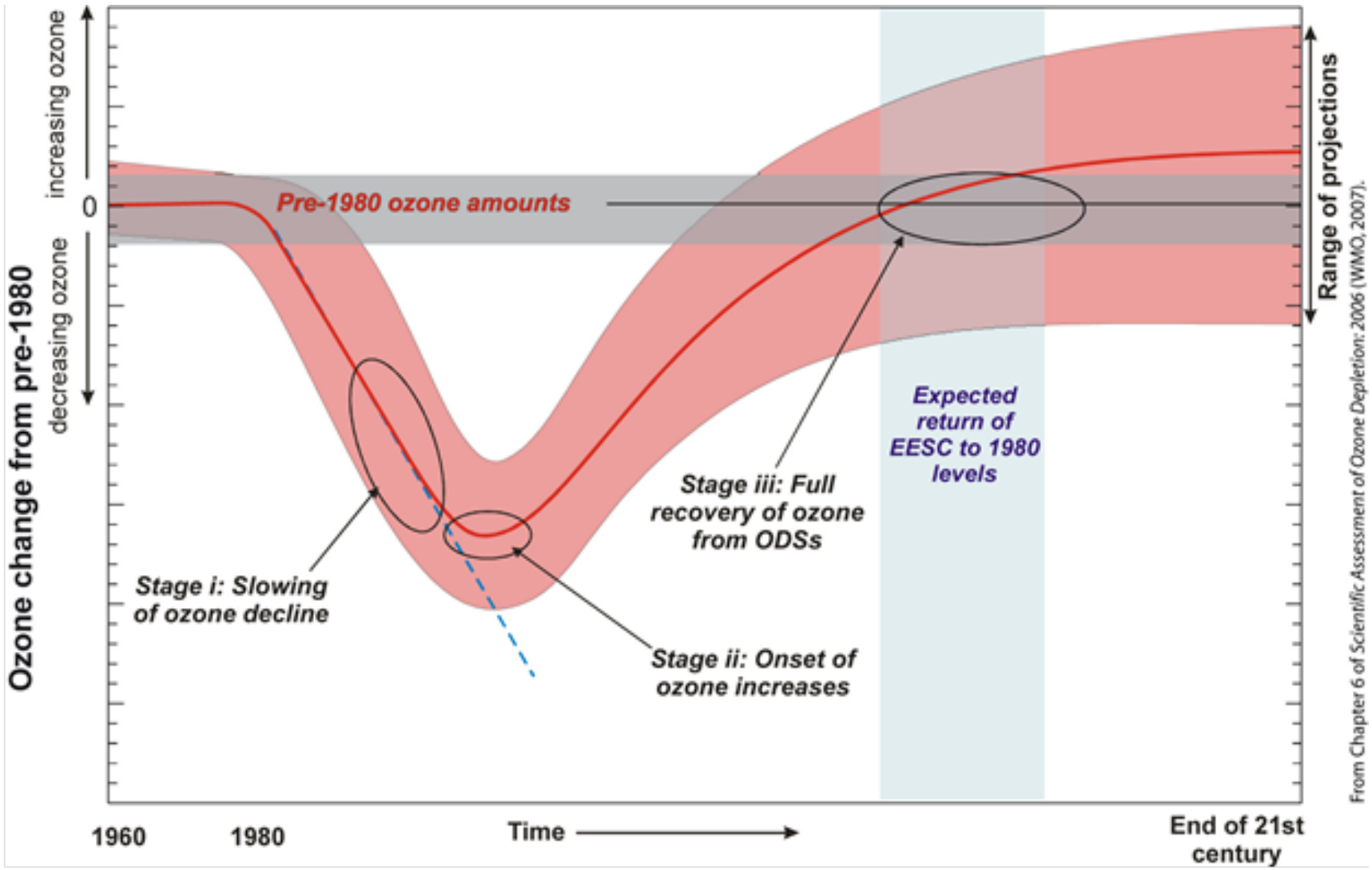

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WCRP REPORT

SUMMARY REPORT

A STRATEGY FOR CLIMATE CHANGE STABILIZATION EXPERIMENTS WITH AOGCMs AND ESMs

Aspen Global Change Institute 2006 Session Earth System Models: The Next Generation

(Aspen, Colorado, July 30–August 5, 2006)

May 2007

WCRP Informal Report N° 3/2007
ICPO Publication N° 112
IGBP Report N° 57

Contributions to IPCC AR5

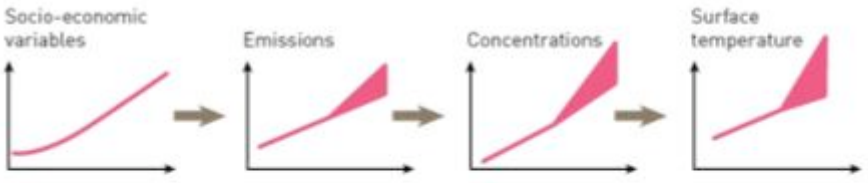
in collaboration with IGBP

WGCM CMIP5

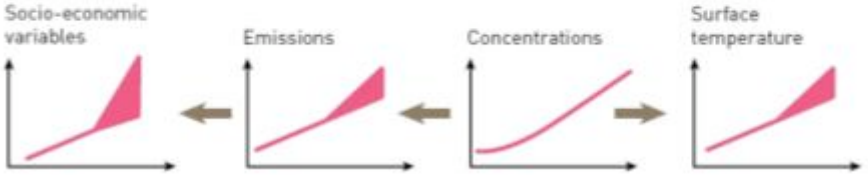
Decadal + Long-Term Protocols

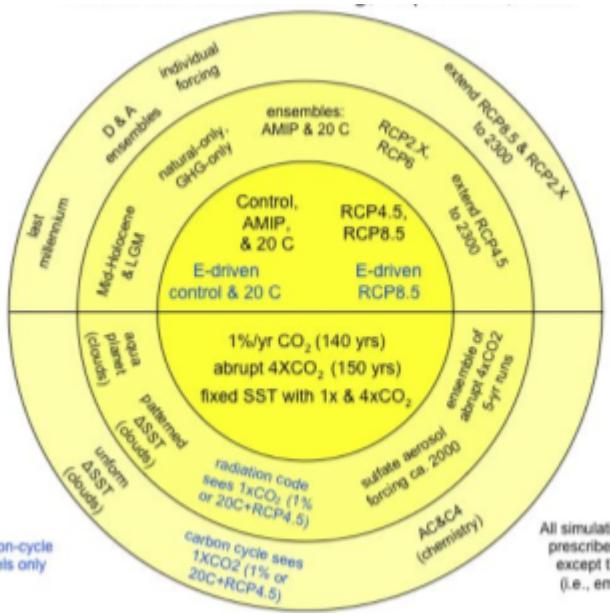
AR5 Scenario Development

Traditional forward approach



New approach: Start with Concentrations





Coupled carbon-cycle climate models only

All simulations are forced by prescribed concentrations except those "E-driven" (i.e., emission-driven).

World Climate Conference-3

Better Climate Information for a Better Future

A Global Framework for Climate Services

WCC · 3

World Meteorological Organization
Weather • Climate • Water

Geneva, Switzerland

31 August–4 September 2009

UN SYSTEM
DELIVERING AS ONE ON
CLIMATE KNOWLEDGE

WCC-3 Outcomes

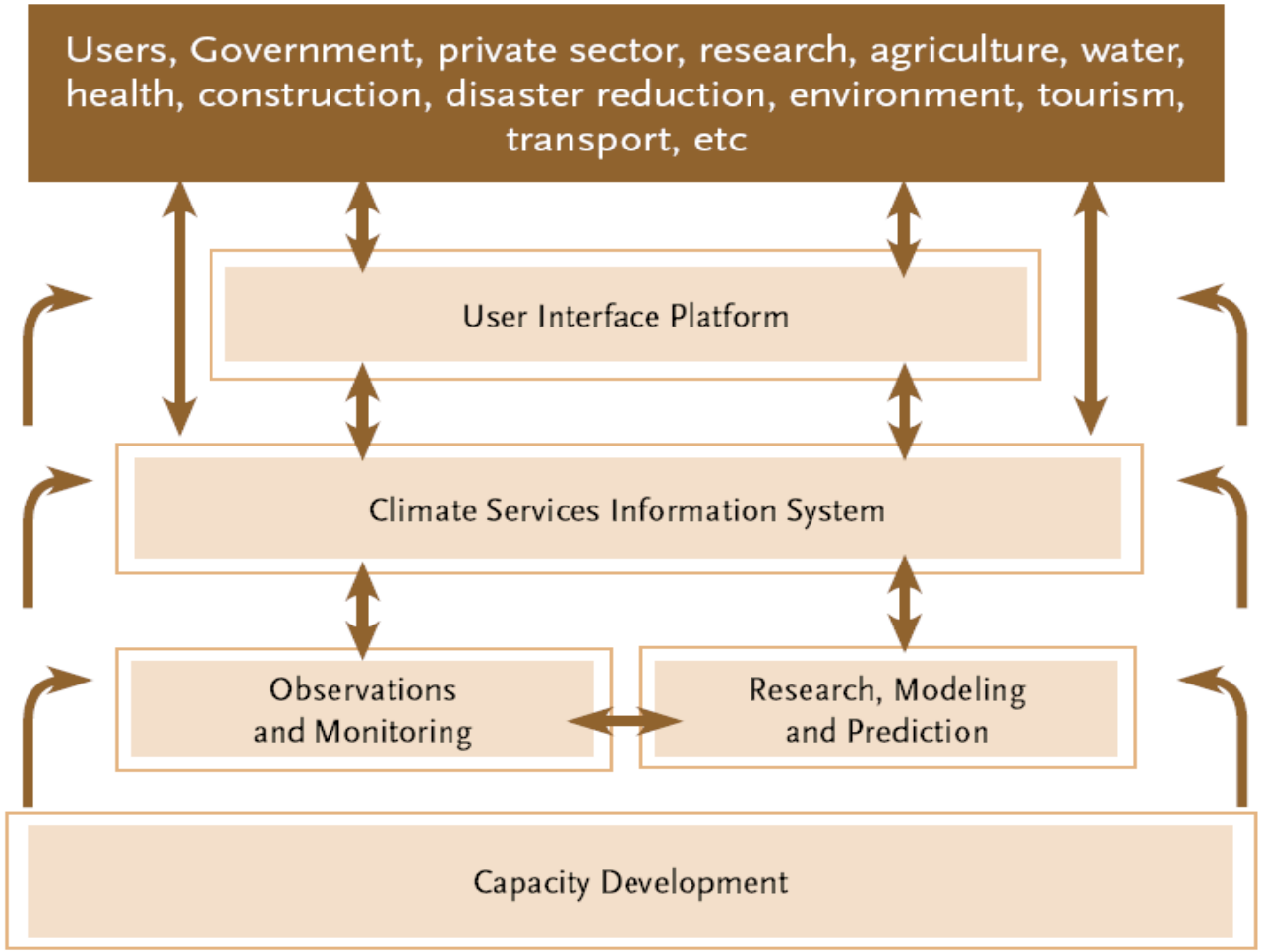
- **Relevant outcomes from the World Climate Conference-3**
  - **Decided to establish a Global Framework for Climate Services** to strengthen production, availability, delivery and application of science-based climate prediction and services
  - **Requested the Secretary-General of WMO to convene**, within four months of the adoption of the Conference Declaration, **an intergovernmental meeting** of Member States of the WMO to **approve the terms of reference** and to **endorse the composition of a task force** of high-level, independent advisors to be appointed by the Secretary-General of WMO with due consideration to expertise, geographical and gender balance.

WCC3 – Expert Segment

Called for major strengthening of the essential elements of a global framework for climate services:

- The **Global Climate Observing System** and all its components and associated activities; and provision of free and unrestricted exchange and access to climate data;
- The **World Climate Research Programme**, underpinned by adequate computing resources and increased interaction with other global climate relevant research initiatives.
- **Climate services information systems** taking advantage of enhanced existing national and international climate service arrangements in the delivery of products, including sector-oriented information to support adaptation activities;
- **Climate user interface** mechanisms focussed on building linkages and integrating information, at all levels, between the providers and users of climate services; and
- Efficient and enduring **capacity building** through education, training, and strengthened outreach and communication.

Global Framework for Climate Services (GFCS)

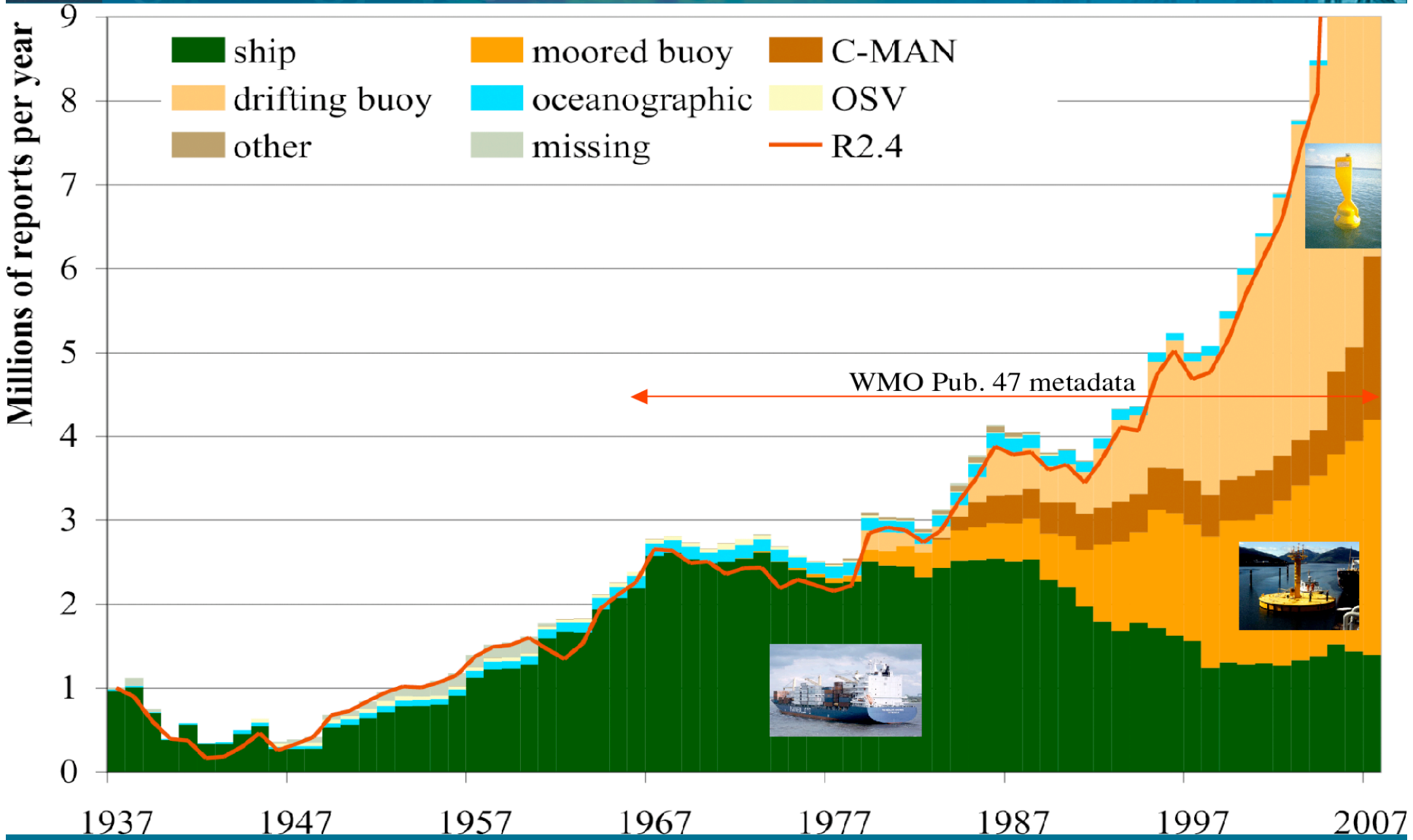


Conference Objective

"Ocean Information for society:

sustaining the benefits, realizing the potential"

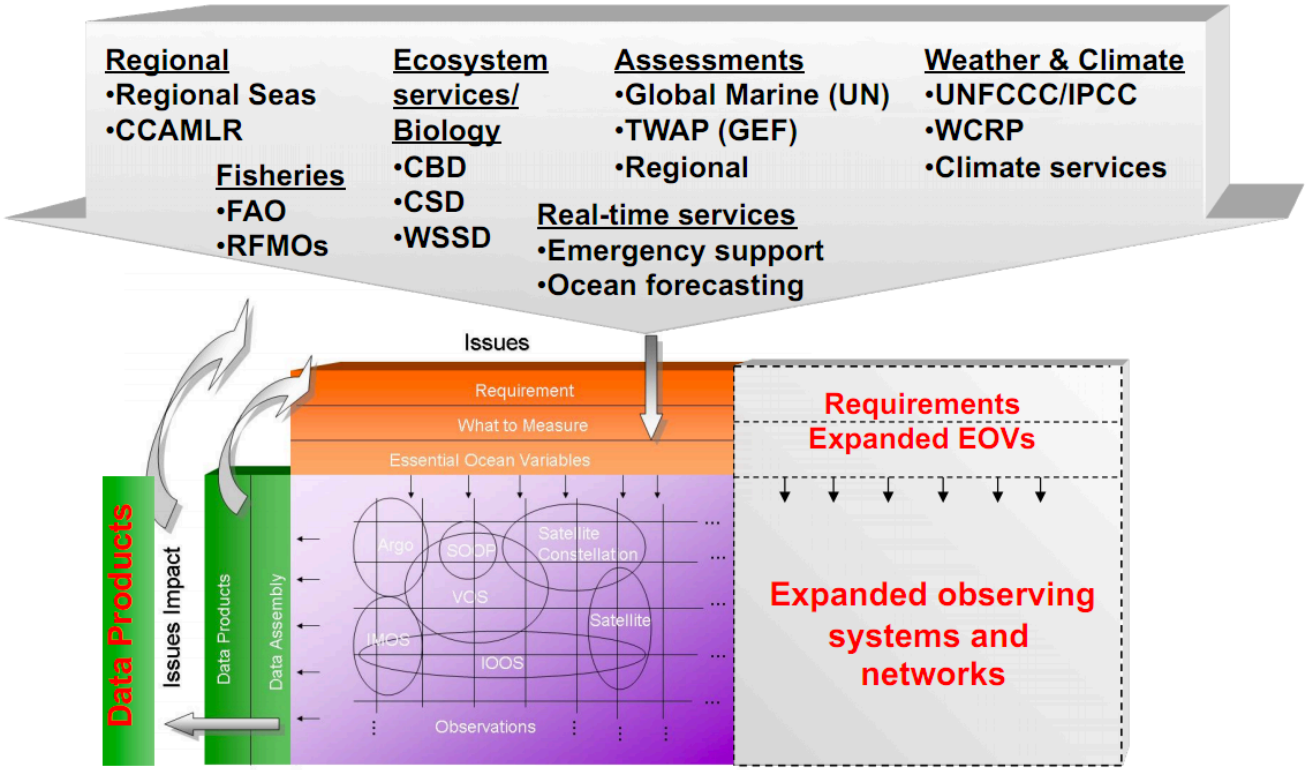
Strengthen and enhance the international framework under GCOS, GOOS, WCRP, IGBP and supporting regional and national frameworks for sustained world ocean observing and information systems supporting the needs of society about ocean weather, climate, ecosystems, carbon and chemistry



cf Worley et al., Snowden et al., 2009

OO'09: Framework for Ocean Observing

Framework: Societal Drivers Next Decade



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Global environmental change research: a long, successful history

four Global Environmental Change Programmes

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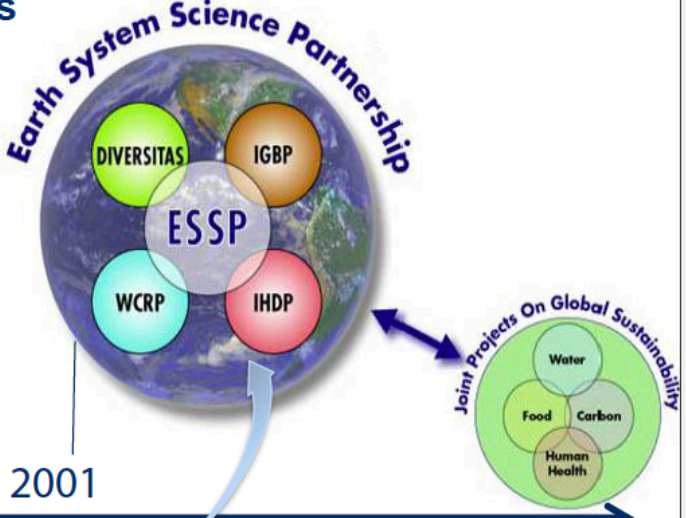
DIVERSITAS an international programme of biodiversity science

GLOBAL CHANGE IGBP International Geosphere-Biosphere Programme

IHDP International Human Dimensions Programme on Global Environmental Change

1980 1986 1991 1996 2001



and their partnership

all co-sponsored by ICSU

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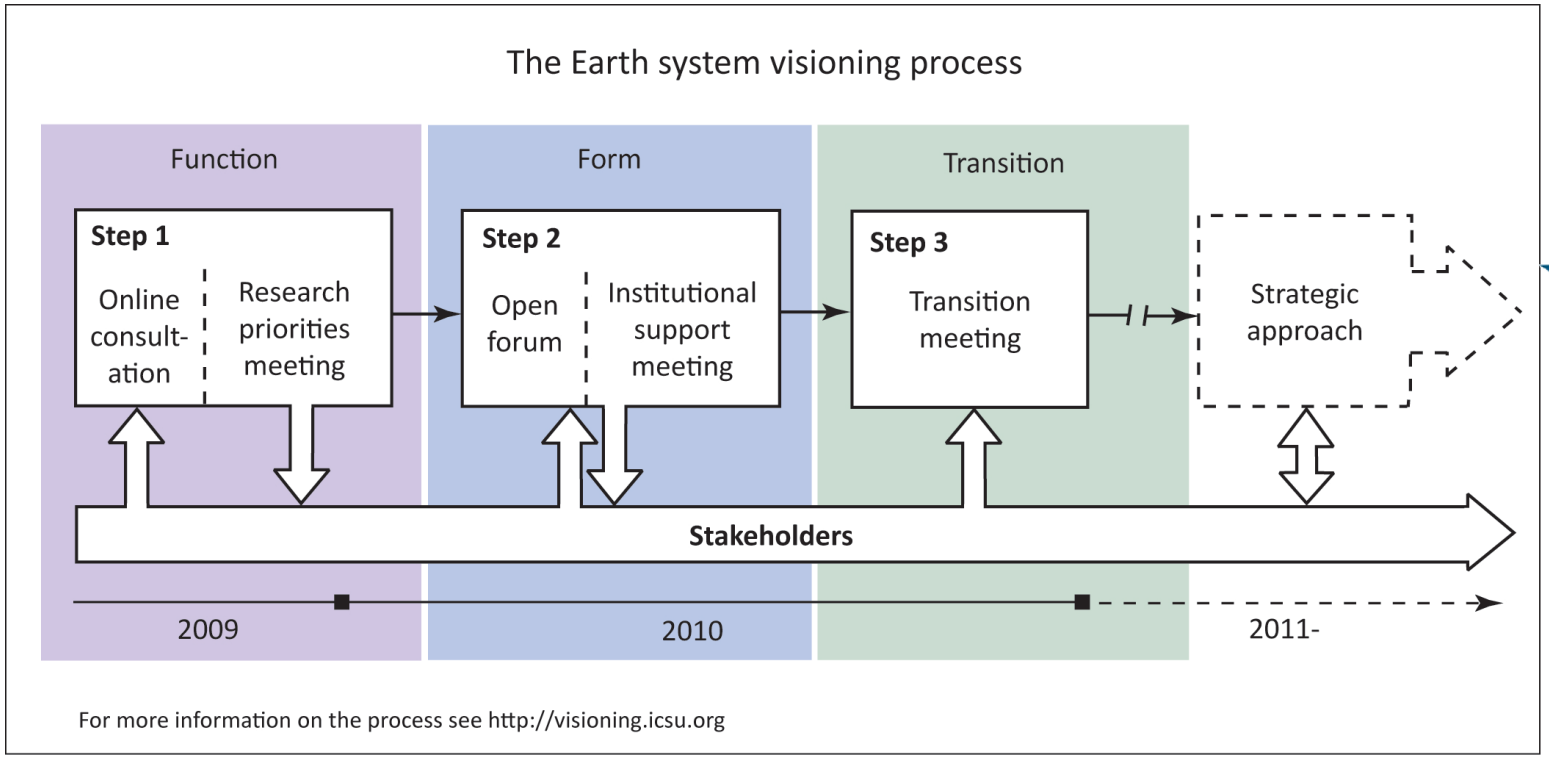
Three Step Process for an Alliance



EARTH SYSTEM VISIONING

ICSU International Council for Science

BELMONT FORUM

IGFA International Group of Funding Agencies for Global Change Research

Goal: to engage the scientific community to explore options and to propose implementation steps for a holistic strategy on the Earth system research. This strategy will both encourage scientific innovation and address policy needs.

The Belmont Challenge

To deliver knowledge needed for action to mitigate and adapt to detrimental environmental change and extreme hazardous events.

This requires:

- Information on the state of the environment, through advanced observing systems;
- Assessments of risks, impacts and vulnerabilities, through regional and decadal analysis and prediction;
- Enhanced environmental information service providers to users;
- Inter-and transdisciplinary research which takes account of coupled natural, social and economic systems;
- Effective integration and coordination mechanisms, to address interdependencies and marshal the necessary resources.

BELMONT FORUM

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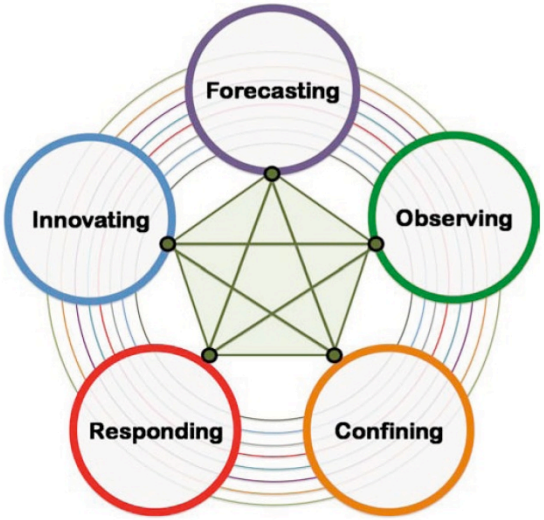
Grand Challenges and a global Alliance



Grand Challenges in Earth System Science for Global Sustainability. The concentric circles represent the disciplinary research needed in the social, natural, health and engineering sciences and the humanities that must be carried out alongside interdisciplinary and transdisciplinary research in order to address the challenges. The lines linking the grand challenges show that progress in addressing any challenge will require progress in addressing each of the others.

WCRP: global & regional information, prediction and impact of CC

Future Directions

- World Climate Conference-3, OceanObs '09, ICSU Review and Visioning, acknowledge WCRP past contributions and identify future challenges and opportunities.

- Need for more flexibility/agility to respond to expanding users needs, that includes information:

  - At regional scale
  - For key sectors of global economy
  - For adaptation, mitigation and risk management

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The Interdisciplinary Nature of Climate Science

- Atmosphere, Oceans and Climate
- Cryosphere and Climate
- Atmospheric Chemistry and Dynamics
- Water, Energy and Climate

Meeting the Information Needs of Society

Activities in Support of Key Deliverables

- Decadal Variability, Predictability and Prediction
- Sea-Level Variability and Change
- Climate Extremes
- Atmospheric Chemistry and Dynamics
- Centennial Climate Change Projections
- Seasonal Climate Prediction

Activities in Support of WCRP Integrating Themes

- Climate-Quality Data Sets and Analyses
- A New Generation of Climate/Earth System Models
- Next Generation of Climate Experts: Developing Capacity Regionally and Globally

WCRP Open Science Conference

Daily Conference Themes – Integrative aspect of WCRP

Monday (early AM): Climate Research in Service to Society

Monday (late AM): The Climate System Components and their Interactions

Tuesday: Observations and Analysis of the Climate System

Wednesday: Assessing and Improving Model and Predictive Capabilities

Thursday: Climate Synthesis and Assessments

Friday (early AM): Translating Scientific Understanding of the Climate System into Climate Information for Decision Makers

Friday (late AM): The Future of WCRP

http://conference2011.wcrp-climate.org

WCRP Open Science Conference

- Assembly of WCRP affiliated researchers and partners (~1800 participants)
- Exclusive opportunity for exchange and collaboration across diverse research communities (e.g., WCRP, WWRP, IGBP, IHDP, …) working to advance understanding and prediction of climate variability and change across scales

The Conference will:

- Appraise the current state of climate science (→ IPCC AR5)
- Identify the most urgent scientific issues and research challenges
- Ascertain how the WCRP can best facilitate research and develop partnerships critical for progress
- Facilitate the growth of the future, diverse workforce

http://conference2011.wcrp-climate.org

- The goals of the OSC include:
  - Building interdisciplinary collaborations within the WCRP community, across the core projects
  - Encouraging more of an "end-to-end", user-needs-driven approach to climate research
  - Demonstrating the continued (in fact growing) importance of fundamental research for meeting user needs
  - Facilitating meaningful collaborations with partners
  - Growing the scientific community
- *All WCRP core projects and working groups will be looking to the OSC for new ideas on opportunities and research needs,* ***and new and diverse talent to entrain***

Emerging structure Post-2013

- The WCRP will be based on four fundamental *interactions* of the Earth/climate system:
  - Ocean-atmosphere
  - Land-atmosphere
  - Stratosphere-troposphere
  - Cryosphere

WCRP Overarching/Unifying themes:

Observation and Analysis

Process understanding

Modeling development, projections and prediction

Climate Information and Application

Charge to Participants

- This conference will serve to identify and define the future research priorities for the WCRP
- This is **your** opportunity to influence the direction of the WCRP
- In that regard, we ask that you engage in vigorous discussion intra- and intersessionally regarding the climate research agenda for the future
- Are there any fundamental challenges, opportunities, or societal needs that we have overlooked?
- If so, please contact me, a member of the JSC, or the various session chairs